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915071

POST-IRM SITE ASSESSMENT REPORT

FORMER LEHIGH VALLEY RAILROAD YARD
BUFFALO, ERIE COUNTY, NY
NYSDEC ID # 915071

Prepared for:

The Lehigh Valley Railroad Company
One East Fourth Street
Cincinnati OH 45202

Prepared by:

Integrated Environmental Services
A Division of NES, Inc.
44 Shelter RCT ock Road
Danbury, 06810

NES Document Control Number 82A8175

February 7, 1994

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DOCUMENT AUTHORIZATION FORM

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TABLE OF CONTENTS
POST IRM SITE ASSESSMENT REPORT

TABLE OF CONTENTS
POST IRM SITE ASSESSMENT REPORT

LIST OF FIGURES (FIGURES APPEAR AT END OF REPORT)

TABLE OF CONTENTS
POST IRM SITE ASSESSMENT REPORT

LIST OF PLATES (PLATES APPEAR AT END OF REPORT)

LIST OF TABLES (TABLES APPEAR AT END OF REPORT)

APPENDICES

NOTE: The following complete NYSDEC ASP 1991 laboratory deliverables analytical reports were submitted as unbound attachments to this report: HAS Report #93-0592; HAS Report #93-0608, HAS Report #93-0609, and HAS Report #93-0722

EXECUTIVE SUMMARY

This report presents the results of the Post-Interim Remedial Measure (Post-IRM) Site Assessment conducted at the former Lehigh Valley Railroad (LVRR) yards, Tifft St., Buffalo, New York (NYSDEC ID #915071) (LVRR Site) which was conducted in partial fulfillment of the requirements of a Draft Order On Consent (Index # B9-0383-91-09). The purpose of the investigation was to delineate the extent of contamination originating from two former 100,000 gallon On-Ground Storage Tanks (OSTs) which were removed by LVRR with the NYSDEC's consent in October, 1991.

The one-acre LVRR Site is located approximately 1 mile south of Buffalo's central business district in an area of industrial, recreational, and undeveloped land uses. Numerous NYSDEC Registered Inactive Hazardous Waste Disposal Sites are located in the area with eleven sites within a 1-mile radius of the LVRR Site. The area can be characterized as being heavily impacted by contamination from industrial and urban activity.

The original LVRR Site as defined by the NYSDEC included approximately 104 acres of former LVRR yards. In July 1991, based on NYSDEC sponsored investigations conducted at the property, the NYSDEC changed the classification of the LVRR Site from 2a to 2 and reduced the area of concern from the entire 104 acres to the two former OSTs and an estimated 1 acre of surrounding land.

IES conducted soil sampling in order to characterize two initial areas of concern: the LVRR Site consisiting of an estimated one acre surrounding the locus of the former OSTs, and an approximately 200 feet (ft) by 15 ft stained area located several hundred feet north of the former tanks. These areas of investigation were ultimately expanded into a five-acre area (Study Area). The investigation consisted of the following: installation of soil borings at 61 locations and field screening of samples at surface and depth with a photo ionization detector (PID); selection of 51 soil samples from 45 locations for laboratory analysis of Target Compound List (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs); selection of seven soil samples from seven locations for laboratory analysis of Target Analyte List (TAL) metals; collection of one sediment and one surface water sample for laboratory analysis of TCL VOCs, TCL SVOCs, and TAL metals; installation and development of three groundwater monitoring wells; and collection of groundwater samples from the three newly installed wells and three preexisting wells with laboratory analysis of TCL VOCs, TCL SVOCs, and TAL metals.

Results of the investigation revealed the following:

- low-level VOC and SVOC soil contamination exists at the LVRR Site, in site soils, the distribution and chemistry of which is consistent with the former OSTs as a source;
- low-level metals soil contamination exists in soils at the LVRR Site, the origin of which appears to be the extensive use of steel industry by-products such as slag and casting sands as fill material;
- contaminants found in the LVRR Site soils are consistent with former uses of the property and are also consistent with contaminants found on other nearby NYSDEC Registry Inactive Hazardous Waste Disposal Sites (NYSDEC, 1993) classified as Class 3 sites, probably as a result of the use of similar fill material on these sites, e.g., Donna Hanna Coke (NYSDEC ID #915017) located immediately north and west of the LVRR Site across the Conrail track and right-of-way (see figure 2);
- groundwater is shallow (2' to 6' below grade), has a relatively flat slope (0.003), and flows to the southwest across the LVRR Site with an estimated velocity of 36 to 292 feet per year;
- the upgradient well had the highest overall concentrations of both VOCs and SVOCs but no similar concentration trend was evident with metals in groundwater;
- migration of contaminants via surface water does not appear to be a concern because the appearance and extent of surface water on the LVRR Site is intermittent and related to precipitation events, and was not observed to be connected to water bodies off the LVRR Site;
- the immediate real and potential threat to human health and the environment posed by the LVRR Site was eliminated when LVRR properly and legally decommissioned the two former 100,000 gallons OSTs during the NYSDEC sanctioned IRM in October 1991;
- the low-level VOC, SVOC and metals soil contamination that exists in the balance of the five-acre Study Area that is not listed on the State Registry of Inactive Hazardous Waste Sites indicates that no portion of the Study Area presents a significant threat to the public health or environment.

The results of this investigation indicate that soil, groundwater and surface water contamination at the LVRR Site does not pose a significant threat to the public health or the environment. Therefore, IES recommends:

- that NYSDEC reclassify the LVRR Site as a Class 3, indicating that the presence of hazardous waste has been confirmed, but it does not present a significant threat to human health or the environment; this classification change would be consistent with the Class 3 classification of the Donna Hanna Coke Site located upgradient of the LVRR which is described in the NYSDEC Registry (NYSDEC, 1993) as having high levels of PNA's and iron in soil as well as contaminated groundwater; and
- that any cleanup at the LVRR Site be deferred until the NYSDEC or other lead agency prepares and is ready to implement a regional remedial plan.

1.0 INTRODUCTION

1.1 PURPOSE

This report has been prepared by Integrated Environmental Services (IES), a division of NES, Inc., on behalf of The Lehigh Valley Railroad Company (LVRR) to present the results of the Post-Interim Remedial Measure (Post-IRM) Site Assessment conducted at the former Lehigh Valley Railroad yards, Buffalo, New York. An approximately one-acre portion of this property is listed on the New York State Department of Environmental Conservation's (NYSDEC's) Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site (NYSDEC ID #915071) (LVRR Site).

The scope, methods, and procedures of the work conducted during this investigation are described in a work plan prepared by IES and presented to the NYSDEC in partial fulfillment of the requirements of the NYSDEC's Draft Order On Consent (Index # B9-0383-91-09) (IES, 1992). IES submitted the work plan to the NYSDEC in March, 1992. The work plan was reviewed by the NYSDEC and sent back to IES with comments. IES edited the work plan to incorporate the NYSDEC comments and resubmitted the work plan on June 17, 1992.

The purpose of the investigation was to: 1) determine if two former 100,000 gallon On-Ground Storage Tanks (OSTs) were a source of contamination at the LVRR Site or the balance of the Study Area; and 2) delineate the extent of contamination originating from the tanks, if any.

Specifically, this report provides:
- a physical and geographical description of the LVRR Site and the Study Area;
- a summary of previous environmental investigations and removal activities;
- a description of the investigation conducted;
- findings of the investigation; and
- recommendations.

1.2 SITE DESCRIPTION

The LVRR Site is located within the corporate limits of the City of Buffalo, Erie County, New York. The property is located approximately 1 mile south of Buffalo's central business district in an area of industrial, recreational, and undeveloped land uses (Figure 1). Numerous NYSDEC Registry Inactive Hazardous Waste Disposal Sites are located in the vicinity of the LVRR Site (Figure 2). As shown in Figure 2, eleven sites are within a 1-mile radius of the LVRR Site. Moreover, the Tifft Farm Nature Preserve Site (NYSDEC ID #915072) abuts the western border of the LVRR Site. On the basis of the density of sites, this area can be characterized as being heavily impacted by contamination from industrial and urban activity.

The character of the area is an important consideration when assessing the potential health and environmental risks posed by a Registry site and evaluating the need for further action.

The original LVRR Site as defined by the NYSDEC included approximately 104 acres of former LVRR yards (YEC, 1990) comprised of three contiguous parcels separated by active Conrail railroad tracks (Plate 1). In July 1991, based on NYSDEC sponsored investigations conducted at the property, the NYSDEC changed the classification of the LVRR Site from Class 2a to Class 2 and reduced its area from the entire 104 acres to the two former OSTs and an estimated 1 acre of surrounding land (Marino, 1991). However, as part of the work plan, the NYSDEC also required investigation of a stained area several hundred feet north of the tanks. In general, the LVRR Site is bounded on the north and south by portions of the former LVRR yard, on the east by Conrail right-of-way and active track, and on the west by the Tifft Farm Nature Preserve.

The closest surface water to the LVRR Site is the nature preserve's Berm Pond located approximately 1000 ft west of the tanks. Lake Erie is approximately 4,000 ft west and the Buffalo River approximately 5,000 ft north of the site. A 95-acre cattail marsh lies immediately west of the LVRR Site within the nature preserve.

Surface drainage at the LVRR Site is expected to be generally to the west or southwest towards the marsh and Lake Erie. Previous investigations indicate that groundwater flow proximal to the tanks is also generally to the west and southwest (YEC, 1990).

2.0 BACKGROUND INFORMATION

2.1 SITE HISTORY

The LVRR, and its predecessor the Lehigh Valley Rail Way Company, operated a rail yard at the property beginning in the early 1900's. LVRR ceased railroad operations in 1976 and transferred part of the former rail yards and active track to the newly formed Conrail. The two 100,000 gallon OSTs were on property retained by LVRR.

No information is available concerning construction and use of the tanks while LVRR operated at the site. LVRR leased the two OSTs to Booth Oil Company, Inc. (Booth) from March 1977 to October 1982 (Stubits, 1989). The tanks are believed to have been unused since that time. The LVRR removed the tanks in October, 1991.

2.2 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

In June 1981, the Erie County Department of Environment and Planning (ECDEP) responded to a release of oil from the tanks (Cambell, 1981). ECDEP inspectors reported a 4 to 6 inch thick accumulation of fuel oil in a 20 feet by 40 feet depression on the north side of the north tank within the diked area. Field notes indicate that the release was adequately contained and that no surface water bodies were affected. ECDEP inspectors also noted an area of stained saturated soil 6 feet wide by 70 feet long near a delivery valve on the south side of the south tank outside of the diking. Again, this was reported not to have affected any surface water. The inspectors also noted surficial soil staining due to used absorbent materials strewn about the area.

The site was re-inspected by the ECDEP in July, 1981. The standing oil had been removed. Two test holes completed to a depth of one foot indicated that the maximum depth of oil contamination was one inch. Contaminated soils south of the south tank were removed and clean stone laid down in their place. Absorbent materials were removed from the property.

The site was re-inspected by the ECDEP several times throughout the fall of 1981. Only partial removal of the stained soil and vegetation had been completed in the north spill area. A representative of Booth told the ECDEP that complete cleanup of soils and vegetation would be completed by August 1, 1982. In January 1982 the ECDEP tickled the incident file for August 1, 1982. No indication of further action by the ECDEP was noted in the incident log.

In 1984, in response to LVRR's offer of donating the property, the City of Buffalo asked the ECDEP to investigate the property for potential environmental problems. The field investigation by the ECDEP was conducted in July 1984 (O'Connor, 1984). The investigation noted leakage from the valve of the southern tank; no estimation of the volume, rates, or size of the area affected was given. Both tanks were described as containing an approximately 1-foot thick odorous residue. A Vehimeyer sampler was driven to a depth of 3 ft in two locations adjacent to the southern tank and in one location adjacent to the northern tank. Poor recovery of the samples was recorded, reportedly due to mucky soil conditions. The material was described as having a greasy feel and oil odor.

The ECDEP investigation also described a 200 feet by 15 feet area north of the tanks with sparse vegetation having a strong oil odor. Three-foot-deep borings were made with a Vehimeyer sampler at three different locations. In each location "heavily oil contaminated surficial ground water filled the hole to one inch below ground surface."

In 1988 the NYSDEC sponsored a "Phase II Investigation" of the entire 104 acre LVRR property. This investigation included sampling of tank contents, soils, sediments, surface waters, groundwater, and a geophysical/geohydrological study.

The results of this investigation were published in March, 1990 (YEC, 1990). The tanks were estimated to contain 25,000 gallons of residual oil. Chemical analysis indicated that this oil (sample SL-1) had high concentrations of Target Compound List (TCL) Volatile Organic Compounds (VOCs) including chlorinated compounds, and also had detectable but non-quantifiable concentrations of TCL semi-VOCs (SVOCs). Groundwater samples from two of the three nearby monitoring wells located approximately 500 to 600 feet from the tanks (GW-4, GW-5 and TF-1) contained TCL VOCs in excess of New York State Department of Health (NYSDOH) Maximum Contaminant Levels (MCLs) for drinking water. A surface water sample (SW-2) from Berm Pond, approximately 1,000 feet west of the tanks, contained TCL VOCs and SVOCs in concentrations which were detectable but non-quantifiable except for the common laboratory/field contaminants methylene chloride, acetone, and bis(2-ethylhexyl)phthalate. A sediment sample (SD-1) collected at the same location also had detectable but below quantification concentrations of TCL VOCs and SVOCs. A surface soil sample (SS-5) taken approximately 400 feet north of the northern tank had detectable concentrations of TCL VOCs and two pesticides.

In October of 1990, the NYSDEC sponsored a Supplemental Phase II Investigation at the LVRR property which included installation of test pits, and collection of soil and drum samples approximately one half mile north of the tanks; further investigation of the tanks or the area around the tanks was not included in this supplemental investigation. The report of the supplemental investigation concluded that widespread low-level hydrocarbon contamination and non-mobile heavy metal contamination existed in the areas investigated. The results of this investigation were published in July 1991 (LMS, 1991). Concurrently, NYSDEC reduced the area of the LVRR Site, as listed on the New York State Registry, to approximately one acre (Marino, 1991).

In July 1991, LVRR sampled the tank contents in preparation for disposal and demolition of the tanks. Waste oil disposal analysis indicated that the material was not a characteristic waste as defined by the Resource Conservation and Recovery Act (RCRA) and did not contain detectable levels of releasable sulfide and cyanide (HAS, 1991). Based upon the analytical results from this sample, the waste oil was not a RCRA characteristic hazardous waste.

2.3 TANK REMOVAL

In October 1991, LVRR sponsored removal of the two tanks. The work plan for removal of the tanks was reviewed by the NYSDEC prior to commencement of removal activities (Walia, 1991). Removal and demolition work was done by the Environmental Services Group, Inc. and other sub-contractors under the direction and supervision of IES. The tanks and associated piping were pumped, drained, cleaned, demolished, and removed from the LVRR Site during the period October 14 through 28, 1991. The tank contents were transported and disposed of as RCRA F001 hazardous waste per NYSDEC requirements (Walia, 1991). The cleaned tanks and piping were sold as scrap.

The tanks sat on concrete pads. The pads and the tanks themselves were in good shape; no indication of leakage directly from the tanks was observed. During removal of the tanks IES looked for signs of the spills and releases documented by the ECDEP. No stressed vegetation, stained soil, or other indications of the these historical events were observed. Documentation of the tank removal was provided in Appendix B of the work plan (IES, 1992).

3.0 POST-IRM SITE ASSESSMENT DESCRIPTION

3.1 SOIL INVESTIGATION

3.1.1 Soil Sampling Locations

IES conducted soil sampling at the LVRR property from April 19 through 23, 1993. The soil investigation task was designed to characterize two initial areas of concern. The first area was the LVRR Site, consisting of an estimated one acre surrounding the locus of the former OSTs. The objective of the investigation in this area was to determine if contamination remained from historical documented spills and also to determine if other undocumented releases had occurred from the former tanks or associated piping. The second area of concern was an approximately 200 ft by 15 ft stained area located several hundred feet north of the former tanks. The objective of the investigation in this area was to confirm the existence of petroleum contamination and determine its extent.

Visual and olfactory observations along with field screening with a photoionization detector (PID) indicated that potential petroleum contamination in the two areas was more areally extensive than first thought and in fact, the two areas overlapped. The initial areas of investigation therefore were expanded to define the limits of the potential contamination, resulting in a total Study Area of approximately five acres.

IES personnel laid down a grid with fifty-foot-spacing over the Study Area. The origin of the grid (LV 0,0) was positioned approximately 90 ft southeast of the southern tank pad (Plate 2). IES flagged the grid nodes, field screened and examined the soil at the nodes, and then selectively collected fifty-one samples for laboratory analyses at forty-three locations as described below. Field screening and sampling locations were surveyed by Soderholm Engineering, Inc. Sample point locations and coordinates are provided on Plate 2.

Surface soil samples were collected for laboratory analysis at fourteen grid nodes in the approximately one acre LVRR Site surrounding the former tanks; subsurface samples were also collected at three of the fourteen surface sampling locations. Subsurface samples were collected at an additional eighteen selected grid nodes located both within the LVRR Site area around the former tanks and in an additional two to three acres extending up to 200 ft. west and 450 ft. south of the former tanks. Because groundwater was encountered at 1 to 1.5 ft. below grade, only one subsurface sample each was obtained at sixteen of the eighteen locations; two samples each were obtained at the other two locations. Samples were split for duplicate analysis at two locations in the area south and west of the former tanks.

One subsurface soil sample was collected at each of eleven locations in the Study Area north of the LVRR Site. Ten of the samples were taken at nodal points in a two acre area approximately 400 ft to 700 ft north of the northern tank pad and one sample was taken approximately 1050 ft north of the northern tank pad. One sample was split for duplicate analysis in the area north of the tanks. Table 1 provides a summary of soil sampling locations, visual examination data, and sample depth.

3.1.2 Soil Sampling Methodology

3.1.2.1 Surface Samples

Surface soil samples were collected with stainless steel scoops. Prior to sampling, vegetation and debris were manually removed from a one foot square area centered on the sampling point. Soil to depth of one inch over the one foot square was placed in a stainless steel mixing bowl. In order to prevent volatile loss, laboratory supplied volatile organic compound (VOC) sample containers were filled with a representative aliquot of the soil from the bowl prior to mixing. The sample was then field screened with a PID by placing a representative soil aliquot into a zip lock freezer bag, sealing, agitating briefly, and sticking the PID probe into a small opening and recording the response. The remainder of the soil in the bowl was homogenized, and a representative sample placed in laboratory supplied containers for semi-VOC (SVOC) and metals analysis.

Immediately after collection, samples were placed in cooled sample shuttles. Samples were logged under full chain of custody and brought by IES personnel to either the Huntingdon Analytical Services, Inc., (HAS) laboratory facility in Middleport, NY or the Empire Soils (an HAS affiliate) office in Hamburg, NY.

Scoops and bowls were decontaminated after each sampling event. Non-chemical decontamination was utilized per IES' April 2, 1993 letter to the NYSDEC (Hanlon, 1993). Decontamination consisted of scrubbing with a non-phosphate detergent wash and rinsing with first potable and then distilled water. Sampling personnel donned new disposable sampling gloves prior to each sampling event.

3.1.2.2 Subsurface Samples

Subsurface soil samples were obtained with a stainless steel split spoon driven by a slide hammer. Prior to sampling, vegetation and debris were cleared from the sampling point. As specified in the work plan, the sampling device was advanced and samples collected in one foot intervals until ground water was encountered; groundwater was encountered at two feet below grade or less at every boring location; hence, only one subsurface sample was obtained at most of the sampling locations.

After being advanced through the appropriate sampling depth interval, the split spoon was retrieved and opened. To ensure soil samples were representative of the sampling interval, soil was preferentially removed from the bottom half of the split spoon. In order to prevent volatile loss, laboratory supplied VOC sample containers were filled immediately after opening the split spoon. The sample was then field screened with a PID by placing a soil aliquot into a zip lock freezer bag, sealing, agitating briefly, and sticking the PID probe into a small opening and recording the response. The remainder of the soil in the split spoon was placed in a stainless steel mixing bowl, homogenized, and a representative sample placed in laboratory supplied containers for SVOC and metals analysis.

Immediately after collection, samples were placed in cooled sample shuttles. Samples were logged under full chain of custody and brought by IES personnel to either the HAS laboratory facility in Middleport, NY or the Empire Soils office in Hamburg, NY. Split spoons, scoops, and bowls were decontaminated after each sampling event. Non-chemical decontamination was utilized per IES' April 2, 1993 letter to the NYSDEC (Hanlon, 1993). Decontamination consisted of scrubbing with a non-phosphate detergent wash and rinsing with first potable and then distilled water. Sampling personnel donned new disposable sampling gloves prior to each sampling event.

3.1.3 Soil Sample Analyses

A total of fifty-one soil samples (including duplicates) were collected and sent for laboratory analysis. Soil samples were analyzed by Huntingdon Analytical Services, Inc., (HAS) of Middleport, NY. HAS is certified and approved (#10834) to conduct environmental analyses by the New York State Department of Health (NYSDOH) under their (NYDOH's) Environmental Laboratory Program (ELAP). Analyses were conducted in accordance with NYSDEC's Analytical Services Protocol (ASP, 1991) and validated by Data Validation Services (DVS) of North Creek, NY. Complete ASP deliverable packages were submitted as unbound attachments to this report (see Table of Contents). Data Validation Reports are provided in Appendix 3.

All fifty-one soil samples were analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) and TCL semi-volatiles organic compounds (SVOCs). Seven of the fifty-one samples were also analyzed for Target Analyte List (TAL) metals. A schedule of analysis performed on individual samples is provided on Table 1 along with a summary of soil sampling locations, visual examination data, and sample depth intervals.

3.2 GROUNDWATER

3.2.1 Monitoring Well Installation

On April 20, 1993 IES installed three shallow 2-inch diameter PVC monitoring wells designated MW-1, MW-2 and MW-3 at the LVRR Site in the vicinity of the two former OSTs (Plate 2). MW-1 is approximately 13.5 ft deep and is located about 80 ft east (upgradient) of the former OSTs. MW-2 and MW-3 are both approximately 10 ft deep and are located about 90 ft west (down gradient) of the former OSTs.

Drilling was performed by Buffalo Drilling Company, Inc., under direct supervision of an IES geologist. The well borings was advanced with a hollow stem auger and were continuously sampled with a split spoon sampler. An IES geologist examined and logged the samples. The wells were constructed in accordance with the specifications provided in the work plan (IES, 1992). Boring logs and well construction diagrams are provided in Appendix A.

Drilling and sampling equipment were decontaminated between wells and between sampling events in accordance with the work plan (IES, 1992) as modified by IES' April 2, 1993 letter (Hanlon, 1993). Decontamination consisted of power-washing with potable water on an impervious pad constructed for this purpose. Water from the decontamination pad was collected in a sump and later discharged to the ground in an area close to the two former OSTs.

The wells were developed by Buffalo Drilling using a gasoline powered centrifugal pump under the direction of an IES field geologist. Approximately 50 gallons of water were removed from MW-1 and approximately 30 gallons of water each were removed from both MW-2 and MW-3. Development water was discharged to the ground surface near the wellhead at a rate and manner to allow infiltration into the soil and recharge of the shallow aquifer in accordance with Hanlon (1993) and DEC policy.

3.2.2 Groundwater Sampling Methodology

On May 13, 1993 IES sampled the three newly installed monitoring wells (MW-1, MW-2, and MW-3) and three pre-existing monitoring wells (TF-1, GW-4, and GW-5) installed by the NYSDEC during previous investigations. Prior to sampling and immediately upon opening of the wells, monitoring well headspace was monitored with a PID; results are provided on Table 2. After PID monitoring, depth of well and water-level measurements were taken with an electronic tape and used to calculate the standing volume of water in the well. A properly decontaminated 12 volt direct current submersible pump was used to purge a minimum of three calculated well volumes prior to sampling. The volume of water purged was determined by counting the number of five-gallon pails filled by the discharge. Purge water was discharged to the ground in the vicinity of the monitoring well from which it came in accordance with IES' April 2, 1993 letter to the DEC (Hanlon, 1993) and DEC policy. To ensure representative formation water was sampled, pH was measured before, during, and after purging of the wells. In addition, temperature, turbidity, and specific conductance were measured after purging and prior to sampling of the wells. Results of all field measurements are provided on Table 2.

Groundwater samples were collected with clear polyethylene disposable bailers which were emptied directly into laboratory supplied pre-cleaned sampling containers. Sampling personnel changed their outer gloves between sampling events to prevent cross-contamination. Samples were placed in chilled coolers immediately after collection. Chain-of-custody and analytical request forms were completed immediately after collection of all samples and were placed in the coolers with the samples. The coolers were taped shut and custody seals were applied. Samples were transported by IES to the Empire Soils (an HAS affiliate) office in Hamburg, NY, where they remained sealed and were later picked up by an HAS courier.

3.2.3 Groundwater Sample Analyses

A total of seven groundwater samples were collected, one sample from each well and one duplicate. Groundwater samples were analyzed by Huntingdon Analytical Services, Inc., (HAS) of Middleport, NY. HAS is certified and approved (#10834) to conduct environmental analyses by the New York State Department of Health (NYSDOH) under their (NYDOH's) Environmental Laboratory Program (ELAP). Analyses were conducted in accordance with NYSDEC's Analytical Services Protocol (ASP, 1991) and validated by Data Validation Services (DVS) of North Creek, NY. Complete ASP deliverable packages were submitted as unbound attachments to this report (see Table of Contents). Data Validation Reports are provided in Appendix 3.

All groundwater samples were analyzed for TCL VOCs and TCL SVOCs. In addition, all samples excluding the duplicate were analyzed for Total Organic Carbon (TOC), Total Suspended Solids (TSS) and Total Dissolved Solids (TDS). Trip and field blanks were analyzed for VOCs only. In addition to laboratory analyses, temperature, pH, dissolved oxygen, and specific conductance were measured in the field.

3.3 SEDIMENT AND SURFACE WATER

3.3.1 Surface Water Sample

IES collected one surface water sample during this investigation. The surface water sample was collected on May 13, 1993, along the western border of the LVRR property near the Tifft Farms Nature Preserve approximately 350 ft northwest of the former OSTs (and not on the LVRR Site) and is designated SWS-1 on Plate 2. The sample was obtained by placing laboratory supplied sample bottles directly into the surface water and slowly allowing them to fill. The surface water sample was collected the same day as the groundwater samples and was sent for analysis in the same cooler and under the same chain-of-custody as the groundwater samples. The following analyses were requested: TCL VOCs, TCL SVOCs and Target Analyte List (TAL) metals.

3.3.2 Sediment Sample

IES collected one sediment sample during this investigation. The sample was collected on May 13, 1993, approximately 400 ft north of the former OSTs (and not on the LVRR Site) and is designated SED-1 on Plate 2. The sample was collected in an area observed to be covered by surface water three weeks earlier during the soil sampling and monitoring well installation component of this investigation. Overall, the Study Area was significantly drier and large areas which were covered with surface water during IES' earlier visit were exposed. Surficial debris and leaf litter were scraped away from a one square ft area and the sample collected from the area to a depth of one inch. The sediment sample was black, water saturated, and had a high organic matter content. The sediment sample was collected on the same day as the groundwater samples and was placed in the same cooler and sent for analysis under the same chain-of-custody as the groundwater samples. The following analyses were requested: TCL VOCs, TCL SVOCs and TAL metals.

4.0 ASSESSMENT RESULTS

4.1 PHYSIOGRAPHY

4.1.1 Geology

According to the previous site report prepared for the NYSDEC (YEC, 1990), the Study Area is underlain by the Oatka Creek Shale, a Devonian Age shale member of the Marcellus Formation. The unit consists of dense, black, fissile, shale with thinly interbedded fine sand, limestone, and some gray shale. The bedrock surface is at approximately 60 ft below grade at the Study Area and is overlain by glacial lake deposits consisting of unconsolidated interbedded silts, sands, and clays.

On the basis of the three monitoring well borings associated with this investigation and previous borings performed at the Study Area by others (YEC, 1990), Study Area Stratigraphy stratigraphy consists of 4 to 8 ft of fill material (bricks, trap rock gravel, and casting sands) overlying unconsolidated glacial lake deposits (interbedded silts, fine sands, and clays). Fill consisting of cinder chips, brick fragments and trap-rock gravel was found at depths of 8 inches to 2 feet in each of the three borings. The underlying strata to a depth of 6 feet consisted of brown to black fine to medium sand with little coarse sand in boring MW-1 and gray to brown silt and clay in borings MW-2 and MW-3. Some gravel was also present in soil boring MW-3 at a depth of 6 ft. Soil borings MW-1 and MW-2 had a layer of white, green, and black fine to medium sands present at approximately the 4 ft depth. This layer extended to a depth of 8 ft in soil boring MW-2. These sands appeared to be some type of casting sand. Gray and brown silty clay with some fine sand comprises the underlying strata from a depth of 8 ft to the completion of the borings (10 to 13 ft). None of the borings associated with this investigation were advanced to bedrock. The results of the borings from the previous investigations indicate that GW-4 and GW-5 exhibit similar stratigraphic units, and fill debris was also present at depths of 3 to 4 ft.

4.1.2 Hydrogeology

During the advancement of the monitoring well borings, groundwater was encountered at 2 to 3 ft below ground surface. A potentiometric surface map (Plate 3), constructed from the groundwater measurement data collected on May 12, 1993, indicates that groundwater beneath the Study Area flows to the southwest. The data indicates that the flow patterns and slope of the water table are uniform across the Study Area.

No hydraulic conductivity testing was performed as part of this investigation; however, hydraulic conductivity tests were performed during a previous LVRR Site investigation (YEC, 1990). Hydraulic conductivity values were obtained from monitoring wells GW-4 and GW-5 utilizing the falling head (slug) test method. The calculated hydraulic conductivity values (K) for monitoring wells GW-4 and GW-5 were approximately 32 ft/day and approximately 4 ft/day respectively assuming anisotropic conditions where the ratio of K-horizontal to K-vertical is assumed to be 10. Groundwater flow velocity across the Study Area can be determined utilizing these hydraulic conductivity values, a representative specific yield value of 0.12 (Capzone, 1992), and the equation for ground-water flow velocity, $V = Ki/n$ (Freeze and Cherry, 1979). Using these values, groundwater velocity was determined to be approximately 292 ft/yr at GW-4 and approximately 36 ft/yr at GW-5. Calculations for these values are presented as Appendix B.

4.1.3 Surface Water

During the soil sampling component of the investigation conducted from April 19 through 23, 1993, standing surface water was observed covering large portions of the west and northwest areas of the Study Area (Plate 2). Numerous shallow (1 to 1.5 ft) soil borings taken at that time revealed a high ground-water table with standing water visible in the bottom of the borings. When IES returned to the Study Area May 12-14, 1993 to conduct groundwater sampling, the Study Area was noticeably drier with large areas, previously covered by standing water, exposed. Only a small area in the northwest corner of the Study Area bordering the western access road was still covered with standing water. These observations and the presence of cat tails and other wetland vegetation indicates that extensive areas of the Study Area are seasonally wet, but no perennial surface water bodies (e.g. lakes, streams, rivers or ponds) were observed on the Study Area. Furthermore, the standing water does not appear to be recharging or discharging from streams or brooks or drainage swales on the Study Area. No evidence of surface water contamination was visible on either the LVRR Site or the larger Study Area during either visit.

4.2. SOIL QUALITY

4.2.1. Objective

The soil investigation conducted by IES was designed to assess the general soil quality at the LVRR Site and the Study Area and to determine the impact of the OSTs formerly located at the LVRR Site and documented historical spills on soil quality. Soil investigation scope, methods, procedures, and protocols were as described in Section 3.1 *et. seq.* of this report. Analytical results are presented below and are compared to generic recommended soil cleanup objectives (RSCOs) established by the NYSDEC for a variety of chemical substances and compounds commonly found at inactive hazardous waste sites (NYSDEC, 1992).

4.2.2. Analytical Results

Note: Summary data tables and the following discussions of sampling results are based on post-validated laboratory data, i.e., they incorporate the data validator's recommendations on data usability and qualifications. Complete ASP deliverable packages were submitted as unbound attachments to this report. Data validation reports are provided in Appendix 3 of this report.

4.2.2.1. Volatile Organic Compounds

Twenty-nine (29) of the 51 soil samples collected and analyzed for VOCs had detectable concentrations of one or more of the targeted compounds; a total of ten different VOC compounds were detected. The specific compounds detected along with their frequency of detection and maximum concentration detected are presented below.

Parameter	**Frequency of Detection (51 samples analyzed)**	**Maximum Concentration (µg/kg)**
Chlorinated Hydrocarbons		
Chloroform	10	42
1,1,1-Trichloroethane	15	200
Trichloroethene	1	5
Aromatic Hydrocarbons		
Ethyl benzene	3	100
Xylene (tot)	3	870
Benzene	1	56
Toluene	2	59
Other Volatiles		
2-Butanone	2	17
Carbon Disulfide	4	37
Acetone	1	140

Concentrations of detected VOCs were all under 900 micrograms per kilogram (µg/kg), most were under 100 µg/kg, and all were below their respective RSCO. VOCs were detected in 29 samples with a maximum total VOC concentration of 1022 ug/kg which is well below the total VOC RSCO of 10,000 ug/kg. Table 3 provides a summary of analytical results for each soil sample analyzed for VOCs.

Chlorinated hydrocarbons were the most frequently detected group of VOC compounds with at least one of the three species detected (1,1,1-trichloroethane, chloroform, trichloroethene) found in 23 of the samples. The maximum total chlorinated hydrocarbon concentration was 200 ug/kg; no RSCO exists for total chlorinated hydrocarbons. 1,1,1-trichloroethane was detected in 15 samples with the highest concentration found in soil samples from boreholes LV-50,100 (200 µg/kg) and LV 0,150 (28 µg/kg) which are located on the LVRR Site about 70 ft southwest and 140 ft southwest of the southern tank pad, respectively, as indicated on Plate 2. Chloroform was detected in 14 samples with the highest concentrations detected in soil samples from boreholes LV 250,50 (42 µg/kg) and LV 300,50 (36 ug/kg) located on the LVRR Site about 50 ft and 90 ft north of the northern tank pad, respectively. Trichloroethene was detected in only one sample, LV 0,150 at 5 ug/kg.

Aromatic hydrocarbons were detected in samples from four locations with a maximum total concentration of 1022 ug/kg; no total aromatic hydrocarbon RSCO exists. Xylene (total) was detected at the highest concentrations and was detected at three of the four locations, LV 630,60 (870 ug/kg), LV 750, 100 (550 ug/kg), and LV -50,100 (260 ug/kg). Ethylbenzene was the next most dominant aromatic hydrocarbon and was detected at the same three locations as follows: LV 630,60 (37 ug/kg), LV 750, 100 (100 ug/kg), and LV -50,100 (31 ug/kg). Toluene was detected at two locations, LV 630,60 (59 ug/kg) and LV 200,150 (4 ug/kg). Benzene was located at one location, LV 630,60 (56 ug/kg). LV 630,60 and LV 750, 100 are located about 450 ft and 550 ft north of the northern tank pad respectively. LV -50,100 is located about 150 ft south of the southern tank pad and LV 200, 150 is located about 60 ft west of the northern tank pad.

4.2.2.2. *Semi-volatile Organic Compounds*

All of the 51 soil samples collected and analyzed for SVOCs had detectable concentrations of one or more of the targeted compounds; a total of 28 different SVOC compounds were detected. Polynuclear aromatic hydrocarbons (PAHs) were the most frequently detected group of SVOCs and also occurred in the highest concentrations; phenols, phthalates and other semi-volatiles were not as widespread. The 18 specific PAHs detected along with their frequency of detection and maximum concentration detected are presented below.

Parameter	Frequency of Detection (51 samples analyzed)	Maximum Concentration (µg/kg)
Semi-volatiles (PAHs)		
Napthalene	48	9000
Acenapthylene	30	6100
Acenapthene	22	31,000
Fluorene	23	36,000
Phenanthrene	48	96,000
Anthracene	41	110,000
Fluoranthene	47	13,000
Pyrene	49	19,000
Benzo (a) Anthracene	41	9300
Chrysene	43	10,000
Benzo (b) Fluoranthene	39	14,000
Benzo (k)Fluoranthene	37	6900
Benzo (a)Pyrene	38	12,000
Indeno (1,2,3,-cd) Pyrene	40	5800
Dibenz (a,h) Anthracene	30	2100
Carbazole	33	13,000
2-Methylnapthalene	48	470,000
Benzo (g,h,i) Perylene	40	6000

The distribution of the semi-volatile compounds detected in soil samples is shown in Plate 4. Forty-two (42) of the 51 samples exceeded the RSCO for one or more individual SVOCs but only one sample LV 630,60 (786,400 ug/kg) exceeded the RSCO for total SVOCs (500,000 ug/kg). The most widespread contaminants (those that exceed NYSDEC's RSCOs) at the site are PAHs. The extent that SVOCs exceed RSCOs is grid-wide and shows no particular pattern. Four sample locations (LV 750,100, LV 630,60, LV-50,100 and LV 0,150) show total SVOCs to be in excess of 100,000 µg/kg (Plate 4 and Table 4). LV 750,100 is located about 550 ft north of the northern tank pad and LV 630,60 is located about 430 ft north of the northern tank at the center of the visibly stained area which was the focus of investigation in this area. Sample locations LV-50,100 and LV 0,150 are in the southern portion of the grid and may be related to the initial area of concern that encompasses the two OST concrete pads.

Only one phenolic compound RSCO was exceeded, and this, only in one sample. LV 700,100 has a 2-methylphenol concentration of 820 µg/kg compared with the RSCO of 100 ug/kg.

Two other sample locations, LV-50,100, and LV 630,60 have dibenzofuran concentrations (18,000 and 31,000 µg/kg respectively) that exceed the RSCO (6200 ug/kg).

4.2.2.3. Metals

All of the seven soil samples collected and analyzed for TAL metals had detectable concentrations of one or more of the targeted analytes; a total of 21 different metals were detected. The only TAL metals not detected were silver and sodium. The 21 specific metals detected along with their frequency of detection and maximum concentration detected are presented below.

Parameter	Frequency of Detection (7 samples analyzed)	Maximum Concentration (mg/kg)
Metals		
Aluminum	7	5790
Antimony	4	91.2
Arsenic	7	28.6
Barium	7	208
Beryllium	2	1.3
Cadmium	6	4.7
Calcium	7	171,000
Chromium	7	79.1
Cobalt	7	18.8
Copper	7	295
Iron	7	127,000
Lead	7	1620
Magnesium	7	5210
Manganese	7	926
Mercury	5	0.81
Nickel	6	45.8
Potassium	7	827
Selenium	3	0.94
Thallium	3	0.48
Vanadium	7	44.8
Zinc	7	1480

According to the NYSDEC guidance document for determining soil cleanup objectives (NYSDEC, 1992), if the RSCO is greater than the site specific background concentration then the clean-up objective becomes site-specific background. Table 5 presents a summary of analytical results for metals in Study Area soils and also provides the established RSCO and range of naturally occurring concentrations in the eastern USA for specific metals. Determination of site specific background for metals was not within the scope of this investigation: however, the wide distribution of fill materials at the Study Area would make it difficult to obtain a sample not impacted by local industrial activities. The concentrations of metals detected in LVRR Site and Study Area soils are therefore compared to both NYSDEC RSCOs and eastern USA background ranges. All seven samples had metals concentrations greater than both RSCOs and the upper limit of eastern USA background ranges for one or more targeted metals.

The most widespread metals found in Study Area soils were aluminum, arsenic, cadmium, chromium, copper, iron, mercury, nickel and zinc. The maximum concentrations of aluminum (5790 mg/kg) and iron (127,000 mg/kg) detected in Study Area soils is well below the published maximum naturally occurring concentration in the eastern U.S. (33,000 mg/kg and 550,000 mg/kg, respectively).

The soil sample from boring location LV 630,60 had elevated levels (greater than established RSCOs) for antimony (31.3 mg/kg), arsenic (17.3 mg/kg), calcium (171,000 mg/kg) chromium (12.8 mg/kg), copper (34.2 mg/kg), iron (16,00 mg/kg), magnesium (5,210 mg/kg) and zinc (74.6 mg/kg); the concentrations of aluminum, chromium, copper and iron were all within eastern U.S. background levels. The other elevated concentrations are related to the soil sample location within the northern stained area. Sample locations LV 300,50, LV 250,0 (0-1.0), LV 100,50 and LV 0,150 are all located on the LVRR Site in or around the area of the concrete tank pads. Sample locations NSB-1E and LV-400,50 represent the northern most and southern most points on the grid, respectively.

4.2.3 Discussion

4.2.3.1 Volatile Organic Compounds

Detected concentrations of individual and total VOCs in soil samples were all below their respective RSCOs. The most frequently detected VOCs were chlorinated hydrocarbons, which were detected in a total of 23 samples. The maximum total chlorinated hydrocarbon concentration was 200 ug/kg (sample LV-50,100). All of the remaining samples had total chlorinated hydrocarbon concentrations of 55 ug/kg or less. These data suggest that these compounds are present at the LVRR Site and across the Study Area at very low levels. No discernible pattern of detection is apparent, although these compounds were detected in samples collected adjacent to the former location of the OSTs which are known to have contained these parameters.

4.2.3.2 Semi-volatile Organic Compounds

All soil samples collected and analyzed for SVOCs contained detectable concentrations of these compounds, with PAHs being the most dominant category of SVOCs detected. This is not surprising and is consistent with the historical use of the LVRR Site as a rail yard because a wide variety of PAHs are found in creosote which is used as a preservative for railroad ties. PAHs are also generated as a result of the combustion of fossil fuels and are commonly detected in soils in urban areas.

Forty-two samples contained individual SVOCs which exceeded their respective RSCOs, but only one sample exceeded the RSCO for total SVOCs. SVOCs in soil above RSCOs were pervasive throughout the sampling grid and show no particular pattern. This is consistent with the historical use of the LVRR Site as a railroad yard because it appears operations throughout and across the site have deposited these compounds, primarily PAHs from creosote laced railroad ties and fuel burning, randomly across the site, with no specific source area.

Only one phenolic compound, 2-methylphenol, was detected at a concentration (820 ug/kg) exceeding its RSCO (100 ug/kg); these data indicate that these compounds are not significant parameters of environmental concern at the LVRR Site or the Study area in general. The concentration which exceeded the RSCO was detected in a sample collected approximately 500 ft north of the former OSTs (LV 700,100). Phenols are used as fuel oil sludge inhibitors (Hawley, 1987) and the presence of this compound is consistent with the former use of the LVRR Site.

Dibenzofuran was the only other SVOC detected at a concentration exceeding its RSCO (6200 ug/kg). Values greater than this level were detected in two samples, one at each end of the Study Area. Approximately 150 ft south of the former OSTs, sample LV-50,100 contained a concentration of 18,000 ug/kg and sample LV 630,60, approximately 400 ft north of the former OSTs contained 7500 ug/kg. This distribution indicates that this compound is not widespread at the LVRR Site or Study Area and is not a significant parameter of environmental concern. This compound is derived from coal tar and used as an insecticide (Sax and Lewis, 1987), which is consistent with the former use of the LVRR Site as a railroad yard.

No phthalate compounds were detected at concentrations exceeding RSCOs; therefore, these compounds are not considered to be parameters of concern at the LVRR Site or the Study Area.

4.2.3.3 Metals

Each of the seven soil samples analyzed for metals contained one or more parameters at levels exceeding either the RSCO or eastern US background ranges as identified by the NYSDEC (NYSDEC, 1992). The following metals exceeded both the RSCO and eastern US background ranges in at least one sample: arsenic, cadmium, calcium, chromium, copper, iron, lead, mercury, nickel and zinc. The presence of these metals at these concentrations is consistent with the historic use of the LVRR Site and the location of the LVRR Site and The Study Area in an industrialized area.

4.3 GROUNDWATER QUALITY

4.3.1. Scope and Objective

The groundwater quality investigation conducted by IES was designed to assess the general shallow groundwater quality at the LVRR Site and the Study Area and to determine the impact of the former OSTs and documented historical spills on groundwater quality. The groundwater investigation included installation of three shallow monitoring wells at the LVRR Site and sampling of the three new wells and three pre-existing wells. Groundwater samples were obtained from the on-site monitoring wells on May 13 and May 14, 1993, and except where noted, are considered representative of the groundwater quality of the water table aquifer beneath the Study Area at the time of sampling. The scope, methods, procedures, and protocols of the groundwater investigation were described in detail in Section 3.2 *et. seq.* of this report.

4.3.2 Analytical Results

Note: Summary data tables and the following discussions of sampling results are based on post-validated laboratory data, i.e., they incorporate the data validator's recommendations on data usability and qualifications. Complete ASP deliverable packages were submitted as unbound attachments to this report. Data validation reports are provided in Appendix 3 of this report.

Groundwater analytical results are compared to applicable NYSDEC standards for groundwater quality. Groundwater beneath the Study Area is classified as Class GA, for which the best usage is as a source of potable water supply (6 NYCRR 703.5(a)) The groundwater standards were taken from the September 25, 1990 NYSDEC memorandum regarding the Division of Water - Technical and Operational Guidance Series 1.1.1 (TOGS) Ambient Water Quality Standards and Guidance Values. This document considers all NYSDEC groundwater standards that result from the references in paragraph 703.5 (a)(2), the NYCRR Title 10, Chapter 1, Part 5, Subpart 5-1 Maximum Contaminant Levels (MCLs) and Part 170 standards of the NYSDOH.

4.3.2.1 Volatile Organic Compounds

Volatile organic compounds (VOCs) were detected in samples from four of the six wells sampled on May 13, 1993 (MW-1, MW-2, MW-3, and GW-4); a total of seven targeted VOC compounds were detected. The specific compounds detected along with their frequency of detection and the maximum concentration detected are presented below.

Parameter	Frequency of Detection (6 wells sampled)	Maximum Concentration (µg/l)
Chlorinated Hydrocarbons		
Methylene Chloride	1	100
Chloroform	1	1900
1,2-Dichloroethene	2	20
Vinyl Chloride	3	31
Trichloroethene	1	5
Aromatic Hydrocarbons		
Xylenes (total)	3	8
Other Volatiles		
Acetone	2	31

Methylene chloride and acetone were detected in investigation quality control samples and are not considered contaminants of concern at the LVRR Site or the Study Area. These compounds are cited by the USEPA as common laboratory contaminants (USEPA, 1988). Consequently, these compounds were not considered during the evaluation of groundwater quality conditions.

With the exclusion of acetone and methylene chloride, the total concentration of VOCs found in groundwater beneath the Study Area ranged from non-detect in TF-1 and GW-5, to 1912 micrograms per liter (ug/l) in MW-1. Chlorinated hydrocarbons were the principle VOCs detected, with totals ranging from non-detect to 1900 ug/l. The following detection's above NYSDEC standards are noted: chloroform in MW-1 (1900 ug/l vs. 7 ug/l); 1,2-dichloroethene in GW-4 (20 ug/l vs. 5 ug/l), and vinyl chloride in MW-2, MW-3, and GW-4 (31, 6, and 5 ug/l vs. 2 ug/l). All of the chlorinated hydrocarbons found in groundwater were either detected in Study Area soil (chloroform and trichloroethane) or are degradation products of those compounds (1,2-dichloroethane and vinyl chloride) (Vogel et. al., 1987). Moreover, trichloroethane was detected in the residual oil sludge removed from the former OSTs (YEC, Inc., 1990).

Xylene was the only aromatic hydrocarbon detected in ground water beneath the Study Area; it was detected in samples from MW-1, MW-2, and MW-3, exceeding the NYSDEC standard of 5 ug/l in MW-1 (8 ug/l) and MW-2 (7 ug/l). Xylene was also detected in soil samples during the investigation, and is commonly found as a component of petroleum contamination (California LUFT Manual, 1989). Monitoring wells MW-1, MW-2, and MW-3, all on the LVRR Site, were the only locations on the Study Area where Tentatively Identified Compounds (TICs) were detected during the analyses of groundwater samples for VOCs. The compounds tentatively identified include methyl-cyclohexane, isopropyl benzene (cumene) and propyl-benzene. These compounds are associated with petroleum products (Sax and Lewis, 1987; California LUFT Manual, 1989). In addition, a number of unknown alicyclic and aliphatic hydrocarbons were detected. The estimated concentration for each detected TIC was at or below 15 ug/L.

The results of VOC analyses of the groundwater samples collected from each of the monitoring wells are presented in Table 6 and are summarized below.

- Monitoring Well MW-1 had 100 ug/l of methylene chloride, 8 ug/l of total xylenes, 4 ug/l of ethylbenzene, 219 ug/l of acetone, and 1900 ug/l of chloroform.
- Monitoring Well MW-2 had 31 ug/l of vinyl chloride, 31 ug/L of acetone, 3 ug/l of 1,2-dichloroethene, 5 ug/l of trichloroethene, and 7 ug/l of total xylenes.
- The analyses of samples collected from Monitoring Well MW-3 and the duplicate sample (MW-3 DUP) revealed 6 ug/l and 5 ug/l of vinyl chloride respectively, and each revealed 2 ug/l of total xylenes.
- Monitoring Well GW-4 had 5 ug/l of vinyl chloride and 20 ug/l of 1,2-dichloroethene.
- The analyses for all other parameters in these wells were below the detection limits.
- The analyses of the groundwater samples collected from monitoring wells TF-1 and GW-5 were below the detection limits for all parameters.

4.3.2.2 Semi-volatile Organic Compounds

Semi-volatile organic compounds (SVOCs) were detected in groundwater from four of the six wells sampled on May 13, 1993 (MW-1, MW-2, MW-3, and GW-5); a total of eight targeted SVOC compounds were detected. The specific compounds detected along with their frequency of detection and the maximum concentration detected are presented below.

Parameter	Frequency of Detection (6 wells sampled)	Maximum Concentration (µg/l)
PAHs		
Napthalene	3	84
Acenapthene	3	13
Fluorene	3	14
Phenanthrene	3	9
Fluoranthene	1	3
Pyrene	1	2
2-Methylnapthalene	2	160
OTHER		
Dibenzofuran	3	13

Only one value above NYSDEC standards and guidelines for SVOCs in groundwater is noted; napthalene was detected in MW-1 at a concentration of 84 ug/l compared with the NYSDEC guideline concentration of 10 ug/l. The results of SVOC analyses of the groundwater samples collected from each of the monitoring wells are presented in Table 7 and are summarized below:

- Monitoring Well MW-1 revealed 84 ug/l of napthalene, 160 ug/l of 2-methylnapthalene, 5 ug/l of acenapthalene, 3 ug/l of dibenzofuran (tentative identification), 6 ug/l of fluorene, and 7 ug/l of phenanthrene.
- Monitoring Well MW-2 revealed 3 ug/l of napthalene, 10 ug/l of acenapthalene, 10 ug/l dibenzofuran, 12 ug/l of fluorene, and 9 ug/l of phenanthrene.
- Monitoring Well MW-3 revealed 3 ug/l of napthalene, 4 ug/l of 2-methylnapthalene, 7 ug/l of acenapthalene, 8 ug/l of dibenzofuran, 10 ug/l of fluorene, and 4 ug/L of phenanthrene. The duplicate sample obtained from Monitoring Well MW-3 (MW-3 DUP) revealed 8 ug/L of 2-methylnapthalene, 13 ug/l of acenapthalene, 13 ug/l of dibenzofuran, 14 ug/l of fluorene, and 4 ug/l of phenanthrene.
- Monitoring Well GW-5 revealed 3 ug/l of Fluoranthene, and 2 ug/l of pyrene.

- The results of the analyses in each of these monitoring wells for all other parameters were below the detection limit.
- The results of the ground-water samples collected from monitoring wells TF-1 and GW-4 were below the detection limits for all parameters.

4.3.2.3 Metals

Metals were detected in groundwater from all of the six wells sampled on May 13, 1993 (MW-1, MW-2, MW-3, TF-1, GW-4, and GW-5); a total of 15 targeted metals were detected. All TAL metals were detected in the samples with the exception of Antimony, Beryllium, Cadmium, Cobalt, Mercury, Nickel, and Silver. The specific metals detected along with the maximum value detected and the monitoring well the maximum concentration was detected in are presented below:

Parameter Metals	**Maximum Concentration (ug/l) (Monitoring Well - #)**
Aluminum	3830 (MW-3)
Arsenic	4.3 (MW-1)
Barium	178 (GW-5)
Calcium	125,000 (MW-3)
Chromium	14 (MW-3)
Copper	29 (MW-3)
Iron	25,800 (GW-5)
Lead	73.8 (MW-3)
Magnesium	13,800 (MW-3)
Manganese	1070 (GW-4)
Potassium	10,900 (MW-3 DUP)
Selenium	1.5 (MW-2)
Sodium	32,400 (MW-2)
Vanadium	11.6 (MW-3)
Zinc	90.6 (MW-3)

4.3.2.4 Other Groundwater Parameters

Samples from the six monitoring wells were also laboratory analyzed for total suspended solids (TSS), total dissolved solids (TDS), and total organic carbon (TOC); analytical results are presented in Table 2 along with field measurements of temperature, pH, specific conductance, turbidity, and PID response. TSS results ranged from 61 mg/l (GW-4) to 1070 mg/l (MW-3), TDS results ranged from 279 mg/l (MW-1) to 501 mg/l (TF-1), and TOC ranged from 8.8 mg/l (MW-3 and GW-4) to 27 mg/l (GW-5). Field measurements were as follows: temperature ranged from 29°C (TF-1) to 40°C (MW-1); pH ranged from 5.92 (GW-5) to 9.17 (MW-1); turbidity ranged from 5.2 NTU (MW-3) to 21.3 NTU (MW-1), specific conductance ranged from 110 umhos (MW-1) to 370 umohs (TF-1), and PID responses upon opening of the well ranged from 0 units of deflection (GW-4) to 1185 units of deflection (MW-2).

4.3.3 Discussion

4.3.3.1 Volatile Organic Compounds

Volatile organic compounds were detected in samples from four of the six well sampled (MW-1, MW-2, MW-3, and GW-4). The four wells all had detectable concentrations of both chlorinated aliphatic and aromatic hydrocarbons and all exceeded NYSDEC standards for one or more compounds. The upgradient well MW-1, had the worst overall analytical results, with a total VOC concentration (exclusive of methylene chloride and acetone) of 1912 ug/l; the other three wells had total VOC concentrations of 46 ug/l (MW-2), 8 ug/l (MW-3), and 25 ug/l (GW-4).

The bulk of the total VOCs detected in MW-1 is chloroform detected at 1900 ug/l compared with the NYSDEC standard of 7 ug/l. According to Sax and Lewis (1987), chloroform is used in fluorocarbon plastics, as a solvent, in analytical chemistry, in fumigants, and in insecticides. Chloroform was not detected in any of the other wells but was detected in 42 of the 51 soil samples collected during this investigation. The origin of chloroform at the LVRR Site is unknown but available information does not point to the former tanks as the source because: 1) chloroform was not detected in analyses of the former tank contents (YEC, 1990) (IES, 1992); 2) chloroform was detected in wide spread soil samples with no discernible pattern; and 3); MW-1 is up-gradient of the former location of the OSTs.

Other chlorinated hydrocarbons detected in monitoring wells above NYSDEC standards are 1,2 dichloroethene and vinyl chloride in MW-2, MW-3, and GW-4. These compounds were not detected in Study Area soil samples, however they are degradation products of trichloroethene and tetrachloroethene, which were detected in the contents of the former tanks (YEC, 1990); trichloroethene was also detected in one soil sample. The distribution of these compounds and related compounds in groundwater and soil neither points to nor eliminates the former tanks as the source.

The aromatic hydrocarbon xylene was detected above the NYSDEC standard in monitoring wells MW-1 and MW-2; it was also detected below the NYSDEC standard in MW-3. Xylene was also detected in soil samples during the investigation, and is commonly found as a component of petroleum contamination (California LUFT Manual, 1989). The detection of xylene in groundwater is consistent with the general petroleum hydrocarbon contamination found in Study Area soils and is indicative of widespread low-level contamination rather than active sources or hotspots.

4.3.3.2 Semi-volatile Organic Compounds

A total of eight targeted SVOC compounds were detected in four of the six wells sampled; the majority of these compounds were PAHs. Napthalene, detected in MW-1 at a concentration of 84 ug/l compared with the NYSDEC guideline concentration of 10 ug/l, was the only SVOC detected in groundwater above NYSDEC guidelines or standards. Napthalene is a derivative of coal tar. Groundwater SVOC results are consistent with soil SVOC results, i.e., SVOC compounds are found in low concentrations throughout the LVRR Site and The Study Area. SVOCs are some what more prevalent in soil than they are in groundwater as is expect due to their generally low solubility and mobility.

4.3.3.3 Metals

A total of 15 TAL metals were detected in groundwater at the Study Area; however, only iron, lead, manganese and sodium were detected at concentrations exceeding NYSDEC guidelines or standards. Iron was detected in concentrations greater than the NYSDEC standard of 300 ug/l in five of the six wells sampled; concentrations in the six wells ranged from 204 ug/l (MW-2) to 25,800 ug/l (GW-5). Lead was detected in concentrations greater than the NYSDEC standard of 25 ug/l in two of the six wells sampled (note: lead results from 3 wells were rejected due to QA/AC failure); lead concentrations in the three wells with usable data ranged from 11.1 ug/l (GW-5) to 73.8 ug/l (MW-3). Manganese was detected in concentrations greater than the NYSDEC standard of 300 ug/l in four of the six wells sampled; concentrations in the six wells ranged from 17.3 ug/l (MW-1) to 1070 ug/l (GW-4). Sodium was detected in concentrations greater than the NYSDEC standard of 20,000 ug/l in four of the six wells sampled; concentrations in the six wells ranged from 10,500 ug/l (MW-1) to 32,400 ug/l (GW-4). It should be noted, that in accordance with NYSDEC policy (NYSDEC, 1988), groundwater samples were not filtered prior to analysis; therefore, the actual dissolved, i.e., mobile, concentrations of metals in groundwater may be lower than reported here.

Based on spatial distribution and chemistry, the former OSTs do not appear to be the source of the elevated metal concentrations found in groundwater at the Study Area. The metals quality of groundwater is consistent with the metals quality of Study Area soils, i.e., overall wide spread elevated metals concentration. Elevated metals concentrations detected in groundwater at the Study Area are most likely due to the use both on the LVRR Site and in the general vicinity of fill material associated with the steel industry, i.e. slag and casting sands. Study Area borings indicate that these materials were used extensively as fill on both the LVRR Site and the balance of the Study Area. The history of the surrounding areas combined with elevated metals concentrations detected in the upgradient boundary wells (MW-1 and GW-5) indicated that similar fill material may have been used on neighboring properties.

4.3.3.4 Other Groundwater Parameters

Laboratory Analysis - The concentration of total suspended solids (TSS) in ground-water samples measured from a minimum of 61 mg/l (Monitoring Well GW-4) to a maximum of 1,070 mg/l (Monitoring Well MW-3) during this sampling event. The cause of the wide variance in TSS levels is not apparent.

Measurements of total dissolved solids (TDS) during this sampling event ranged from 279 mg/l (Monitoring Well GW-4) to 501 mg/l (Monitoring Well TF-1). These levels are well within the general range of 0 mg/l to 1,000 mg/l cited for fresh water (Freeze and Cherry, 1979).

The concentration of TDS in ground water at each monitoring well was below the NYSDEC standard, with the exception of Monitoring Well TF-1. The NYSDEC standard for TDS in Class GA ground water is 500 mg/l (NYCRR 703.3). The concentration of TDS measured in Monitoring Well TF-1 is 501 mg/l, which is only slightly above the regulated criterion. In view of this information, TDS is not a ground-water quality issue at the LVRR Site or the Study Area.

The range of the total organic carbon (TOC) levels resulting from the laboratory analysis of the ground-water samples were between 8.8 mg/l (Monitoring Wells MW-3 and GW-4) and 35 mg/l (Monitoring Well MW-1). The concentration of TOC in ground water is commonly around 0.1 mg/l to 10 mg/l (Freeze and Cherry, 1979). Therefore, four of the six samples collected at the Study Area showed TOC concentrations that were above the common range. No trend was evident concerning the concentration of organic contaminants detected and the TOC measured in ground water, and the cause of the elevated TOC levels is not apparent.

Field Measurements - Turbidity results from samples collected during ground-water sampling showed measurements from 5.2 nephelometric units (NTU) (Monitoring Well MW-3) to 21.3 NTU (Monitoring Well MW-1). These measurements are all below the NYSDEC's maximum allowable level for metals analysis (50 NTU) (TAGM 4015), but are all above the NYSDEC turbidity standard for Class GA ground water (5 NTU) (NYCRR 703.3). However, it should be noted that the tested samples were extracted from monitoring wells installed and developed explicitly for this investigation, and that the only intent was to reduce the turbidity within the wells below the 50 NTU standard for metals analysis rather than below the 5 NTU standard for drinking water.

In addition, there was no evident trend between turbidity and TSS, as would be expected. On the contrary, the lowest turbidity level was measured at Monitoring Well MW-3 which showed the highest result for TSS.

In general, pH measurements were collected on three occasions from each monitoring well during the ground-water sampling: before purging the well; during purging of the well; and immediately after purging the well. To ensure that the collected measurement is representative of indigenous ground water beneath the Study Area and not stagnant water from the well column, the last measurement collected during purging of the well was used to assess water quality.

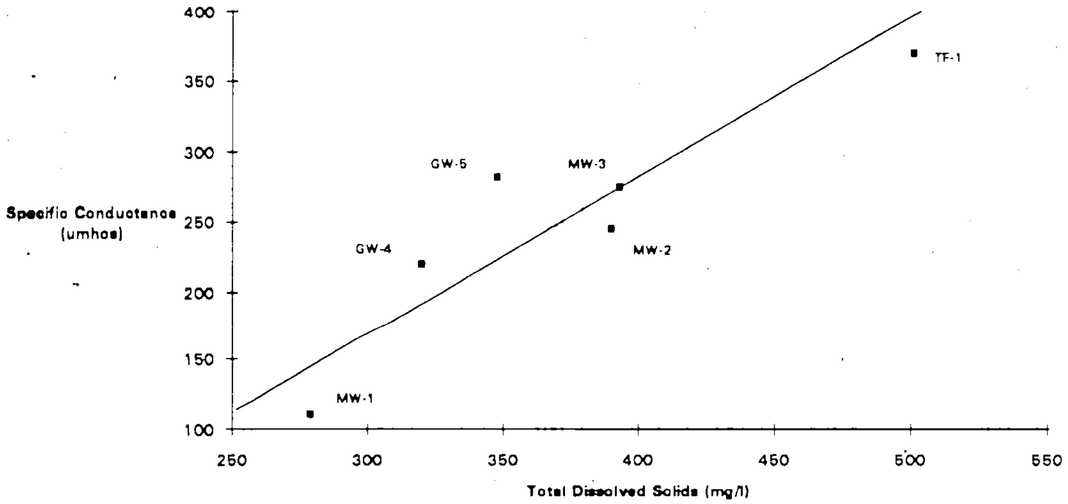
The measurements of pH ranged from 5.9 (Monitoring Well GW-5) to 9.2 (Monitoring Well MW-1), indicating that ground water varies from slightly acidic to slightly basic beneath the Study Area. With the exception of the extreme measurements taken at Monitoring Well GW-5 and MW-1, pH levels were within the NYSDEC standard range for Class GA ground water of 6.5 to 8.5 (NYCRR 703.3).

To determine if potentially hazardous gases were present, head space measurements were collected from each monitoring well using a photo-ionization detector (PID). In addition, these measurements were taken to provide a preliminary assessment of ground-water quality with regard to VOC contamination. The PID responses during the sampling ranged from 0 (Monitoring Well GW-4) to 185 (Monitoring Well MW-2). For the most part, the PID readings collected from wells where VOCs were detected are relatively higher than those collected from wells where no VOCs were present.

Ground-water temperature measurements collected during sampling of the wells ranged from a minimum of 29° Celsius (Monitoring Well TF-1) to a maximum of 40° Celsius (Monitoring Well MW-1). These data are considered suspect and were not evaluated further for the following reasons:

- it is IES' experience that the temperature of ground water for water-table aquifers in the northeastern United States ranges from 10° Celsius to 20° Celsius, which is considerably below the values measured at the Study Area; and
- operating problems with the meter used to measure temperature were noted by the IES field manager in the logbook during the sampling.

In-situ measurements of the specific conductivity in each ground-water monitoring well were collected during the sampling event. Levels of specific conductance varied from 110 micromhos (µmhos) at Monitoring Well MW-1 to 370 µmhos at Monitoring Well TF-1. As shown by the chart below, there appears to be a linear relationship between the specific conductance measurements and the level of total dissolved solids. This trend is the norm for dilute solutions such as ground water (Driscoll, 1986).



It should be noted that the instrument used to collect the specific conductivity measurements from the wells is the same one used for the temperature measurements. Since there is some suspicion as to the validity of the temperature results, the specific conductivity values must also be viewed with caution.

4.4. SURFACE WATER/SEDIMENT QUALITY

4.4.1 Objective

The objective of the surface water/sediment quality investigation conducted by IES was to assess the surface water quality at the LVRR Site and The Study Area and to determine the impact of the former OSTs and documented historical spills on surface and sediment quality. Because the Study Area was relatively dry during performance of this task, one surface water sample (SWS-1) and one sediment sample (SED-1) in an area previously covered with surface water were collected. The scope, methods, procedures, and protocols of the surface groundwater investigation are described in detail in Section 3.3 *et. seq.* of this report.

4.4.2 Analytical Results

Note: Summary data tables and the following discussions of sampling results are based on post-validated laboratory data, i.e., they incorporate the data validator's recommendations on data usability and qualifications. Complete ASP deliverable packages were submitted as unbound attachments to this report. Data validation reports are provided in Appendix 3 of this report.

Analytical results of the surface water sample are summarized on Tables 6, 7, and 8 and results of the sediment sample are summarized on Tables 3, 4 and 5. The surface water sample had no detectable concentrations of VOC or SVOC compounds but did have detectable concentrations of several metals, most notably calcium (153,00 ug/l), magnesium (20,300 ug/l), sodium (18,600 mg/l), potassium (10,600 mg/l), iron (717 mg/l) and manganese (611 mg/l); however, iron and manganese were the only detected metals which exceeded NYSDEC surface water standard of 300 mg/l for both metals (NYSDEC, 1991).

Study Area observations indicate that the sample designated SED-1 was collected in an area which is only intermittently covered with surface water and which is not hydraulically connected to any surface water bodies; therefore, it is more appropriate to compare SED-1 analytical results to NYSDEC soil standards (NYSDEC, 1992) rather than sediment standards which are based on potential loading of contaminants to surface water systems. SED-1 had a total VOC concentration of 428 ug/kg with the following species detected: acetone (300 ug/kg); 2-butanone (47 ug/kg); methylene chloride (39 ug/kg); toluene (18 ug/kg); trichloroethene (14 ug/kg); and chlorobenzene (10 ug/kg). Excluding the common laboratory contaminants acetone and methylene chloride, the total VOC concentration was 89 ug/kg and no NYSDEC standards were exceeded. SED-1 had detectable concentrations of four SVOC compounds (4-methylphenol @ 350 ug/kg; phenanthrene @ 400 ug/kg; fluoranthene @ 1100 ug/kg; and pyrene @ 1500 ug/kg) and a total SVOC concentration of 3,350 ug/kg; none of the detected compounds were in concentrations exceeding NYSDEC standards for soil. Seventeen (17) metals were detected in SED-1, twelve of which were detected at concentrations greater than the NYSDEC standard or the maximum Eastern USA background range (aluminum, arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, nickel, selenium, and zinc). The most dominant metals detected (total concentration) are iron (93,900 mg/kg); calcium (36,400 mg/kg); aluminum (8340 mg/kg); magnesium (4670 mg/kg); zinc (1850 mg/kg) and lead (2260 mg/kg).

4.4.3 Discussion

Analytical results of the surface water sample (detectable concentrations of metals but no VOCs or SVOCs) are consistent with Study Area observations. Organic compounds are not expected to be found in the ponded water because either they are found in very low concentrations in Study Area soils and groundwater (VOCs) or are not very mobile in aqueous systems (SVOCs). Elevated metals concentrations in the surface water sample is not surprising due to: 1) the expected occurrence of naturally occurring metals in soils (e.g., calcium and magnesium from native carbonate rocks); 2) the use of metals-containing fill both on and off the LVRR Site; and 3) the fact that the surface water sample was not filtered prior to analysis and was retrieved by direct dipping of the sample container into the water which probably led to collection and analysis of metal containing solids along with the water.

As discussed in the previous section, it is moot whether the sample designated SED-1 should be considered "sediment" in that the material was probably not transported and deposited in a recently active lacustrine or fluvial system, but rather is Study Area soil that is intermittently covered with water. Analytical results of the sediment sample are consistent with those of soil samples collected at the Study Area, i.e., detectable concentrations and some excursions above the NYSDEC soil standards (NYSDEC, 1992) for VOCs, SVOCs, and metals.

Observations made by IES personnel during this investigation indicate that the majority of surface water on the Study Area is seasonal or associated with precipitation events, i.e. ponded rain water or high water table, and that surface water does not discharge off the LVRR Site or the larger Study Area. Based on LVRR Site physiography and the chemistry of the surface water sample, migration of contaminants off the LVRR Site via surface water poses a minimal threat and does not warrant significant consideration.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

Based on the results of this investigation, previous investigations (YEC, 1990)(LMS, 1991), and other available information, IES concludes the following about the LVRR Site:

- low-level VOC and SVOC soil contamination exists at the LVRR Site, the distribution and chemistry of which is consistent with the former OSTs as a source;
- low-level metals soil contamination exists at the LVRR Site, the origin of which appears to be the extensive use of steel industry by-products such as slag and casting sands as fill material;
- contaminants found in the LVRR Site soils are consistent with former uses of the property and are also consistent with contaminants found on other nearby NYSDEC Registry Inactive Hazardous Waste Disposal Sites (NYSDEC, 1993), probably as a result of the use of similar fill materials on those sites, e.g., the Donna Hanna Coke (NYSDEC ID #915017) located immediately north and west of the LVRR site across the Conrail track and right-of-way (see figure 2);
- groundwater is shallow (2' to 6' below grade), has a relatively flat slope (0.003), and flows to the southwest across the LVRR Site with an estimated velocity of 36 to 292 ft/yr;
- the upgradient well had the highest overall concentrations of both VOCs and SVOCs but no similar concentration trend was evident with metals in groundwater;
- migration of contaminants via surface water does not appear to be a concern because the appearance and extent of surface water on the LVRR Site is intermittent and related to precipitation events, and was not observed to be connected to water bodies off the LVRR Site;
- the immediate real and potential threat to human health and the environment posed by the LVRR Site was eliminated when LVRR properly and legally decommissioned the two former 100,00 gallons OSTs during the NYSDEC sanctioned IRM in October 1991;
- the low-level VOC, SVOC and metals soil contamination that exists in the balance of the five-acre Study Area that is not listed on the State Registry of Inactive Hazardous Waste Sites indicates that no portion of the Study Area presents a significant threat to the public health or environment.

5.2 RECOMMENDATIONS

The two key elements of the NYSDEC's listing process for Inactive Hazardous Waste Sites are the presence of hazardous waste and the significance of any threat to human health or the environment. In July 1991, the NYSDEC classified the LVRR Site as a Class 2, indicating the presence of hazardous waste which is causing a significant threat to the public health or the environment. This classification was based upon the presence of waste oil containing solvents in the former OSTs, which the NYSDEC defined as a hazardous waste (F001). LVRR has complied with the request of the NYSDEC by disposing of the waste oil as F001 waste and decommissioning and removing the OSTs from the LVRR Site, thus eliminating the hazardous waste as a potential health risk.

The results of this investigation indicate that soil, groundwater and surface water contamination at the LVRR Site does not pose a significant threat to the public health or the environment. Therefore, IES recommends that the NYSDEC reclassify the LVRR Site to a Class 3, indicating that the presence of hazardous waste has been confirmed, but it does not present a significant threat to human health or the environment. This recommendation is based on the following findings from this investigation of the LVRR Site:

- the hazardous waste which caused the one-acre LVRR Site to be elevated to a Class 2 "significant threat", i.e., waste oil allegedly mixed with solvents, has been removed from the Site;
- any remaining contamination at the LVRR Site does not constitute a "significant threat"; e.g., no site-specific VOCs were found above the NYSDEC RSCOs in soil;
- similarly, petroleum-derived SVOCs are present in soils but are not leaching in significant levels as to impair groundwater above the NYSDEC guidelines or standards;
- similarly, metals in soil and groundwater appear to be a regional issue arising out of numerous Registry sites in the area and groundwater metals results may be elevated due to suspended fines (i.e., non-dissolved particles) in the samples;
- a nearby NYSDEC Inactive Hazardous Waste Disposal Site with similar characteristics to the LVRR Site has a Class 3 designation, i.e., the Donna Hanna Coke Site, which is described in the registry as having "...high levels of most of the PNA's, and the concentration of iron was higher than background levels. Groundwater is also contaminated at this site"; it therefore would be fair for the one-acre LVRR Site to be classified similarly;
- groundwater in the area (3-mile radius) is not utilized as a potable source of water;

- the nearest surface water body used for drinking water is 0.8 miles from the site (Lake Erie) and the intake is located 4 miles away (YEC, 1990); and
- the population is relatively sparse (163 persons) within a 1-mile radius of the site (YEC, 1990).

Furthermore, we concur with the recommendation provided by the NYSDEC's contractor, YEC, Inc., who performed the Phase II investigation. In their March 1990 report, YEC, Inc. recommended that a regional study be conducted because of the high concentration of industrial operations and NYSDEC Inactive Hazardous Waste Sites located in the area. YEC, Inc. advised that a Regional Remedial Action Plan be prepared using the combined results of available RI/FS reports for the area. IES agrees with the concept of a regional remedial plan and therefore recommends that any cleanup at the LVRR Site be deferred until the NYSDEC or other lead agency is prepared to implement such a plan.

6.0 REFERENCES

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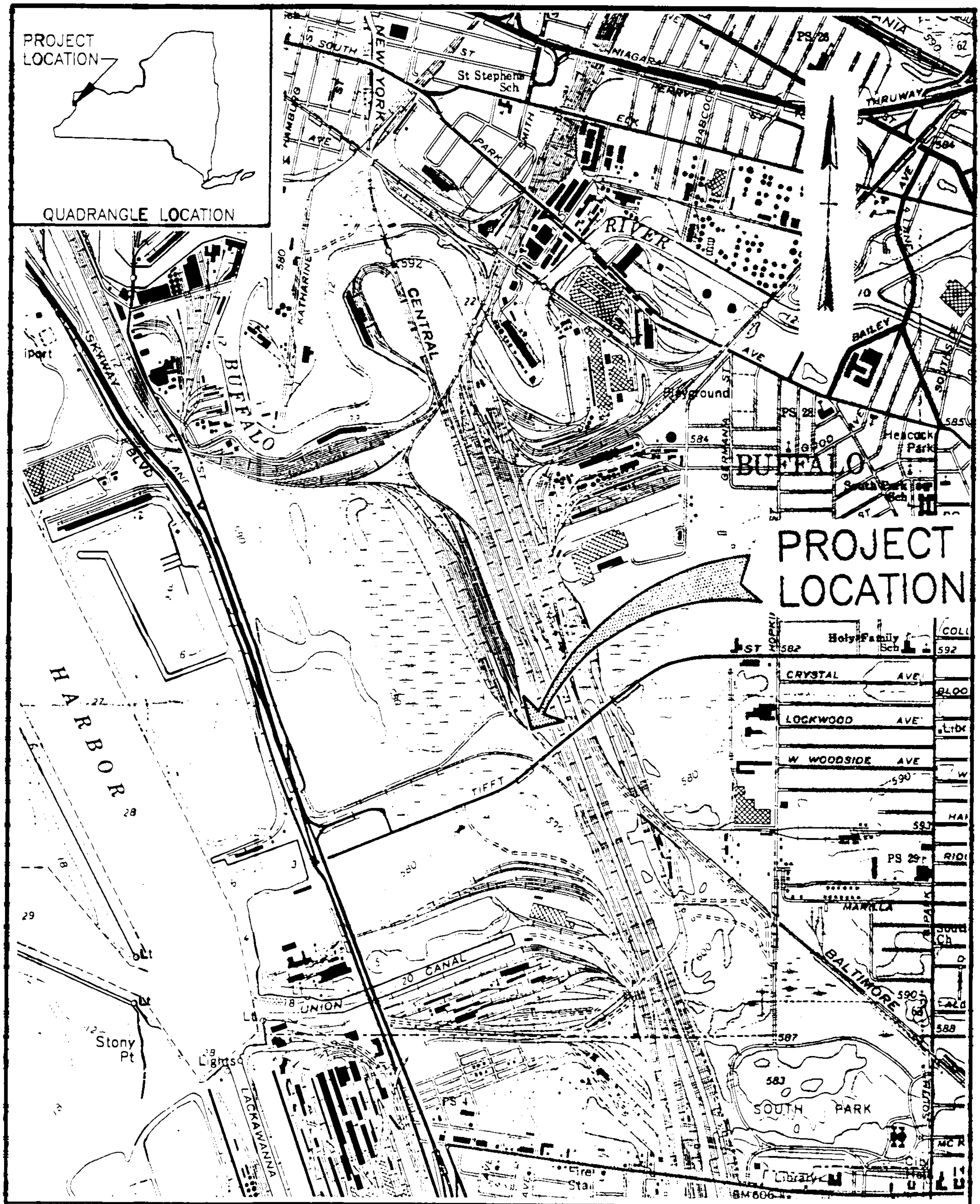
FIGURES



REVISIONS

NO. DATE

PROJECT

LEHIGH VALLEY RAILROAD

BUFFALO, NEW YORK

DRAWING

SITE LOCATION MAP

U.S.G.S. QUADRANGLE, BUFFALO SE. NY - 1965

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INTEGRATED ENVIRONMENTAL SERVICES

PROJECT #
2310-170

2310170H

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DATE
7/26/93

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FIGURE #
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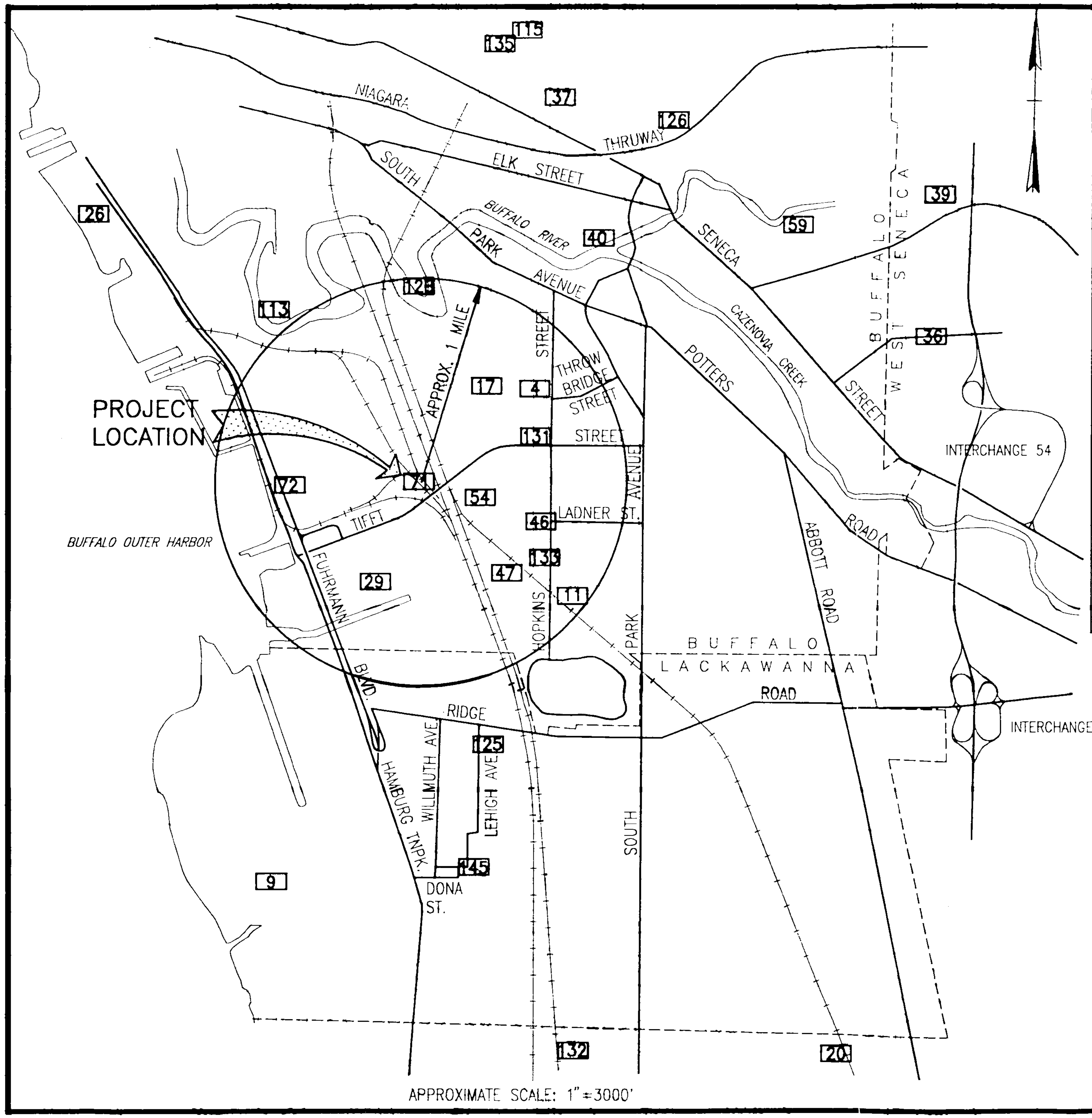

MAP NUMBER	REGISTRY NUMBER	SITE CLASS	SITE NAME
4	915004	2a	ALLIED CHEMICAL IND. CHEM. DIV.
9	915009	2	BETHLEHEM STEEL
11	915011	2a	BUFFALO CITY-HOPKINS STREET LANDFILL
12B	915012B	2	BUFFALO COLOR – WEATHERING AREA
17	915017	3	DONNER HANNA COKE
20	915020	2a	FERRO CORPORATION – ELECTRO DIV.
29	915029	2a	HANNA FURNACE DIV. NATIONAL STEEL CORP.
36	915036	2	MADISON WIRE COMPANY (ORBAN INDUSTRIES)
37	915037	2	HOUDAILLE IND. – MANZEL DIV.
39	915039	2a	WEST SENECA TRANSFER STATION
40	915040	3	MOBIL OIL CORPORATION
46	915046	2	RAMCO STEEL
47	915047	2a	REPUBLIC STEEL (LTV)
54	915054	2	ALLTIFT INC.
59	915059	3	HOUGHTON PARK
71	**915071**	**2**	**LEHIGH VALLEY RAILROAD**
72	915072	2a	TIFFT FARM NATURE PRESERVE
113	915113	2a	US STEEL – EASTERN LIMESTONE DIVISION
115	915115	4	BENGART & MEMEL, INC.
125	915125	2a	CENTRAL AUTOWRECKING
126	915126	2a	CLINTON--BAILEY
131	915131	2a	TIFFT AND HOPKINS
132	915132	2a	LSB WAREHOUSE
133	915133	4	AMERON
135	915135	2	BERN METAL CORP./UNIVERSAL IRON & METAL
145	915145	2	LEHIGH INDUSTRIAL PARK

NOTE:
MAP AND DATA TAKEN FROM MAP BY: NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) OF ERIE COUNTY, REGISTERED INACTIVE HAZARDOUS WASTE DISPOSAL SITES, PRIMARY WATER SUPPLY AQUIFERS, AND FRESHWATER WETLANDS PUBLISHED: JANUARY 28, 1993

REVISIONS

NO.	*DATE*

PROJECT
LEHIGH VALLEY RAILROAD
TIFFT STREET
BUFFALO, NEW YORK

DRAWING
NYSDEC REGISTERED INACTIVE
HAZARDOUS WASTE DISPOSAL SITES

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INTEGRATED ENVIRONMENTAL SERVICES

PROJECT # 2310-170
FILENAME: 2310170C
SCALE: NOTED
DATE: 7/22/93
BY: AD
CK:
FIGURE # 2

PLATES

f: 915071

Releasable ✓
Non-Releasable

From: Maurice Moore
To: Theresa.Benson@parsons.com
Date: 1/5/01 11:06AM
Subject: Lehigh Valley Railroad and Buckhorn Marsh Sediments

Terri,

Marty just spoke with Dave Paley and it seems that a signed Order for the site can be expected by mid-month. This in turn would allow bid specs to go out and work by March. Please remember to contact or have the contractor contact Mr. Rolfe Steck (Rolfe.Steck@oprhp.state.ny.us) (716-773-3271) for the availability for Buckhorn Marsh sediments for backfill. Honeywell will have to purchase the material from Parks since they are not a municipality. If you have any questions let me know. Thanks, Maurice

CC: Doster, Martin

TABLES

TABLES

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 1
Summary of Soil Sampling Program
Lehigh Valley Railroad
Tifft Street, Buffalo NY

SAMPLE DESIGNATION	DEPTH OF SAMPLE	OBSERVATIONS AND SOIL DESCRIPTION	PID	LABORATORY ANALYSIS
LV -400,50	1.5'-2.5'	NC	3.6	VOCs, SVOCs and Metals
LV -400,50	0-1.5'	NC	NA	VOCs,SVOCs
LV -300,50	1.5'-2.5'	NC	2.8	VOCs, SVOCs
LV -300,50	0-1.5'	NC	6.7	VOCs, SVOCs
LV -300,100	0-1.5'	NC	0.0	VOCs, SVOCs
LV -250,50	0-1.0'	NC	5.0	VOCs, SVOCs
LV -250,100	0-1.5'	NC	5.1	VOCs, SVOCs
LV -200,50	0-1.5'	NC	57.0	NA
LV -200,100	0-1.5'	NC	3.5	VOCs, SVOCs
LV -150,100	0-1.0'	NC	7.5	VOCs, SVOCs
LV -150,100 DUP	0-1.0'	NC	2.3	VOCs, SVOCs
LV -100,50	0-1.5'	NC	7.2	VOCs, SVOCs
LV -100,100	0-1.0'	NC	14.5	NA
LV -50,50	0-1.0'	NC	95.0	NA
LV -50,100	0-1.5'	NC	87.0	VOCs, SVOCs
LV -50,150	0-1.5'	NC	1.5	VOCs, SVOCs
LV 0,0	0-0.1'	Blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 0,50	0-0.1'	Blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 0,50	0-1.0'	NC	6.5	VOCs, SVOCs
LV 0,100	0-0.1'	Blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 0,150	0-0.1'	Blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 0,150	0-1.5'	NC	2.8	VOCs, SVOCs and Metals
LV 0,200	0-1.5'	NC	5.2	VOCs, SVOCs
LV 50,0	0-0.1'	Blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 50,50	0-0.1'	Blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 50,150	0-1.0'	NC	0.0	VOCs, SVOCs
LV 50,200	0-1.5'	NC	4.3	VOCs, SVOCs
LV 100,50	0-0.1'	Blk. sand, silt and tan clay	0.0	VOCs, SVOCs and Metals
LV 100,100	0-0.1'	Wet blk. sand, silt and gravel	0.0	VOCs, SVOCs
LV 150,50	0-0.1'	Blk. sand, silt and gravel	5.0	VOCs, SVOCs
LV 200,0	0-0.1'	Blk. stained silt and sand	4.9	VOCs, SVOCs
LV 200,150	0-1'	NC	1.6	VOCs, SVOCs
LV 250,0	1'-2.0'	NC	0.0	VOCs, SVOCs and Metals
LV 250,0	0-1.0'	NC	0.0	VOCs, SVOCs

NOTES:
PID units based on 100 ppm isobutylene calibrant
VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
NC = No Comments or descriptions
NA = Not Analyzed

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 5/4/93

TABLE 1
Summary of Soil Sampling Program
Lehigh Valley Railroad
Tifft Street, Buffalo NY

ies

SAMPLE DESIGNATION	DEPTH OF SAMPLE	OBSERVATIONS AND SOIL DESCRIPTION	PID	LABORATORY ANALYSIS
LV 250,50	0-0.1'	Blk. silt, sand and gravel	4.1	VOCs, SVOCs
LV 250,300	0-1.5'	NC	1.3	VOCs, SVOCs
LV 250,300 **DUP**	0-1.5'	NC	2.1	VOCs, SVOCs
LV 300,0	0-0.1'	Blk. silt, sand and gravel	4.5	VOCs, SVOCs
LV 300,50	0-0.1'	Moist, blk., silt sand and gravel	2.3	VOCs, SVOCs and Metals
LV 300,150	0-0.1'	Moist, blk., silt sand and gravel	2.9	VOCs, SVOCs
LV 300,200	0-1.5'	NC	1.2	VOCs, SVOCs
LV 630,60	0-1.75'	Sample located in center of black stained area. The sample consisted of black stained soil, gravel and coal chips, and had a strong odor.	72.0	VOCs, SVOCs and Metals
LV 700,100	0-1.5'	Slight odor Moist blk. gravel	6.7	VOCs, SVOCs
LV 750,100	0-1.0'	Strong odor. Blk. stained gravel.	86.0	VOCs, SVOCs
LV 800,100	0.5'-1.5'	NC	20.4	VOCs, SVOCs
LV 850,100	0.5'-1.5'	NC	19.0	VOCs, SVOCs
LV 900,100	0-1.0'	Med. to strong odor. Blk. stained gravel.	30.5	VOCs, SVOCs
LV 900,100 **DUP**	0-1.0'	NC	33.0	VOCs, SVOCs
NSB-4W	0.5'-1.5'	Sample borders marsh area	10.1	VOCs, SVOCs
NSB-3	0.5'-1.5'	Br. silt, sand, organics	5.6	VOCs, SVOCs
NSB-2	0.5'-1.5'	Br. silt, sand, organics	4.0	VOCs, SVOCs
NSB-1E	0-1.0'	Wet br./ blk. silt, sand, organics, gravel. Slight odor	4.3	VOCs, SVOCs and Metals
BSS-1	0-1.5'	Southern most sampling point	3.7	VOCs, SVOCs
BSS-2	0-1.5'	Northern most sampling point	2.3	VOCs, SVOCs
LV 1	0-1.0'	Odor/Visual Contamination	NA	NA
LV 2	0-1.0'	Odor/Visual Contamination	NA	NA
LV 3	0-1.0'	Odor/Visual Contamination	NA	NA
LV 4	0-1.0'	Odor/Visual Contamination	NA	NA
LV 5	0-1.0'	Odor/Visual Contamination	NA	NA

NOTES:
PID units based on 100 ppm isobutylene calibrant
VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
NC = No Comments or descriptions
NA = Not Analyzed

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 1
Summary of Soil Sampling Program
Lehigh Valley Railroad
Tifft Street, Buffalo NY

SAMPLE DESIGNATION	DEPTH OF SAMPLE	OBSERVATIONS AND SOIL DESCRIPTION	PID	LABORATORY ANALYSIS
LV 6	0-1.0'	Odor/Visual Contamination	NA	NA
LV 7	0-1.0'	Odor/Visual Contamination	NA	NA
LV 8	0-1.0'	Odor/Visual Contamination	NA	NA
LV 9	0-1.0'	Odor/Visual Contamination	NA	NA
LV 12	0-1.0'	Odor/Visual Contamination	NA	NA
LV 13	0-1.0'	Odor/Visual Contamination	NA	NA
LV 16	0-1.0'	Odor/Visual Contamination	NA	NA
LV 17	0-1.0'	Odor/Visual Contamination	NA	NA
LV 18	0-1.0'	Odor/Visual Contamination	NA	NA
LV 19	0-1.0'	Odor/Visual Contamination	NA	NA
LV 20	0-1.0'	Odor/Visual Contamination	NA	NA
LV 21	0-1.0'	Odor/Visual Contamination	NA	NA
LV 22	0-1.0'	Odor/Visual Contamination	NA	NA

NOTES:
PID units based on 100 ppm isobutylene calibrant
VOC = Volatile Organic Compounds
SVOC = Semi-Volatile Organic Compounds
NC = No Comments or descriptions
NA = Not Analyzed

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 1/4/93

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TABLE 2
Summary of Groundwater Quality Parameters
Lehigh Valley Railroad
Tifft Street, Buffalo, NY

	Date Sampled	MW-1	MW-2	MW-3	TF-1	GW-4	GW-5
LABORATORY ANALYSES							
Total Suspended Solids (mg/l)	5/13/93	121	349	1070	168	61	165
Total Dissolved Solids (mg/l)	5/13/93	279	390	393	501	320	348
Total Organic Carbon (mg/l)	5/13/93	35	20	8.8	16	8.8	27
FIELD MEASUREMENTS							
Turbidity (NTU)	5/13/93	21.3	12.8	5.2	12.2	9.9	10.2
pH (prior to purging)	5/13/93	7.4	8.7	7.7	6.2	6.9	NM
pH (during purging)	5/13/93	NM	7.7	6.8	6.2	6.6	5.9
pH (after purging)	5/13/93	9.2	7.0	7.1	6.6	6.7	NM
PID (units of deflection)*	5/13/93	8.5	185	111	6	0	2.3
Temperature (degrees Celsius)	5/13/93	40**	32**	31.8**	29**	31**	30.5**
Specific Conductivity (umhos)	5/13/93	110**	245**	275**	370**	220**	282**

NM = No measurement taken.

* PID response based on 100 ppm isobutylene calibrant.

** Data considered suspect due to instrument malfunction.

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 3
Analytical Results Summary for Soil and Sediment Samples
Volatile Organic Compounds (VOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

VOLATILES (ug/kg)	RSCO (ug/kg)	LV -100,50 (0-1.5')	LV -50,100 (0-1.5')	LV -50,150 (0-1.5')	LV 0,0 (0-0.1')	LV 0,50 (0-0.1')	LV 0,50 (0-1')	LV 0,100 (0-0.1')	LV 0,150 (0-0.1')	LV 0,150 (0-1')	LV 0,200 (0-1.5')
Laboratory ID #		93060803	93060801	93060817	93059206	93059201	93060814	93059209	93059205	93060808	93060804
Chlorinated Hydrocarbons											
Chloroform	300	13 U	64 U	13 UJ	13 U	6 J	14 U	5 J	15 UJ	12 U	13 U
1,1,1-Trichloroethane	800	13 U	200 J	17 J	13 U	14 U	14 U	15 U	15 U	28	3 J
Trichloroethene	700	13 U	64 U	13 UJ	13 U	14 U	14 U	15 U	15 U	5 J	13 U
Total Chlorinated	**NS**	**ND**	**200**	**17**	**ND**	**6**	**ND**	**5**	**ND**	**33**	**3**
Aromatic Hydrocarbons											
Ethylbenzene	5500	13 U	31 J	13 UJ	13 U	14 U	14 U	15 U	15 U	12 U	13 U
Xylene (tot)	1200	13 U	260 J	13 UJ	13 U	14 U	14 U	15 U	15 U	12 U	13 U
Chlorobenzene	1700	13 U	64 U	13 UJ	13 U	14 U	14 U	15 U	15 U	12 U	13 U
Benzene	60	13 U	64 U	13 UJ	13 U	14 U	14 U	15 U	15 U	12 U	13 U
Toluene	1500	13 U	64 U	13 UJ	13 U	14 U	14 U	15 U	15 U	12 U	13 U
Total Aromatic	NS	ND	291	ND	ND	ND	ND	ND	ND	ND	ND
Other Volatiles											
2-Butanone	300	13 U	64 U	13 UJ	13 U	14 U	14 U	15 U	15 U	12 U	13 U
Carbon Disulfide	2700	13 U	37 J	13 UJ	13 U	14 U	6 J	15 U	15 U	12 U	13 U
Acetone	200	13 U	220 U	13 UJ	13 U	14 U	14 U	62 U	40 UJ	12 U	13 U
Total Other	NS	ND	37	ND	ND	ND	6	ND	ND	ND	ND
Total Volatiles	10,000	ND	528	17	ND	6	6	5	ND	33	3

RSCO: Recommended Soil Cleanup Objective obtained
from NYSDEC TAGM HWR-92-4046

NS: No Standard

J: Estimated value

U: Undetected at indicated detection limit

ND: None Detected

Bold value in shaded box indicates results exceeds RSCO.

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 9/4/93

TABLE 3
Analytical Results Summary for Soil and Sediment Samples
Volatile Organic Compounds (VOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

VOLATILES (ug/kg)	RSCO (ug/kg)	LV 50,0 (0-0.1')	LV 50,50 (0-0.1')	LV 50,150 (0-1.0')	LV 50,200 (0-1.5')	LV 100,50 (0-0.1')	LV 100,100 (0-0.1')	LV 150,50 (0-0.1')	LV 200,0 (0-0.1')	LV 200,150 (0-1.0')	LV 250,0 (0-1')	LV 250,0 (1'-2')
Laboratory ID #		93059210	93059204	93060817	93060811	93059211	93059203	93059208	93059213	93060912	93060901	93060902
Chlorinated Hydrocarbons												
Chloroform	300	13 U	13 U	13 UJ	11 U	6 J	6 J	13 U	12 J	14 UJ	12 U	11 U
1,1,1-Trichloroethane	800	13 U	13 U	10 J	7 J	14 U	15 U	13 U	4 J	14 UJ	12 U	11 U
Trichloroethene	700	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	14 UJ	12 U	11 U
Total Chlorinated	**NS**	**ND**	**ND**	**10**	**7**	**6**	**6**	**ND**	**16**	**ND**	**ND**	**ND**
Aromatic Hydrocarbons												
Ethylbenzene	5500	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	14 UJ	12 U	11 U
Xylene (tot)	1200	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	14 UJ	12 U	11 U
Chlorobenzene	1700	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	14 UJ	12 U	11 U
Benzene	60	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	14 UJ	12 U	11 U
Toluene	1500	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	4 J	12 U	11 U
Total Aromatic	NS	ND	ND	ND	ND	ND	ND	ND	ND	4	ND	ND
Other Volatiles												
2-Butanone	300	13 U	13 U	13 UJ	11 U	14 U	17	13 U	12 U	17 J	12 U	11 U
Carbon Disulfide	2700	13 U	13 U	13 UJ	11 U	14 U	15 U	13 U	12 U	14 UJ	12 U	4 J
Acetone	200	13 U	13 U	13 UJ	11 U	14 U	84 U	22 U	19 U	140 J	12 U	11 U
Total Other	NS	ND	ND	ND	ND	ND	17	ND	ND	157	ND	4
Total Volatiles	10,000	ND	ND	10	7	6	23	ND	16	161	ND	4

RSCO: Recommended Soil Cleanup Objective obtained
from NYSDEC TAGM HWR-92-4046
NS: No Standard
J: Estimated value
U: Undetected at indicated detection limit
ND: None Detected
Bold value in shaded box indicates results exceeds RSCO.

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 3
Analytical Results Summary for Soil and Sediment Samples
Volatile Organic Compounds (VOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

VOLATILES (ug/kg)	RSCO (ug/kg)	LV 250,50 (0-0.1')	LV 250,300 (0-1.5')	LV 250,300 (0-1.5') DUP	LV 300,0 (0-0.1')	LV 300,50 (0-0.1')	LV 300,150 (0-0.1')	LV 300,200 (0-1.5')	LV 630,60 (0-1.75')	LV 700,100 (0-1.5')	LV 750,100 (0-1.0')	LV 800,100 (0.5'-1.5')
Laboratory ID #		93059202	93060911	93060904	93059214	93059212	93059207	93060910	93060907	93060913	93060914	93060918
Chlorinated Hydrocarbons												
Chloroform	300	42 J	17 U	13 U	3 J	36 J	14 J	11 U	60 UJ	14 U	65 U	14 UJ
1,1,1-Trichloroethane	800	13 J	17 U	13 U	12 U	15 U	16 UJ	11 U	60 UJ	14 U	65 U	14 UJ
Trichloroethene	700	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	60 UJ	14 U	65 U	14 UJ
Total Chlorinated	NS	55	ND	ND	3	36	14	ND	ND	ND	ND	ND
Aromatic Hydrocarbons												
Ethylbenzene	5500	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	37 J	14 U	100	14 UJ
Xylene (tot)	1200	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	870 J	14 U	550	14 UJ
Chlorobenzene	1700	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	60 UJ	14 U	65 U	14 UJ
Benzene	60	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	56 J	14 U	65 U	14 UJ
Toluene	1500	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	59 J	14 U	65 U	14 UJ
Total Aromatic	NS	ND	ND	ND	ND	ND	ND	ND	1,022	ND	650	ND
Other Volatiles												
2-Butanone	300	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	60 U	14 U	65 U	14 U
Carbon Disulfide	2700	14 U	17 U	13 U	12 U	15 U	16 UJ	11 U	60 U	14 U	65 U	14 U
Acetone	200	14 U	27 U	32 U	32 U	15 U	67 UJ	12 U	99 UJ	20 U	180 U	14 UJ
Total Other	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatiles	10,000	55	ND	ND	3	36	14	ND	1,022	ND	650	ND

RSCO: Recommended Soil Cleanup Objective obtained from NYSDEC TAGM HWR-92-4046
NS: No Standard
J: Estimated value
U: Undetected at indicated detection limit
ND: None Detected
Bold value in shaded box indicates results exceeds RSCO.

Prepared by: KMH
Date: 8/3/93
Checked by: ~~ ~~ [illegible]
Date: 8/4/93

TABLE 3
Analytical Results Summary for Soil and Sediment Samples
Volatile Organic Compounds (VOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

VOLATILES (ug/kg)	RSCO (ug/kg)	LV 850,100 (0.5'-1.5')	LV 900,100 (0-1.0')	LV 900,100 (0-1.0') DUP	NSB4W (0.5'-1.5')	NSB-3 (0.5'-1.5')	NSB-2 (0.5'-1.5')	NSB-1E (0-1.0')	BSS-1 (0-1.5')	BSS-2 (0-1.5')	SED-1
Laboratory ID #		93060909	93060906	93060915	93059217	93059215	93059216	93059218	93060903	93060905	93072209
Chlorinated Hydrocarbons											
Chloroform	300	13 U	68 U	13 U	14 U	15 U	11 U	4 J	14UJ	14 U	30 U
1,1,1-Trichloroethane	800	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	30 U
Trichloroethene	700	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	14 J
Total Chlorinated	NS	ND	ND	ND	ND	ND	ND	4	ND	ND	14
Aromatic Hydrocarbons											
Ethylbenzene	5500	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	30 UJ
Xylene (tot)	1200	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	30 UJ
Chlorobenzene	1700	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	10 J
Benzene	60	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	30 U
Toluene	1500	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14 UJ	14 U	18 J
Total Aromatic	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	28
Other Volatiles											
2-Butanone	300	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	47 J
Carbon Disulfide	2700	13 U	68 U	13 U	14 U	15 U	11 UJ	17 U	14UJ	14 U	30 U
Acetone	200	13 U	230 U	13 U	14 U	80 U	25 UJ	25 U	18 UJ	20 U	**300 J**
Total Other	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	347
Total Volatiles	10,000	ND	ND	ND	ND	ND	ND	4	ND	ND	389

RSCO: Recommended Soil Cleanup Objective obtained
from NYSDEC TAGM HWR-92-4046
NS: No Standard
J: Estimated value
U: Undetected at indicated detection limit
ND: None Detected
Bold value in shaded box indicates results exceeds RSCO.

Prepared by: KMH
Date: 8/3/93
Checked by: [illegible]
Date: 8/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV -400,50 (0-1.5')	LV -400,50 (1.5'-2.5')	LV -300,50 (0-1.5')	LV -300,50 (1.5'-2.5')	LV -300,100 (0-1.5')	LV -250,50 (0-1.5')	LV -250,100 (0-1.0')
Laboratory ID #		93060802	93060813	93060809	93060812	93060806	93060816	93060805
Phenols								
2,4-Di-Chlorophenol	400	430 U	439 U	400 U	430 U	390 U	420 U	380 U
2-Methylphenol	100 or MDL	430 U	439 U	400 U	430 U	390 U	420 U	380 U
4-Methylphenol	900	430 U	439 U	400 U	430 U	390 U	420 U	380 U
Total Phenols	NS	ND	ND	ND	ND	ND	ND	ND
PAHs								
Napthalene	13,000	280 J	602	580	820	720	1100	280 J
Acenapthylene	41,000	430 U	439 U	1100	430 U	120 J	150 J	380 U
Acenapthene	50,000	430 U	439 U	400 U	430 U	84 J	420 U	380 U
Fluorene	50,000	430 U	439 U	400 U	430 U	390 U	91 J	380 U
Phenanthrene	50,000	310 J	571	740	340 J	1400	1000	620
Anthracene	50,000	430 U	439 U	120 J	430 U	320 J	180 J	100 J
Fluoranthene	50,000	430 U	632	890	430 U	2000	1600	1000
Pyrene	50,000	430 U	345 J	530	430 U	990	1300	590
Benzo (a) anthracene	220 or MDL	430 U	**347 J**	**450**	430 U	**970**	**950**	520
Chrysene	400	430 U	**490**	**570**	100 J	**1200**	**1200**	**650**
Benzo (b) fluoranthene	1100	430 U	857	690	430 U	**2500**	1000	650
Benzo (k) fluoranthene	1100	430 U	439 U	570	430 U	390 U	730	510
Benzo (a) pyrene	61 or MDL	430 U	**367 J**	**470**	430 U	**790**	**580**	**520**
Indeno (1, 2, 3,-cd) pyrene	3200	430 U	194 J	150 J	430 U	530	320 J	290 J
Dibenzo (a,h) anthracene	14 or MDL	430 U	439 U	400 U	430 U	**210 J**	**99 J**	**100 J**
2-Methylnapthalene	36,400	640	1224	1100	2000	1000	2000	430
Benzo (g,h,i) perylene	50,000	430 U	204 J	140 J	430 U	490	330 J	260 J
Total PAHs	NS	1230	5833	8100	3260	13,324	12,630	6520
Phthalates								
Di-n-butylphthalate	8100	430 U	102 J	400 U	430 U	390 U	420 U	380 U
Di-n-octylphthalate	50,000	430 U	439 U	400 U	430 U	390 U	420 U	380 U
Butylbenzylphthalate	50,000	430 U	439 U	400 U	430 U	390 U	94 J	380 U
bis (2-Ethylhexyl phthalate	50,000	430 U	255 J	200 J	430 U	390 U	420 U	380 U
Total Phthalates	NS	ND	357	200	ND	ND	94	ND
Other SVOCs								
Dibenzofuran	6200	150 J	214 J	210 J	220 J	530	400 J	160 J
N-Nitrosodiphenylamine (1)	NS	430 U	439 U	400 U	430 U	390 U	420 U	380 U
Hexachlorobenzene	410	430 U	439 U	400 U	430 U	390 U	420 U	380 U
1,4-Dichlorobenzene	410	430 U	439 U	400 U	430 U	390 U	420 U	380 U
Total Other SVOCs	NS	150	214	210	220	530	400	160
TOTAL SVOCs	500,000	1380	6404	8510	3480	13,854	13,124	6680

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.
NS: No Standard.
J: Estimated Value.
U: Undetected at indicated detection limit.
ND: None Detected
Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV -200,100 (0-1.5')	LV -150,100 (0-1.0')	LV -150,100 DUP	LV -100,50 (0-1.5')	LV -50,100 (0-1.5')	LV -50,150 (0-1.5')	LV 0,0 (0-0.1')
Laboratory ID #		93060815	93060810	93060908	93060803	93060801	93059217	93059206
Phenols								
2,4-Di-Chlorophenol	400	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
2-Methylphenol	100 or MDL	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
4-Methylphenol	900	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
Total Phenols	NS	ND	ND	ND	ND	ND	ND	ND
PAHs								
Napthalene	13,000	1600	630	320 J	1400	9000 J	2200	1200
Acenapthylene	41,000	900	210 J	140 J	210 J	5700 J	2200 U	420 U
Acenapthene	50,000	280 J	110 J	410 U	140 J	20,000	460 J	120 J
Fluorene	50,000	470	96 J	84 J	220 J	31,000	570 J	100 J
Phenanthrene	50,000	2900	1400	860	1000	50,000	4900	600
Anthracene	50,000	1200	360 J	200 J	180 J	5700 J	1200 J	420 U
Fluoranthene	50,000	7100	2300	1300	2100	3600 J	13,000	140 J
Pyrene	50,000	5100	1500	2500	1200	5800 J	11,000	370 J
Benzo (a) anthracene	220 or MDL	**3100**	**1400**	**1200**	**1100**	17,000 U	**7800**	130 J
Chrysene	400	**3200**	**1600**	**1400**	**1200**	17,000 U	**8200**	230 J
Benzo (b) fluoranthene	1100	**4000**	**2200**	**1500**	**1400**	17,000 U	**5800**	140
Benzo (k) fluoranthene	1100	**3900**	**1800**	**1400**	**1300**	17,000 U	**4700**	420 J
Benzo (a) pyrene	61 or MDL	**3400**	**1500**	**1300**	**1200**	17,000 U	**4000**	420 U
Indeno (1, 2, 3,-cd) pyrene	3200	2200	660	1300	570	17,000 U	1600 J	120 J
Dibenzo (a,h) anthracene	14 or MDL	**660**	**230 J**	**650**	**200 J**	17,000 U	**610 J**	420 U
2-Methylnapthalene	36,400	2200	1200	650	3200	**180,000**	2900	4500
Benzo (g,h,i) perylene	50,000	2500	490	1100	510	17,000 U	1700 J	130 J
Total PAHs	NS	44,710	17,686	15,904	17,130	310,800	70,640	7780
Phthalates								
Di-n-butylphthalate	8100	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
Di-n-octylphthalate	50,000	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
Butylbenzylphthalate	50,000	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
bis (2-Ethylhexyl phthalate	50,000	450 U	410 U	150 J	430 U	17,000 U	2200 U	98 J
Total Phthalates	NS	ND	ND	150	ND	ND	ND	98
Other SVOCs								
Dibenzofuran	6200	1100	480	240 J	360 J	**18,000**	1400 J	270 J
N-Nitrosodiphenylamine (1)	NS	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
Hexachlorobenzene	410	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
1,4-Dichlorobenzene	410	450 U	410 U	410 U	430 U	17,000 U	2200 U	420 U
Total Other SVOCs	NS	1100	480	240	360	18,000	1400	270
TOTAL SVOCs	500,000	45,810	18,166	16,294	17,490	328,800	72,040	8148

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.

NS: No Standard.

J: Estimated Value.

U: Undetected at indicated detection limit.

ND: None Detected

Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by: J.Ay
Date: 9/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV 0,50 (0-1.0')	LV 0,50 (0-0.1')	LV 0,100 (0-0.1')	LV 0,150 (0-0.1')	LV 0,150 (0-1.5')	LV 0,200 (0-1.5')	LV 50,0 (0-0.1')
Laboratory ID #		93060814	93059201	93059209	93059205	93060808	93060804	93059210
Phenols								
2,4-Di-Chlorophenol	400	460 U	460 U	510 U	490 U	400 U	440 U	430 U
2-Methylphenol	100 or MDL	460 U	460 U	510 U	490 U	400 U	440 U	430 U
4-Methylphenol	900	460 U	460 U	510 U	490 U	400 U	440 U	430 U
Total Phenols	NS	ND	ND	ND	ND	ND	ND	ND
PAHs								
Napthalene	13,000	820	930	1600	1700	1100	380 J	720
Acenapthylene	41,000	460 U	180 J	880	2000	1000	120 J	270 J
Acenapthene	50,000	460 U	460 U	310 J	470	150 J	440 U	430 U
Fluorene	50,000	460 U	460 U	310 J	520	250 J	440 U	430 U
Phenanthrene	50,000	730	840	3100	4200	2400	960	1000
Anthracene	50,000	460 U	140 J	990	1600	720	220 J	240 J
Fluoranthene	50,000	600	2400	7600	11,000	6400	2100	1500
Pyrene	50,000	320 J	1800	6100	15,000	4000	1500	1200
Benzo (a) anthracene	220 or MDL	**300 J**	**1500**	**5400**	**9300**	**4000**	**1200**	**730**
Chrysene	400	**470**	**1500**	**5600**	**10,000**	**3500**	**1400**	**960**
Benzo (b) fluoranthene	1100	450 J	**1200**	**7700**	**14,000 J**	**5800**	**1500**	**2500**
Benzo (k) fluoranthene	1100	310 J	820	**5900**	**6900 J**	**4200**	**1200**	430 U
Benzo (a) pyrene	61 or MDL	**230 J**	**780**	**6400**	**12,000 J**	**4400**	**1200**	**830**
Indeno (1, 2, 3,-cd) pyrene	3200	120 J	440	**3500**	**5800 J**	1800	440	670
Dibenzo (a,h) anthracene	14 or MDL	460 U	**260**	**1200**	**2100 J**	**570**	**180**	**210 J**
2-Methylnapthalene	36,400	1600	1900	2800	2400	1400	600	1300
Benzo (g,h,i) perylene	50,000	460 U	560	3000	6000 J	1600	370 J	650
Total PAHs	NS	5950	15,250	62,390	105,990	43,290	13,370	12,780
Phthalates								
Di-n-butylphthalate	8100	460 U	460 U	510 U	490 U	400 U	440 U	430 U
Di-n-octylphthalate	50,000	460 U	460 U	510 U	220 J	400 U	440 U	430 U
Butylbenzylphthalate	50,000	460 U	460 U	510 U	490 U	400 U	1200	430 U
bis (2-Ethylhexyl phthalate	50,000	460 U	460 U	510 U	490 U	400 U	440 U	430 U
Total Phthalates	NS	ND	ND	ND	220	ND	1200	ND
Other SVOCs								
Dibenzofuran	6200	300 J	320 J	860	1000	560	220 J	380 J
N-Nitrosodiphenylamine (1)	NS	460 U	460 U	510 U	490 U	400 U	440 U	140 J
Hexachlorobenzene	410	460 U	460 U	510 U	490 U	400 U	440 U	430 U
1,4-Dichlorobenzene	410	460 U	460 U	510 U	490 U	400 U	440 U	430 U
Total Other SVOCs	NS	300	320	860	1000	560	220	520
TOTAL SVOCs	500,000	6250	15,570	63,250	107,210	43,850	14,790	13,300

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.

NS: No Standard.

J: Estimated Value.

U: Undetected at indicated detection limit.

ND: None Detected

Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV 50,50 (0-0.1')	LV 50,150 (0-1.0')	LV 50,200 (0-1.5')	LV 100,50 (0-0.1')	LV 100,100 (0-0.1')	LV 150,50 (0-0.1')	LV 200,0 (0-0.1')
Laboratory ID #		93059204	93060807	93060811	93059211	93059203	93059208	93059213
Phenols								
2,4-Di-Chlorophenol	400	410 U	410 U	380 U	450 U	510 U	420 U	380 U
2-Methylphenol	100 or MDL	410 U	410 U	380 U	450 U	510 U	420 U	380 U
4-Methylphenol	900	410 U	410 U	380 U	450 U	510 U	420 U	380 U
Total Phenols	NS	ND	ND	ND	ND	ND	ND	ND
PAHs								
Napthalene	13,000	480 J	1200	560	460	540	440	380 U
Acenapthylene	41,000	410 U	1100	380 U	180 J	630	480	380 U
Acenapthene	50,000	410 U	240 J	380 U	450 U	510 U	150 J	380 U
Fluorene	50,000	84 J	280 J	380 U	450 U	250 J	210 J	380 U
Phenanthrene	50,000	980 J	2400	870	730	1700	1400	380 U
Anthracene	50,000	180 J	860	100 J	320 J	1900	540	380 U
Fluoranthene	50,000	1700 J	6500	990	1500	7600	3200	81 J
Pyrene	50,000	820 J	6300	650	2900	4700	3300	85 J
Benzo (a) anthracene	220 or MDL	**700 J**	**4300**	**500**	**1100**	**3100**	**2200**	380 U
Chrysene	400	**820 J**	**4300**	**650**	**1400**	**3300**	**2400**	380 U
Benzo (b) fluoranthene	1100	850 J	**6500**	**1400**	730	**4000**	**3400**	380 U
Benzo (k) fluoranthene	1100	540 J	**4900**	**1400 J**	950	**3000**	**1600**	380 U
Benzo (a) pyrene	61 or MDL	**480 J**	**5600**	**390**	**1100**	**2700**	**2300**	380 U
Indeno (1, 2, 3,-cd) pyrene	3200	280 J	**4100**	140 J	980	1500	1200	380 U
Dibenzo (a,h) anthracene	14 or MDL	**110 J**	**1300**	380 U	**510**	**470 J**	**630**	380 U
2-Methylnapthalene	36,400	680 J	1400	980	770	850	660	380 U
Benzo (g,h,i) perylene	50,000	310 J	4100	120 J	940	1600	920	380 U
Total PAHs	NS	9014	55,380	8750	14,570	37,840	25,030	166
Phthalates								
Di-n-butylphthalate	8100	410 U	410 U	380 U	450 U	510 U	420 U	380 U
Di-n-octylphthalate	50,000	410 U	410 U	380 U	450 U	510 U	420 U	380 U
Butylbenzylphthalate	50,000	410 U	410 U	78 J	600	510 U	420 U	380 U
bis (2-Ethylhexyl phthalate	50,000	410 U	410 U	380 U	450 U	510 U	420 U	380 U
Total Phthalates	NS	ND	ND	78	600	ND	ND	ND
Other SVOCs								
Dibenzofuran	6200	220 J	830	300 J	450 U	290 J	280 J	380 U
N-Nitrosodiphenylamine (1)	NS	410 U	410 U	380 U	450 U	510 U	420 U	380 U
Hexachlorobenzene	410	410 U	310 J	380 U	450 U	510 U	420 U	380 U
1,4-Dichlorobenzene	410	410 U	260 J	380 U	450 U	510 U	420 U	380 U
Total Other SVOCs	NS	220	1360	300	ND	290	280	ND
TOTAL SVOCs	500,000	9234	56,740	9128	15,170	38,130	25,310	166

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.

NS: No Standard.

J: Estimated Value.

U: Undetected at indicated detection limit.

ND: None Detected

Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV 200,150 (0-1.0')	LV 250,0 (0-1')	LV 250,0 (1'-2')	LV 250,50 (0-0.1')	LV 250,300 (0-1.5')	LV 250,300 DUP	LV 300,0 (0-0.1')
Laboratory ID #		9306912	93060901	93060902	93059202	9306911	9306904	93059214
Phenols								
2,4-Di-Chlorophenol	400	460 U	389 U	380 U	470 U	560 U	430 U	400 U
2-Methylphenol	100 or MDL	460 U	389 U	380 U	470 U	560 U	430 U	400 U
4-Methylphenol	900	460 U	389 U	380 U	470 U	560 U	430 U	400 U
Total Phenols	NS	ND	ND	ND	ND	ND	ND	ND
PAHs								
Napthalene	13,000	870	236 J	230 J	590	190 J	100 J	280 J
Acenapthylene	41,000	600	307 J	380 U	120 J	200 J	430 U	310 J
Acenapthene	50,000	120 J	389 U	380 U	470 U	560	230 J	400 U
Fluorene	50,000	170 J	98 J	380 U	470 U	460 J	190 J	400 U
Phenanthrene	50,000	1600	1038	340 J	990	3400	1700	670
Anthracene	50,000	480	271	380 U	180 J	960	480	210 J
Fluoranthene	50,000	3600	2596	380 U	1900	5100	2200	1400
Pyrene	50,000	5700	3304	130 J	1200	6200	3700	1600
Benzo (a) anthracene	220 or MDL	**3900**	**1770**	380 U	**720**	**4000**	**2100**	**1000**
Chrysene	400	**3900**	**2124**	380 U	**930**	**4000**	**2200**	**1100**
Benzo (b) fluoranthene	1100	**4900**	**2006**	380 U	1000	**4900**	**1800**	1100
Benzo (k) fluoranthene	1100	**4600**	**1534**	380 U	620	**3400**	**1800**	**1400**
Benzo (a) pyrene	61 or MDL	**4900**	**873**	380 U	**540**	**4700**	**2500**	**830**
Indeno (1, 2, 3,-cd) pyrene	3200	2800	850	380 U	310 J	2600	2100	540
Dibenzo (a,h) anthracene	14 or MDL	**1400**	**460**	380 U	**120 J**	**1400**	**1000**	400 U
2-Methylnapthalene	36,400	1300	319 J	540	870	770	110 J	530
Benzo (g,h,i) perylene	50,000	2300	732	380 U	320 J	2200	2100	440
Total PAHs	NS	43,140	18,518	1240	10,410	45,040	24,310	11,410
Phthalates								
Di-n-butylphthalate	8100	460 U	389 U	380 U	470 U	560 U	430 U	400 U
Di-n-octylphthalate	50,000	460 U	389 U	380 U	470 U	560 U	430 U	400 U
Butylbenzylphthalate	50,000	460 U	389 U	380 U	470 U	560 U	430 U	400 U
bis (2-Ethylhexyl phthalate	50,000	460 U	86 J	220 J	470 U	200 J	150 J	170 J
Total Phthalates	NS	ND	86	220	ND	200	150	170
Other SVOCs								
Dibenzofuran	6200	480	142 J	130 J	470 U	310 J	150 J	160 J
N-Nitrosodiphenylamine (1)	NS	460 U	389 U	380 U	470 U	560 U	430 U	400 U
Hexachlorobenzene	410	460 U	389 U	380 U	470 U	560 U	430 U	400 U
1,4-Dichlorobenzene	410	460 U	389 U	380 U	470 U	560 U	430 U	400 U
Total Other SVOCs	NS	480	142	130	ND	310	150	160
TOTAL SVOCs	500,000	43,620	18,746	1590	10,410	45,550	24,610	11,570

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.
NS: No Standard.
J: Estimated Value.
U: Undetected at indicated detection limit.
ND: None Detected
Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 9/14/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV 300,50 (0-0.1')	LV 300,150 (0-0.1')	LV 300,200 (0-1.5')	LV 630,60 (0-1.75)	LV 700,100 (0-1.5')	LV 750,100 (0-1.0)	LV 800,100 (0.5'-1.5')
Laboratory ID #		93059212	93059207	93060910	93060907	93060913	93060914	93060918
Phenols								
2,4-Di-Chlorophenol	400	490 U	540 U	380 U	16,000 U	120 J	4250 U	4500 U
2-Methylphenol	100 or MDL	490 U	540 U	380 U	16,000 U	820	4250 U	4500 U
4-Methylphenol	900	490 U	540 U	380 U	16,000 U	490	4250 U	4500 U
Total Phenols	NS	ND	ND	ND	ND	1430	ND	ND
PAHs								
Napthalene	13,000	1200	1300	220 J	8800 J	570	1225 J	4500 U
Acenapthylene	41,000	1100	2200	390	6100 J	210 J	4250 U	4500 U
Acenapthene	50,000	150 J	360 J	120 J	31,000	470 U	7250	4500 U
Fluorene	50,000	190 J	1600	130 J	36,000	470 U	4250 U	4500 U
Phenanthrene	50,000	1800	9900	1200	**96,000**	560	18,750	4500 U
Anthracene	50,000	1000	2300	360 J	**110,000**	300 J	20,000	4500 U
Fluoranthene	50,000	6800	13,000	2900	4100 J	420 J	1650	4500 U
Pyrene	50,000	6600	19,000	4600	10,000 J	740	3750	2100 J
Benzo (a) anthracene	220 or MDL	**5400**	**8300**	**2900**	16,000 U	**270 J**	4250 U	4500 U
Chrysene	400	**5800**	**7500**	**3100**	16,000 U	**450 J**	4250 U	4500 U
Benzo (b) fluoranthene	1100	**7000**	**7000**	**3500**	16,000 U	300 J	4250 U	4500 U
Benzo (k) fluoranthene	1100	**6500**	**6000**	**3400**	16,000 U	430 J	4250 U	4500 U
Benzo (a) pyrene	61 or MDL	**6300**	**7500**	**4000**	16,000 U	**190 J**	4250 U	4500 U
Indeno (1, 2, 3,-cd) pyrene	3200	2800	**4100**	2600	16,000 U	420 J	4250 U	4500 U
Dibenzo (a,h) anthracene	14 or MDL	**1100**	**2200**	**1300**	16,000 U	470 U	4250 U	4500 U
2-Methylnapthalene	36,400	2000	1600	270 J	**470,000**	1800	**65,000**	4500 U
Benzo (g,h,i) perylene	50,000	2400	3300	2200	16,000 U	340 J	4250 U	4500 U
Total PAHs	NS	58,140	97,160	33,190	772,000	7000	117,625	2100
Phthalates								
Di-n-butylphthalate	8100	490 U	540 U	380 U	16,000 U	470 U	4250 U	4500 U
Di-n-octylphthalate	50,000	490 U	540U	380 U	16,000 U	470 U	4250 U	4500 U
Butylbenzylphthalate	50,000	490 U	540U	380 U	16,000 U	470 U	4250 U	4500 U
bis (2-Ethylhexyl phthalate	50,000	490 U	540 U	380 U	6900 J	470 U	4250 U	4500 U
Total Phthalates	NS	ND	ND	ND	6900	ND	ND	ND
Other SVOCs								
Dibenzofuran	6200	590	1000	150 J	7500	470 U	4250 U	4500 U
N-Nitrosodiphenylamine (1)	NS	490 U	540 U	380 U	16,000 U	470 U	4250 U	4500 U
Hexachlorobenzene	410	490 U	540 U	380 U	16,000 U	470 U	4250 U	4500 U
1,4-Dichlorobenzene	410	490 U	540 U	380 U	16,000 U	470 U	4250 U	4500 U
Total Other SVOCs	NS	590	1000	150	7,500	ND	ND	ND
TOTAL SVOCs	500,000	58,730	98,160	33,340	786,400	8430	117,625	2100

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.

NS: No Standard.

J: Estimated Value.

U: Undetected at indicated detection limit.

ND: None Detected

Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	LV 850,100 (0.5'-1.5')	LV 900,100 (0-1.0')	LV 900,100 DUP	NSB-1E (0.-1.0')	NSB-2 (0.5'-1.5')	NSB-3 (0.5'-1.5')	NSB-4W (0.5'-1.5')
Laboratory ID #		93060909	9306906	93060915	93059218	93059216	93059215	93059217
Phenols								
2,4-Di-Chlorophenol	400	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
2-Methylphenol	100 or MDL	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
4-Methylphenol	900	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
Total Phenols	NS	ND	ND	ND	ND	ND	ND	ND
PAHs								
Napthalene	13,000	290 J	4500 U	4500 U	190 J	230 J	790	350 J
Acenapthylene	41,000	430 U	4500 U	4500 U	230 J	290 J	490 U	450 UJ
Acenapthene	50,000	430 U	4500 U	2200 J	550 U	380 UJ	490 U	450 UJ
Fluorene	50,000	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
Phenanthrene	50,000	420 J	1200 J	4500 U	850	270 J	560	520 J
Anthracene	50,000	380 J	1300 J	2500 J	270 J	190 J	490 U	160 J
Fluoranthene	50,000	620	1500 J	1100 J	4500	500 J	160 J	710 J
Pyrene	50,000	1300	2800 J	3000 J	7300	880 J	280 J	1200 J
Benzo (a) anthracene	220 or MDL	**310 J**	4500 U	4500 U	**3800**	**610 J**	110 J	**590 J**
Chrysene	400	**450**	**1100 J**	4500 U	**4100**	**800 J**	190 J	**820 J**
Benzo (b) fluoranthene	1100	430 U	4500 U	4500 U	**2100**	1000 J	490 U	430 J
Benzo (k) fluoranthene	1100	430 J	4500 U	4500 U	**1400**	**1100 J**	490 U	860 J
Benzo (a) pyrene	61 or MDL	**340 J**	4500 U	4500 U	**2500**	**1800 J**	490 U	**270 J**
Indeno (1, 2, 3,-cd) pyrene	3200	200 J	4500 U	4500 U	830	930 J	490 U	280 J
Dibenzo (a,h) anthracene	14 or MDL	430 U	4500 U	4500 U	340 J	**150 J**	490 U	450 UJ
2-Methylnapthalene	36,400	410 J	4500 U	4500 U	310 J	260 J	610	720 J
Benzo (g,h,i) perylene	50,000	160 J	4500 U	4500 U	510 J	1200 J	490 U	150 J
Total PAHs	NS	5310	7900	8800	29,230	10,210	2700	7060
Phthalates								
Di-n-butylphthalate	8100	190 J	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
Di-n-octylphthalate	50,000	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
Butylbenzylphthalate	50,000	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
bis (2-Ethylhexyl phthalate	50,000	100 J	5400	4500 U	550 U	660 J	100 J	450 UJ
Total Phthalates	NS	290	5400	ND	ND	660	100	ND
Other SVOCs								
Dibenzofuran	6200	430 U	4500 U	4500 U	550 U	100 J	340 J	180 J
N-Nitrosodiphenylamine (1)	NS	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
Hexachlorobenzene	410	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
1,4-Dichlorobenzene	410	430 U	4500 U	4500 U	550 U	380 UJ	490 U	450 UJ
Total Other SVOCs	NS	ND	ND	ND	ND	100	340	180
TOTAL SVOCs	500,000	5680	13,300	8800	29,230	10,970	3140	7240

RSCO: Recommended Soil Cleanup Objective from
NYSDEC TAGM HWR-92-4046.
NS: No Standard.
J: Estimated Value.
U: Undetected at indicated detection limit.
ND: None Detected
Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 4
Analytical Results Summary for Soil and Sediment Samples
Semi-Volatile Organic Compounds (SVOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/kg)	RSCO (ug/kg)	BSS-1 (0-1.5')	BSS-2 (0-1.5')	SED-1
Laboratory ID #		93060903	93060905	93072209
Phenols				
2,4-Di-Chlorophenol	400	460 U	450 U	1400 U
2-Methylphenol	100 or MDL	460 U	450 U	1400 U
4-Methylphenol	900	460 U	450 U	350 J
Total Phenols	NS	ND	ND	350
PAHs				
Napthalene	13,000	610	200 J	1400 U
Acenapthylene	41,000	230 J	450 U	1400 U
Acenapthene	50,000	95 J	450 U	1400 U
Fluorene	50,000	460 U	450 U	1400 U
Phenanthrene	50,000	1500	270 J	400 J
Anthracene	50,000	260 J	450 U	1400 U
Fluoranthene	50,000	2400	190 J	1100 J
Pyrene	50,000	3900	350 J	1500
Benzo (a) anthracene	220 or MDL	**2100**	160 J	1400 U
Chrysene	400	**2300**	280 J	1400 U
Benzo (b) fluoranthene	1100	580	450 U	1400 U
Benzo (k) fluoranthene	1100	**1400**	200 J	1400 U
Benzo (a) pyrene	61 or MDL	**2100**	450 U	1400 U
Indeno (1, 2, 3,-cd) pyrene	3200	1800	160 J	1400 U
Dibenzo (a,h) anthracene	14 or MDL	**940**	450 UJ	1400 U
2-Methylnapthalene	36,400	820	330 J	1400 U
Benzo (g,h,i) perylene	50,000	1700	140 J	1400 U
Total PAHs	NS	22,735	2280	3000
Phthalates				
Di-n-butylphthalate	8100	460 U	450 UJ	1400 U
Di-n-octylphthalate	50,000	460 U	450 UJ	1400 U
Butylbenzylphthalate	50,000	460 U	450 UJ	1400 U
bis (2-Ethylhexyl phthalate	50,000	130 J	160 J	1400 U
Total Phthalates	NS	130	160	ND
Other SVOCs				
Dibenzofuran	6200	280 J	100 J	1400 U
N-Nitrosodiphenylamine (1)	NS	460 U	450 UJ	1400 U
Hexachlorobenzene	410	460 U	450 UJ	1400 U
1,4-Dichlorobenzene	410	460 U	450 UJ	1400 U
Total Other SVOCs	NS	280	100	ND
TOTAL SVOCs	500,000	23,145	2540	3350

RSCO: Recommended Soil Cleanup Objective from NYSDEC TAGM HWR-92-4046.

NS: No Standard.

J: Estimated Value.

U: Undetected at indicated detection limit.

ND: None Detected

Bold value in shaded box indicates result > RSCO

Prepared by: KMH
Date: 8/3/93
Checked by: JJ
Date: 8/4/93

TABLE 3
Analytical Results Summary for Soil and Sediment Samples
Volatile Organic Compounds (VOCs)
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

VOLATILES (ug/kg)	RSCO (ug/kg)	LV -400,50 (0-1.5')	LV -400,50 (1.5'-2.5')	LV -300,50 (0-1.5')	LV -300,50 (1.5'-2.5')	LV -300,100 (0-1.5')	LV -250,50 (0-1.5')	LV -250,100 (0-1.0')	LV -200,100 (0-1.5')	LV -150,100 (0-1.0')	LV -150,100 **(0-1.0')** **DUP**
Laboratory ID #		93060802	93060813	93060809	93060812	93060806	93060816	93060805	93060815	93060810	93060908
Chlorinated Hydrocarbons											
Chloroform	300	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
1,1,1-Trichloroethane	800	8 J	13 U	16 J	13 U	24 J	9 J	18	6 J	11 J	12 U
Trichloroethene	700	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Total Chlorinated	**NS**	**8**	**ND**	**16**	**ND**	**24**	**9**	**18**	**6**	**11**	**ND**
Aromatic Hydrocarbons											
Ethylbenzene	5500	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Xylene (tot)	1200	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Chlorobenzene	1700	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Benzene	60	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Toluene	1500	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Total Aromatic	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Other Volatiles											
2-Butanone	300	13 U	13 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Carbon Disulfide	2700	13 U	3 J	12 U	13 U	12 U	13 U	12 U	14 U	13 U	12 U
Acetone	200	13 U	19 U	12 U	13 U	12 U	13 U	12 U	14 U	13 U	15 U
Total Other	NS	ND	3	ND	ND	ND	ND	ND	ND	ND	ND
Total Volatiles	10,000	8	3	16	ND	24	9	18	6	11	ND

RSCO: Recommended Soil Cleanup Objective obtained
from NYSDEC TAGM HWR-92-4046
NS: No Standard
J: Estimated value
U: Undetected at indicated detection limit
ND: None Detected
Bold value in shaded box indicates results exceeds RSCO.

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 5
Analytical Results Summary for Sediment and Soil Samples
Target Analyte List (TAL) Metals
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

METALS (mg/kg)	RSCO (mg/kg)	Eastern USA Background (mg/kg)	LV 250,0 (1'-2')	LV 630,60 (0-1.75')	LV 0,150 (0-1.5')	LV-400,50 (1.5'-2.5')	LV 300,50 (0-0.1')	LV 100,50 (0-0.1')	NSB-1E (0-1.0')	SED-1
			60902	60907	60808	60813	59212	59211	59218	72209
Aluminum	30 or SB	33,000	**1290**	**1200**	**4240**	**3790**	**2460**	**5790**	**5070**	**8340 J**
Antimony	30 or SB	NA	5.9 U	**31.3 J**	**58.2 J**	6.4 UJ	7.6 U	14.1	**91.2**	27.7
Arsenic	7.5 or SB	3 to 12	4.2 J	**17.3 J**	**22.5 J**	**15 J**	**36 J**	**20.5 J**	**28.6 J**	**75.2**
Barium	300 or SB	15 to 600	42.2	19.7	144	107	208	143	133	**691**
Beryllium	0.14	0 to 1.75	0.91U	0.93 U	**1.2**	0.97 U	1.1 U	1.0 U	**1.3**	2.3 U
Cadmium	1 or SB	0.1 to 1	**1.3**	1.2 U	**4.7**	**1.4**	**2.7**	**2.2**	**2.4**	**7.5**
Calcium	SB	130 to 35,000	1860	171,000	16,800	9250 J	6810	19,700	6320	36,400
Chromium	10 or SB	1.5 to 40	**11.9**	**12.8**	**79.1**	**20.2**	**137 J**	**64.9 J**	**27.5 J**	**179**
Cobalt	30 or SB	2.5 to 60	4.6	4.0	17.1	11	10	12.2	18.8	20.7
Copper	25 or SB	1 to 50	17.9	**34.2**	**396**	**83.6**	**139**	**174**	**295**	**1140**
Iron	2000 or SB	2000 to 550,000	**12,700**	**16,900**	**79,200**	**39,800**	**39,900**	**45,400**	**80,400**	**93,900**
Lead	30 or SB	4 to 61	4.1 J	**309 J**	**684 J**	**192 J**	**799 J**	**1620 J**	**536 J**	**2260 J**
Magnesium	SB	100 to 5000	122	5210	2620	2070	1300	3440	623	4670
Manganese	SB	50 to 5000	12.0	228	926 J	340 J	980	565	753	762
Mercury	0.1	0.001 to 0.2	0.11 U	0.11 U	**0.35**	**0.17**	**0.39**	**0.81**	**0.23**	0.30 U
Nickel	13 or SB	0.5 to 25	8.0	6.0 U	**45.8**	**22.3**	**29.9**	**34.5**	**35.4**	**148**
Potassium	4000 or SB	8500 to 43,000	217	332	548	819 J	574	827	714	1220
Selenium	2 or SB	0.1 to 3.9	0.23 UJ	0.33 J	0.44 J	0.94 J	0.31 UJ	0.28 UJ	1.8 UJ	**2.1 J**
Silver	200	NA	2.1 U	2.1 U	2.1 U	2.2 U	2.6 UJ	2.3 UJ	2.9 UJ	5.2 U
Sodium	3000 or SB	6000 to 8000	7.8 U	7.9 U	8.1 U	8.5 UJ	10.1 U	9.1 U	11.3 U	20.1 U
Thallium	20 or SB	NA	0.48	0.47 U	0.41 U	0.46	0.48 UJ	0.45 UJ	0.56 UJ	0.79 U
Vanadium	150 or SB	1 to 300	11.9	11.8	34.4	30.1	43.3	28	44.8	52.2
Zinc	20 or SB	9 to 50	**24.4**	**74.6**	**1480**	**234**	**520**	**562**	**617**	**1850**

RSCO: Recommended Soil Cleanup Objective obtained from NYSDEC TAGM HWR-92-4046.
Eastern USA Background data obtained from NYSDEC TAGM HWR-92-4046.
SB: Site Background - metals concentrations have not been established for the site, but are assumed to be at or below the Eastern USA Background Levels.
U: Undetected at indicated detection limit.
J: Estimated concentration.
Bold value in shaded box indicates detected concentration execeeds the RSCO.
Underlined values indicate detected concentration exceeds the upper range of Eastern USA Background.

Prepared by: KMH
Date: 8/3/93
Checked by: JCY
Date: 8/4/93

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TABLE 6
Analytical Results Summary Groundwater and Surface Water Samples; Volatile Organic Compounds (VOCs), Lehigh Valley Railroad, Tifft Street, Buffalo, NY

VOLATILES (ug/l)	NYSDEC Standard (S) Guidance (G) (ug/l)		SAMPLES											
	Ground Water	Surface Water	MW-1	MW-2	MW-3	MW-3 DUP	TF-1		GW-4		GW-5		SWS-1	Field Blank
Date Sampled			5/13/93	5/13/93	5/13/93	5/13/93	9/15/88	5/13/93	12/20/8	5/13/93	12/20/8	5/13/93	5/13/93	5/13/93
Chlorinated Hydrocarbons														
Methylene Chloride	5 (S)	5 (G)	**100**	10 U	10 U	10 U	5 U	10 U	4 B,J	10 U	**7 B**	10 U	10 U	10 U
Chloroform	7 (S)	7 (S)	**1900**	10 U	10 U	10 U	5 U	10 U	5 U	10 U	5 U	10 U	10 U	10 U
1,2-Dichloroethene (tot)	5 (S)	5 (S)	10 U	3 J	10 U	10 U	5 U	10 U	**20**	**20**	5 U	10 U	10 U	10 U
Vinyl Chloride	2 (S)	0.3 (G)	10 U	**31**	**6 J**	**5 J**	10 U	10 U	10 U	**5 J**	10 U	10 U	10 U	10 U
Tetrachloroethene	5 (S)	0.7 (G)	10 U	10 U	10 U	10 U	5 U	10 U	0.7 BJ	10 U	0.5 BJ	10 U	10 U	10 U
Trichloroethene	5 (S)	3 (G)	10 U	5 J	10 U	10 U	5 U	10 U	0.9 J	10 U	5 U	10 U	10 U	10 U
Chlorinated Hydrocarbons (tot)	NS	NS	2,000	39	6	5	5 U	ND	25.6	25	8	ND	ND	ND
Aromatic Hydrocarbons														
Chlorobenzene	5 (S)	5 (S)	10 U	10 U	10 U	10 U	5 U	10 U	0.6 J	10 U	0.7 J	10 U	10 U	10 U
Ethylbenzene	5 (S)	5 (G)	4 J	10 U	10 U	10 U	5 U	10 U	0.4 J	10 U	1 BJ	10 U	10 U	10 U
Xylene (tot)	5 (S)	5 (G)	**8 J**	**7 J**	2 J	2 J	5 U	10 U	**6**	10 U	**8**	10 U	10 U	10 U
Benzene	0.7 (S)	0.7 (S)	10 U	10 U	10 U	10 U	**2 J**	10 U	10 U	10 U	**2 J**	10 U	10 U	10 U
Toluene	5 (S)	5 (G)	10 U	10 U	10 U	10 U	5 U	10 U	0.5 J	10 U	0.9 J	10 U	10 U	10 U
Aromatics (tot)	NS	NS	12	7	2	2	2	ND	7.5	ND	12.6	ND	ND	ND
Other Volatiles														
Acetone	NS	NS	19 J	31	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Other Volatiles (tot)	NS	NS	19	31	ND	ND	ND	ND	ND	ND	ND	ND	ND	10 U
Total Volatiles	NS	NS	2,031	77	8	7	2	ND	33.1	25	20.1	ND	ND	ND

NOTES:

Bold face values in shaded boxes indicate results greater than standard or guidance value.

Standards and guidance values obtained from NYSDEC "Water Quality Standards and Guidance Values", November 1991.

NS: No standard available

U: Undetected at detection level indicated.

J: Estimated value.

ND: None detected.

(tot) - Total sum of detected compounds regardless of laboratory qualifiers.

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 7
Analytical Results Summary
Groundwater and Surface Water Samples
Semi-Volatile Organic Compounds
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

SEMI-VOLATILES (ug/l)	NYSDEC Standard (S) Guidance (G) (ug/l)		SAMPLES										
	Ground Water	Surface Water	MW-1	MW-2	MW-3	MW-3 DUP	TF-1		GW-4		GW-5		SWS-1
Date Sampled			5/13/93	5/13/93	5/13/93	5/13/93	9/15/88	5/13/93	12/20/88	5/13/93	12/20/88	5/13/93	5/14/93
Phenols													
Phenols (tot)	1 (S)	1 (S)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
PAHs													
Napthalene	10 (G)	10 (S)	84	3 NJ	3 J	10 U	11 U	10 U	11 U	10 U	11 U	10 U	10 U
Acenapthene	20 (G)	20 (S)	5 J	10	7 J	13	5 J	10 U	11 U	10 U	11 U	10 U	10 U
Fluorene	50 (G)	50 (G)	6 J	12	10	14	3 J	10 U	11 U	10 U	11 U	10 U	10 U
Phenanthrene	50 (G)	50 (G)	7 J	9 J	4 J	4 J	0.3 J	10 U	11 U	10 U	11 U	10 U	10 U
Fluoranthene	50 (G)	50 (G)	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	11 U	3 J	10 U
Pyrene	50 (G)	50 (G)	10 U	10 U	10 U	10 U	11 U	10 U	11 U	10 U	11 U	2 J	10 U
2-Methylnapthalene	NS	NS	160	10 U	4 J	8 J	11 U	10 U	11 U	10 U	7 J	10 U	10 U
PAHs (tot)	NS	NS	262	34	28	39	8.3	ND	ND	ND	7	5	ND
Phthalates													
Bis (2-Ethylhexyl) Phthalate	50 (S)	0.6 (S)	10 U	10 U	10 U	10 U	36	10 U	ND	10 U	8 J	10 U	10 U
Di-n-Burylphthalate	50 (S)	50 (G)	10 U	10 U	10 U	10 U	0.8 J	10 U	11 U	10 U	11 U	10 U	10 U
Phthalates (tot)	NS	NS	ND	ND	ND	ND	36.8	ND	ND	ND	8	ND	ND
Other SVOCs													
Dibenzofuran	NS	NS	3 NJ	10	8 J	13	2 J	10 U	11 U	10 U	11 U	10 U	10 U
Other SVOCs (tot)	NS	NS	3	10	8	13	2	ND	ND	ND	ND	ND	ND
TOTAL SVOCs	NS	NS	265	44	36	52	47.1	ND	ND	ND	15	5	ND

Standards and guidance values obtained from NYSDEC "Water Quality Standards and Guidance Values", November 1991.
Bolded values in shaded boxes indicate results greater than standard or guidance value.
NS: No standard available
U: Undetected at detection level indicated.
N: Identification considered tentative
J: Estimated value.
ND: None detected.
(tot) - Total sum of detected compounds regardless of laboratory qualifiers.

Prepared by: KMH
Date: 8/3/93
Checked by:
Date: 8/4/93

TABLE 8
Analytical Results Summary for Groundwater and Surface Water Samples
Target Analyte List (TAL) Metals
Lehigh Valley Railroad, Tifft Street, Buffalo, NY

Metals (ug/L)	NYSDEC Standard (S) Guidance (G) (ug/l)		SAMPLES										
	Ground Water	Surface Water	MW-1	MW-2	MW-3	MW-3 DUP	TF -1		GW -4		GW -5		SWS-1
Date Sampled			5/13/93	5/13/93	5/13/93	5/13/93	9/15/88	5/13/93	12/20/88	5/13/93	12/20/88	5/13/93	5/14/93
Aluminum	NS	100 (S)	327	336	3830 J	1880 J	190	49.7	200	100	260	206	30.1
Antimony	3 (G)	3 (G)	25.6 U	25.6 U	25.6 U	25.6 U	ND	25.6 U	ND	25.6 U	ND	25.6 U	25.6 U
Arsenic	25 (S)	50 (S)	4.3	1.5 U	1.7	1.5 U	ND	1.5 U	ND	4.1	ND	1.5	1.5 U
Barium	1000 (S)	1000 (S)	11.9	15.8	73.5	51.7	100	83.4	80	114	120	178	50.4
Beryllium	3 (G)	3 (G)	3.8 U	3.8 U	3.8 U	3.8 U	ND	3.8 U	ND	3.8 U	ND	3.8 U	3.8 U
Cadmium	10 (S)	10 (S)	4.7 U	4.7 U	4.7 U	4.7 U	ND	4. 7 U	ND	4.7 U	ND	4. 7 U	4.7 U
Calcium	NS	NS	42,200	99,000	107,000	95,700	137,000	125,000	109,000	76,200	229,000	100,000	153,000
Chromium	50 (S)	50 (S)	7.2 U	7.2 U	14	9.8	ND	7.2	ND	7.2 U	ND	7.2 U	9.8
Cobalt	NS	5 (S)	7.4 U	7.4 U	7.4 U	7.4 U	ND	7.4 U	ND	7.4 U	ND	7.4 U	7.4 U
Copper	200 (S)	200 (S)	6.5 U	6.5 U	29	20.2	ND	6.5 U	10	6.5 U	13	6.5 U	11.4
Iron	300 (S)	300 (S)	**660**	204	**21900 J**	**9490 J**	**20,800**	**15,800**	**1,150**	**4,590**	**211,000**	**25,800**	**717**
Lead	25 (S)	50 (S)	R	R	**73.8 J**	**52.2 J**	ND	**28.3**	ND	R	ND	11.1 J	R
Magnesium	35,000 (G)	35,000 (S)	1830	9360	12,000	11000	15,100	13,800	9510	7850	24,100	11,400	20,300
Manganese	300 (S)	300 (S)	17.3	72.6	**457 J**	275 J	**887**	**852**	**1290**	**1070**	**1900**	**431**	**611**
Mercury	2 (S)	0.2 (S)	0.21 U	0.21 U	0.21 U	0.21 U	ND	0.21 U	ND	0.21 U	0.25	0.21 U	0.21 U
Nickel	NS	NS	25.8 U	25.8 U	25.8 U	25.8 U	50	25.8 U	ND	25.8 U	ND	25.8 U	25.8 U
Potassium	NS	NS	8050	8430	9780	10,900	ND	10,000	ND	8370	ND	4230	10,600
Selenium	10 (S)	10 (S)	1.1 UJ	1.5 J	1.1 UJ	1.1 UJ	ND	1.1 UJ	ND	1.1 UJ	ND	1.1 UJ	1.1 UJ
Silver	50 (S)	50 (S)	8.8 U	8.8 U	8.8 U	8.8 U	ND	8.8 U	ND	8.8 U	ND	8.8 U	8.8 U
Sodium	20,000 (S)	NS	**24,200**	**32,400**	**22,000**	**26,900**	**32,000**	**28,400**	**28,000**	17,800	**21,000**	10,500	18,600
Thallium	4 (G)	4 (G)	1.3 U	1.3 U	1.3 U	1.3 U	ND	1.3 U	ND	1.3 U	ND	1.3 U	1.3 U
Vanadium	NS	14 (S)	8.8 U	8.8 U	11.6	8.8 U	ND	8.8 U	ND	8.8 U	ND	8.8 U	8.8 U
Zinc	300 (S)	30 (S)	5.5 U	10.7	90.6 J	43.5 J	7 B	10.7	10	14.3	27	43.5	10.7

Standards and Guidance values obtained from NYSDEC "Water Quality Standards and Guidance Values", November, 1991.

Bold face values in shaded boxes indicate results greater than standard or guidance value.

NS: No standard available.

U: Undetected at indicated detection limit.

J: Estimated Value.

R: Data was rejected due to QA/QC failure.

ND: Not Detected - detection limit unavailable

APPENDICES

APPENDIX 1

BORING LOGS AND WELL CONSTRUCTION DIAGRAMS

IES
A DIVISION OF [illegible]
44 SHELTER ROCK ROAD
DANBURY, CT 06810
(203) 796-5279

Page ____ of ____

BORING/WELL LOCATION SKETCH MAP

N

TEST BORING LOG

BORING NO. MW - 1

PROJECT NO., NAME 2310-170 LEHIGH VALLEY R.R.

LOCATION Tifft Rd, Buffalo NY

DRILLING CONTRACTOR/DRILLER Buffalo Drilling Co.

IES GEOLOGIST, OFFICE JOE GLISTA

DRILLING EQUIPMENT, METHOD Rotary HSA	**SIZE, TYPE OF BIT** 4.5" ID HSA	**SAMPLING METHOD** Split Spoon	**START, FINISH DATE** 4/20/93

WELL INSTALLED? YES ☒ NO ☐ **CASING MAT./DIA.** Cast iron/4" **SCREEN: TYPE** Slotted **MAT.** PVC **LENGTH** 10' **DIA.** 2" **SLOT SIZE** 0.10

ELEVATION OF: (FT. ABOVE M.S.L.)	GROUND SURFACE	TOP OF WELL CASING	TOP & BOTTOM SCREEN	GW SURFACE	DATE
		584.51	579.18 / 570.68		4/20/93

REMARKS:

LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
	0-2'	20"	6-12-20-20	TOP - 12" Grey-Brown SILT some Sand and Gravel and Organics Bottom - 8" Dark Grey-Black CINDER CHIPS ASH.	OIL odor		
	2-4'	18"	12-14-18-15	Dark Grey-Black SILT and SAND, some Cinder Chips / Ash.	Oil odor, 60ppm PID. Bottom was wet Sheen on H_2O.		
5	4-6'	8"	22-21-25-29	Green, white and Black fine to medium SAND, little coarse Sand and Silt.	WET SAMPLE oil odor. Casting Sand(?)		
	6-8'	12"	12-6-2-2.	Green, white and Black fine to medium SAND, little coarse Sand and Silt.	WET Sample Sheen on H_2O.		
10	8-10	12"	4-6-4-2	Grey-Brown CLAY little Silt	WET Sample		
	10'-12'	18"	4-4-2-1	Top - 3" Grey CLAY Bottom - 15" Grey-Brown SILT, some fine Sand and Clay	WET Sample End of Exploration Monitoring Well set at 13'.		
15					10' Screen, 5' solid riser. Sand backfill to 1.5' Bentonite ~ 0.5' Cement to top. Stick up.		

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

Page ____ of ____

IES
A DIVISION OF THIS
44 SHELTER ROCK ROAD
DANBURY, CT 06810
(203) 796-5279

TEST BORING LOG

BORING/WELL LOCATION SKETCH MAP
N

BORING NO.	MW-3
PROJECT NO., NAME	2310-170 LEHIGH VALLEY R.R
LOCATION	Tifft Rd. Buffalo NY
DRILLING CONTRACTOR/DRILLER	Buffalo Drilling Co.
IES GEOLOGIST, OFFICE	JOE GLISTA
DRILLING EQUIPMENT, METHOD	Rotary HSA
SIZE/TYPE OF BIT	4.5" HSA
SAMPLING METHOD	Split Spoon
START, FINISH DATE	4/20/93
WELL INSTALLED?	YES ☒ NO ☐
CASING MAT./DIA.	Cast Iron / 4"
SCREEN: TYPE	Slotted
MAT.	PVC
LENGTH	8.5'
DIA.	2"
SLOT SIZE	0.10

ELEVATION OF: (FT. ABOVE M.S.L.)	GROUND SURFACE	TOP OF WELL CASING	TOP & BOTTOM SCREEN	GW SURFACE	DATE
		584.51	579.18 - 570.68		4/20/93

REMARKS:

LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
	0-2'	20"	4-7-15-29	14" Dark Brown to Dark Grey SILT, some fine Sand and Organics grading into 6" Dark Brown to Black GRAVEL and fine to Coarse SAND)	Damp. oil Odor.		
	2-4'	18"	12-15-30-17	Dark Grey to Black GRAVEL, fine to Coarse SAND and FILL (Brick, Cinder Chips etc.)	WET sample oil Odor.		
5	4-6'	12"	16-6-3-2	Dark Grey to Black GRAVEL and fine to Coarse SAND.	WET Sample oil Odor.		
	6-8'	15"	4-2-2-3	3" Dark Grey to Black GRAVEL grading into 12" Grey CLAY with little Silt.	WET Sample oil Odor Sheen on H_2O.		
	8-10'	14"	1-2-1-2	Grey CLAY with little Silt	WET Sample oil Odor Sheen on H_2O. END of exploration monitoring well set at 10'. 8.5' Screen. 5' Solid riser Sand pack to 9.0'. Bentonite seal to top. Cement Cap.		
10							
15							

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%
Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

IES

A DIVISION OF [illegible]
44 SHELTER ROCK ROAD
DANBURY, CT 06810
(203) 796-5279

Page ____ of ____

BORING/WELL LOCATION SKETCH MAP

N

TEST BORING LOG

BORING NO.	MW-2
PROJECT NO., NAME	2310-170 LEHIGH VALLEY R.R.
LOCATION	Tifft Rd. Buffalo NY
DRILLING CONTRACTOR/DRILLER	Buffalo Drilling Co
IES GEOLOGIST, OFFICE	JOE GLISTA
DRILLING EQUIPMENT, METHOD	HSA Rotary Auger
SIZE, TYPE OF BIT	4.5" HSA
SAMPLING METHOD	Split Spoon
START, FINISH DATE	4/20/93
WELL INSTALLED?	YES ☒ NO ☐
CASING MAT./DIA.	Cast iron / 4"
SCREEN: TYPE	Slotted
MAT.	PVC
LENGTH	8.5'
DIA.	2"
SLOT SIZE	0.10

ELEVATION OF: (FT. ABOVE M.S.L.)	GROUND SURFACE	TOP OF WELL CASING	TOP & BOTTOM SCREEN	GW SURFACE	DATE
		584.48	579.37-570.84		4/20/93

REMARKS:

LOG OF TEST BORING

DEPTH (FT)	SAMPLE NO. AND TYPE	RECOVERY (FT)	PENETRATION RESISTANCE BLOWS/FT	DESCRIPTION	REMARKS	WELL CONST.	GRAPHIC LITHO LOG
	0-2'	20"	4-6-4-4	5" Dark Brown SILT and Fine SAND and ORGANICS grading into 5" Gray Brown and Black fine to Coarse SAND grading into 10" light Brown to Tan fine to medium SAND and SILT, some Gravel.	Water in bottom of boring hole. ~~at~~ 2.0'. OIL odor in sands		
	2-4	16"	3-5-10-19	13" ~~Dark~~ Gray to Black fine to Coarse SAND grading into 3" Green fine to Coarse SAND	OIL odor. WET.		
5	4-6	24"	14-39-45-25	Black, Green and ~~Gray~~ fine to Coarse SAND.	Casting sand(?) OIL Odor WET		
	6-8	16"	4-3-4-6	Gray Brown CLAY some Silt.	OIL odor, WET		
10	8-10	18"	3-4-1-1	8" Gray CLAY grading into 10" Gray-Brown SILT, some Clay, little fine Sand	WET sample. End of exploration 10' monitoring well installed. 8.5' Screen. 5' solid riser. Sand to 9.' Bentonite to Surface. Stick up		
15							

Proportions Used: Trace = 0-10%, Little = 10-20%, Some = 20-35%, And = 35-50%

Sampling Abbreviations: SS = Split Spoon, ST = Shelby Tube, CSC = Continuous Soil Core

BY JOE GLISTA DATE 6/9/93 PROJ. 2310 TASK 170
CHKD. VS DATE 6/11/93 PAGE 1 OF 2

REF

Ground-water Flow Velocity Calculation

Ground water Flow Velocity Equation $-\bar{V} = \frac{Ki}{n}$
(Freeze & Cherry, 1979)

$\bar{V}$ = average linear groundwater flow velocity
i = hydraulic gradient (-#)
n = effective porosity
K = Hydraulic Conductivity

Monitoring Well GW-5

$K = 1.358 \times 10^{-3}$ cm/sec
$= 3.849$ ft/day

anisotropic well conditions - Calculated by NYSDEC (Phase II Investigation LEHIGH VALLEY R.R. MARCH 1990)

$n = .12$

from Capzone, OHIO ST. Univ. 1991. Consistent with published and observed site data.

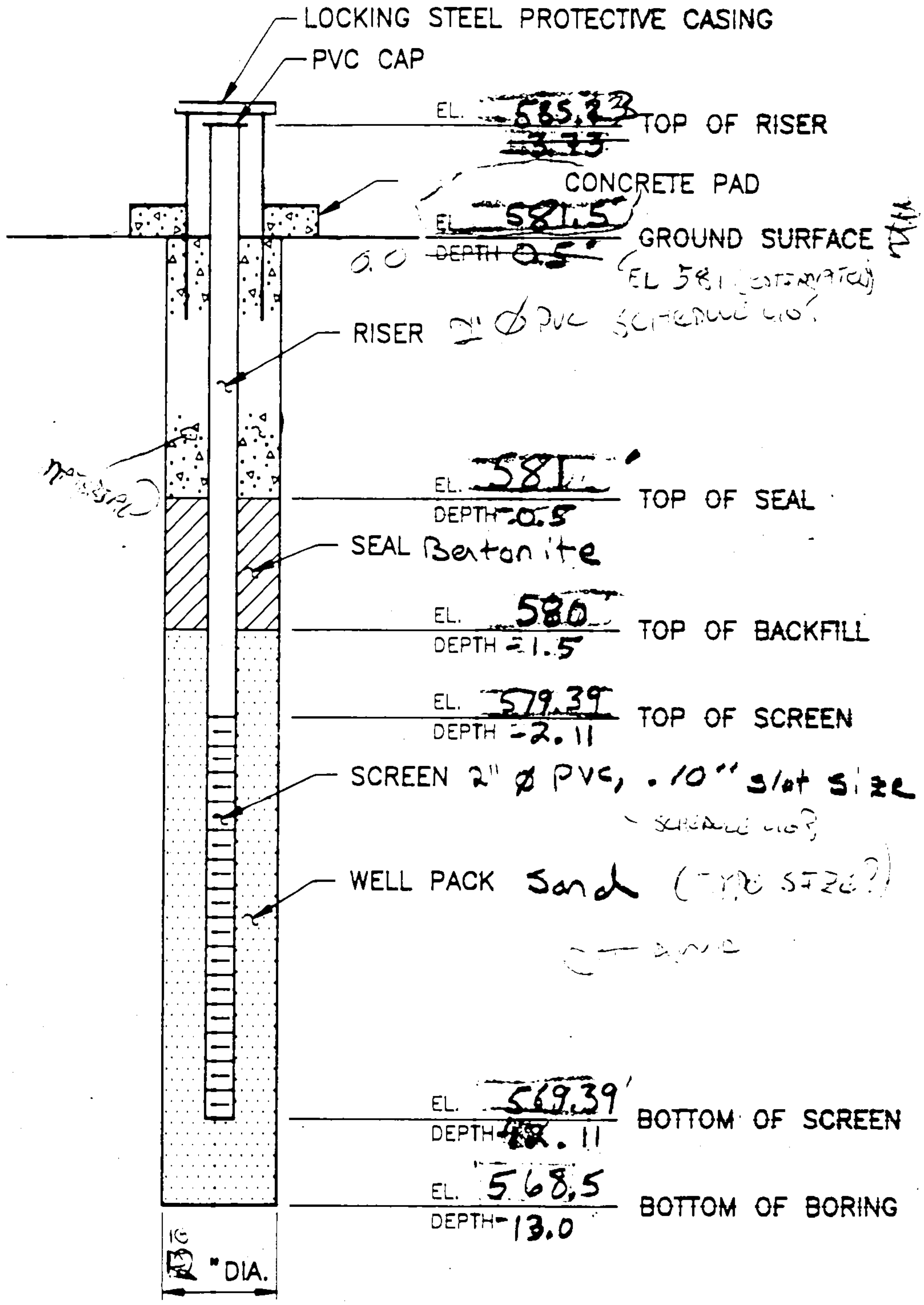
$$i = \frac{\Delta h}{\Delta d} = \frac{-.94\text{ ft.}}{310\text{ ft.}}$$
$$= -3.032 \times 10^{-3}$$

$$K\ \text{ft/day} = \frac{K\ \text{cm/sec} \times 60\ \text{sec/min} \times 60\ \text{min/hr.} \times 24\ \text{hr./day}}{2.54\ \text{cm/in.} \times 12\ \text{in/ft.}}$$

$$-\bar{V} = \frac{3.849\ \text{ft/day} \times -3.032 \times 10^{-3}}{.12}$$
$$= .0973\ \text{ft/day}$$
$$= 35.497\ \text{ft/yr.}$$

Based on the above calculations, the average ground-water flow velocity in the vicinity of monitoring well GW-5 will be approximately 35.5 feet per year.

MW-1



LOCKING STEEL PROTECTIVE CASING

PVC CAP

EL. 585.23 TOP OF RISER ~~3.73~~

CONCRETE PAD

~~EL. 581.5~~ GROUND SURFACE
0.0 ~~DEPTH 0.5'~~
(EL 581 (ESTIMATED)

RISER 2" Ø PVC SCHEDULE 40?

EL. 581' TOP OF SEAL
DEPTH -0.5

SEAL Bentonite

EL. 580 TOP OF BACKFILL
DEPTH -1.5

EL. 579.39 TOP OF SCREEN
DEPTH -2.11

SCREEN 2" Ø PVC, .10" slot size
SCHEDULE 40?

WELL PACK Sand (TYPE SIZE?)

EL. 569.39' BOTTOM OF SCREEN
DEPTH -12.11

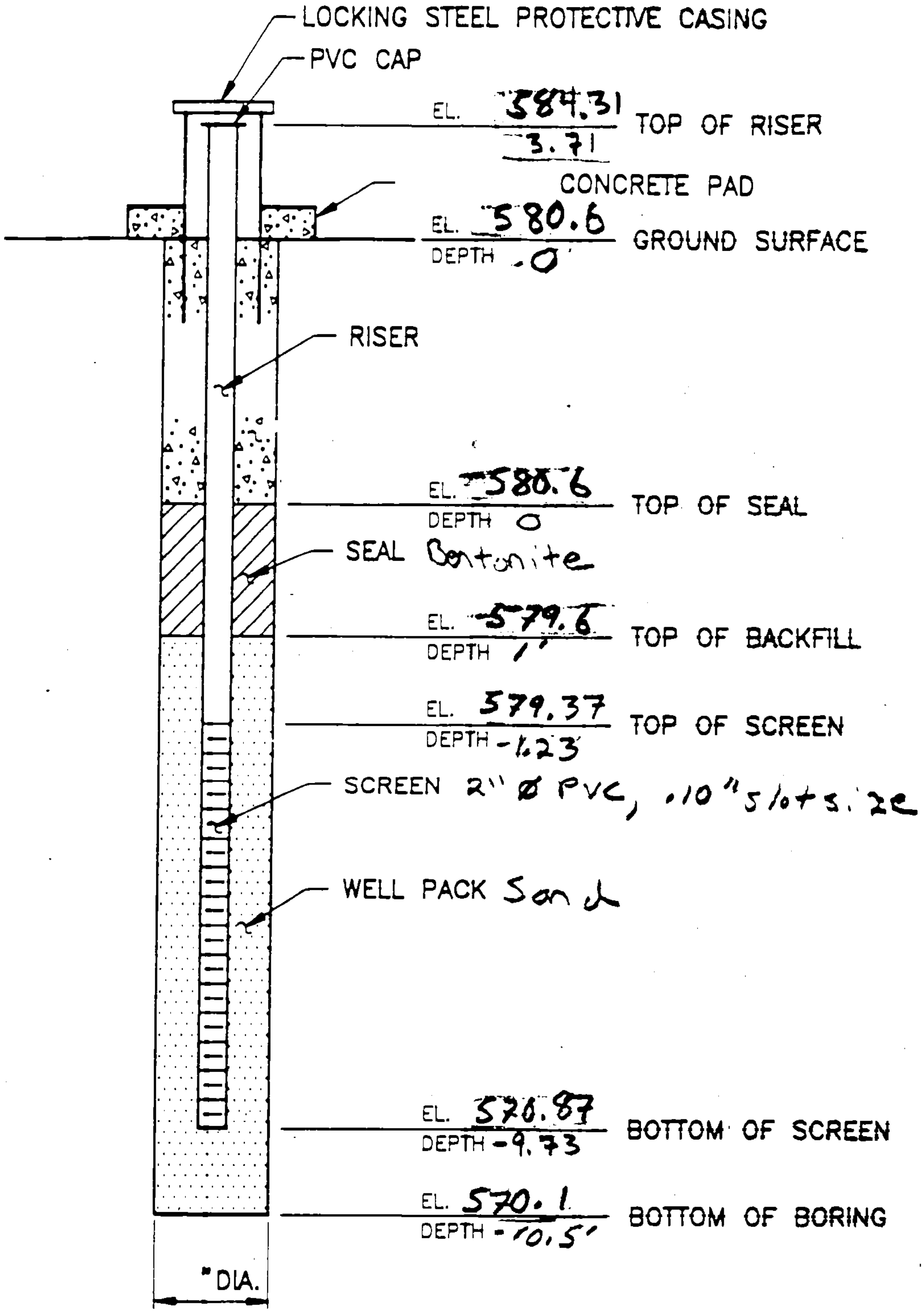
EL. 568.5 BOTTOM OF BORING
DEPTH -13.0

16 "DIA.

NOTES:
1. NOT DRAWN TO SCALE
2. SEE BORING LOG FOR DETAILED SOIL DESCRIPTION.

ies INTEGRATED ENVIRONMENTAL SERVICES	REVISIONS NO. DATE	PROJECT	Lehigh Valley RR	PROJECT # FILENAME:
		DRAWING	OBSERVATION WELL DETAIL	SCALE: NTS DATE: BY: AD CK: FIGURE #

MW-2

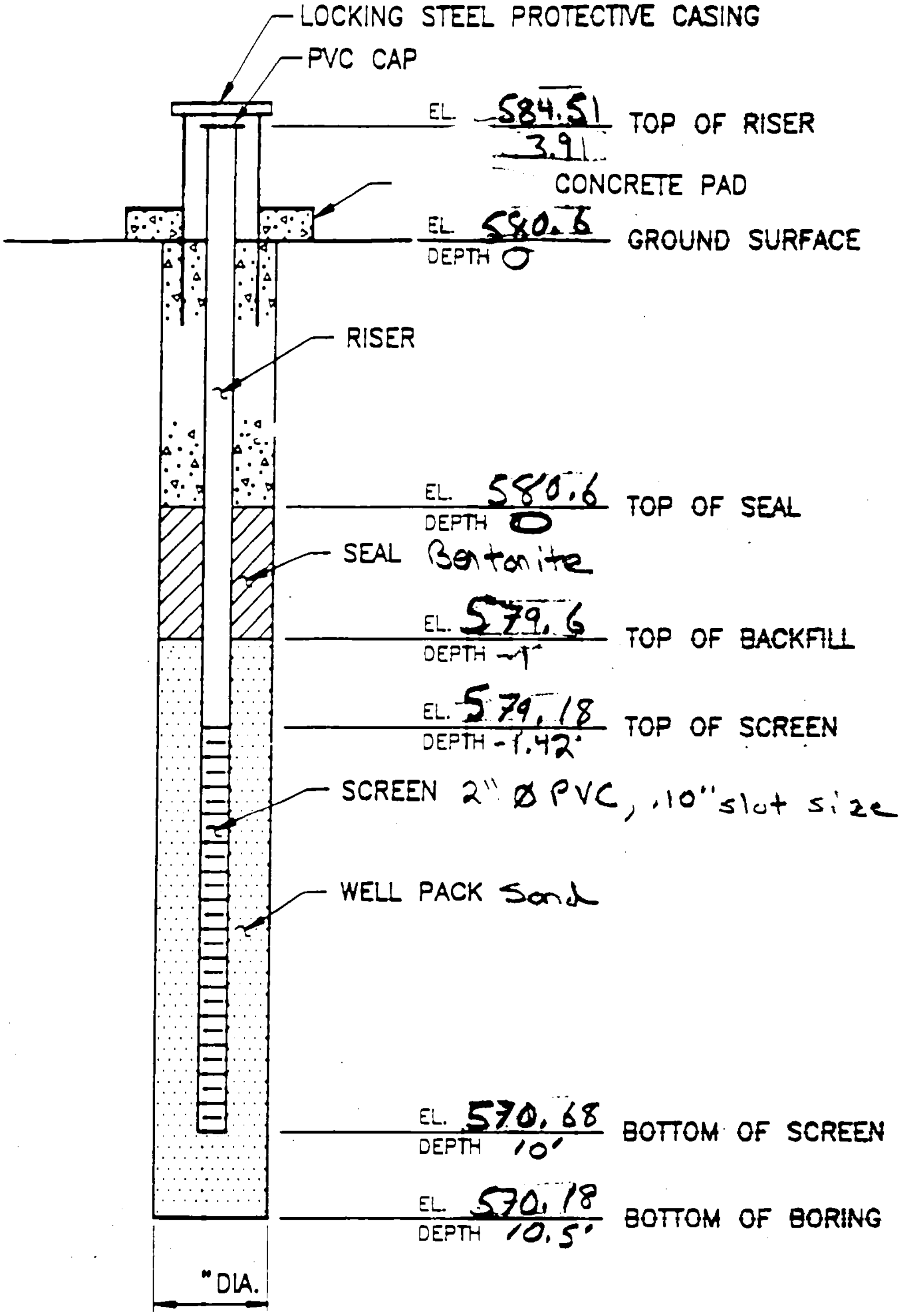


NOTES:

1. NOT DRAWN TO SCALE
2. SEE BORING LOG FOR DETAILED SOIL DESCRIPTION.

ies INTEGRATED ENVIRONMENTAL SERVICES	REVISIONS NO. DATE	PROJECT		PROJECT # FILENAME IES2 SCALE: NTS DATE: BY: AD CK:
		DRAWING	OBSERVATION WELL DETAIL	FIGURE #

MW-3



EL. 584.51 TOP OF RISER
3.91

EL. 580.6 GROUND SURFACE
DEPTH 0

EL. 580.6 TOP OF SEAL
DEPTH 0

SEAL Bentonite

EL. 579.6 TOP OF BACKFILL
DEPTH -1'

EL. 579.18 TOP OF SCREEN
DEPTH -1.42'

SCREEN 2" Ø PVC, .10" slot size

WELL PACK Sand

EL. 570.68 BOTTOM OF SCREEN
DEPTH 10'

EL. 570.18 BOTTOM OF BORING
DEPTH 10.5'

NOTES:

1. NOT DRAWN TO SCALE
2. SEE BORING LOG FOR DETAILED SOIL DESCRIPTION.

ies INTEGRATED ENVIRONMENTAL SERVICES	REVISIONS	PROJECT		PROJECT #
	NO. DATE			DRAWING IES2
		DRAWING	OBSERVATION WELL DETAIL	SCALE NTS DATE
				BY AD CK
				FIGURE #

APPENDIX 2

GROUNDWATER VELOCITY CALCULATIONS

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INTEGRATED ENVIRONMENTAL SERVICES
A DIVISION OF **nes**

BY JOE GIUSTA DATE 6/9/93 PROJ. 2310 TASK 170
CHKD. DATE 6/11/93 PAGE 2 OF 2

Ground-Water Flow Velocity Calculation Cont'd.

REF

Monitoring well GW-4

$K = 1.119 \times 10^{-2}$ cm/sec
$= 31.719$ ft/day

anisotropic well conditions calculated by NYSDEC (Phase II Investigation - LEHIGH VALLEY RR, March 199)

$n = .12$

$$i = \frac{-.94 \text{ ft}}{310 \text{ ft}}$$

$$= -3.032 \times 10^{-3}$$

$$K_{\text{ft/day}} = \frac{K_{\text{cm/sec}} \times 60 \text{ sec/min} \times 60 \text{ min/hr.} \times 24 \text{ hr/day}}{2.54 \text{ cm/in.} \times 12 \text{ in/ft.}}$$

$$-\bar{V} = \frac{31.719 \text{ ft/day} \times -3.032 \times 10^{-3}}{.12}$$

$$= .801 \text{ ft/day}$$

$$= 292.365 \text{ ft/year}$$

Based on the above calculations, the average ground-water flow velocity in the vicinity of monitoring well GW-4 is approximately 292.4 feet per year

APPENDIX 3

DATA VALADATION SERVICES DATA VALADATION REPORTS

Data Validation Services

Cobble Creek Road P. O. Box 208
North Creek, N. Y. 12853
Phone 518-251-4429

TO: Integrated Environmental Systems

FROM: Judy Harry, Data Validation Services J. Harry

DATE: 7-10-93; Revision

RE: Validation of Lehigh Valley Railroad Yard Site data
Huntingdon Analytical Services Reference Numbers 93-0592, 93-0608, and 93-0609

Review has been completed for data packages generated by HAS pertaining to fifty one soil samples collected at the Lehigh Valley Site. These samples were processed for the CLP target compound list volatiles, semivolatiles, and metals. Field and trip blanks were also analysed for volatile components; matrix spikes/duplicates were performed at proper frequency. Methodologies utilized were those of the 1991 NYSDEC ASP, CLP.

In summary, the organic analyses were performed in compliance with protocol requirements, with the exception of the BNA calibration standard/internal standard solution concentrations (discussed below). Noncompliancies were observed in the metals processing, and those associated with the furnace analyses (arsenic, lead, selenium, and zinc) were of significance to require qualification of reported results. These quality concerns are addressed below, as well as noted on the attached compliancy chart. Also attached to this text are copies of the laboratory case narratives and of the communications made with the laboratory during validation.

Although volatile analyses were performed in compliance with protocol, most samples produced poor purge efficiency, as noted by repeated failure of the internal standard recoveries. Consequently, many of them are qualified as estimated reported results, as detailed below.

To aid in resolving sample identities, the client identifications noted within this text will be immediately followed by the SDG number of the sample, in parentheses.

Edits to the reported sample results, and qualification of sample results as indicated by quality control outliers are as follows:

1. The detected values for lead in samples LV-400,50 and LV630,60 were reported without application of dilution factors (1:20 and 1:100, respectively), and should be corrected to be:

Sample ID	Incorrect Reported Results	Corrected Result
LV-400,50 1:00	9.5 mg/kg	192 mg/kg
LV630,60	3	309

Consequently, the lead values in LV630,60 and LV250,0 1-2' do not require the "N" flag, as the corrected sample result is actually above that requiring the spike recovery evaluation.

2. Furnace elemental analyses showed numerous outlying quality parameters, which are detailed in the metals section of this text. In summary, these include failed (unreported) calibration standards, noncompliant timegaps in sample and/or standard processing, improper calibration standard concentrations, and instrumental conditions contributing to low post-digest recoveries (as shown by those spikes of the CCBs). As a result, there is lack of confidence in the sample reported values and detection limits for these elements (arsenic, lead, selenium, and thallium), and all should be considered estimated for all samples. It should be noted that the variances from true value found in noncompliant standards are generally less than 20%; protocol requires that the determined value be within 10%.

3. In addition to the system variances noted in item #1, processing of certain samples for arsenic and lead was performed in a (noncompliant) fashion that could result in greater than a 20% variance. The most prevalent of these is the failure of utilization of the Method of Standard Additions to determine actual sample concentrations where matrix effect is evident. One or more elements (primarily arsenic and lead) for each of the samples should have been processed by MSA.

   Other outlying metals criteria related to specific samples are enumerated in the items listed immediately below.

4. Matrix spike analyses for metals produced values to warrent consideration of reported results for some elements as estimated (in some of these cases the elemental values are already recommended for qualification due to other quality concerns). The outlying values (outside 75 to 125% recovery), and affected samples are:

SDG	Sample Spike	Element	% Recovery Spike	Affected Samples
592	LV300,50	Chromium	270%	LV100,50;LV300,50;NSB1E
		Silver	56	LV100,50;LV300,50;NSB1E
592	LV100,50	Selenium	23	LV100,50;LV300,50;NSB1E
608	LV-400,50	Antimony	51	LV0,150;LV-400,50
		Manganese	169	LV0,150;LV-400,50
	LV0,150	Arsenic	181	LV0,150;LV-400,50
		Selenium	47	LV0,150;LV-400,50
609	LV630,60	Arsenic	47	LV630,60;LV250,0
		Selenium	59	LV630,60;LV250,0

5. Duplicate analyses for metals produced values to warrent consideration of reported results for some elements as estimated (in some of these cases the elemental values are already recommended for qualification due to other quality concerns). The outlying values (above 20 %Relative Percent Difference), and affected samples are:

SDG	Sample Dup	Element	% Rel. Percent Diff.	Affected Samples
592	LV100,50	Lead	89% RPD	LV100,50;LV300,40;NSB1E
609	LV630,60	Arsenic	93	LV630,60;LV250,0
		Lead	97	LV630,60;LV250,0

6. Thallium reported detection limits in SDG 93-0592 are further indicated as estimated, possibly biased low, by the poor recovery of 55% exhibited by the CRA (standard run at CRDL).

7. The following samples produced poor post-digest spike (PDS) recoveries (below limit of 85%), creating additional consideration for estimated reported results:

Sample ID	Element	% PDS Recovery
LV100,50	Selenium	47
	Thallium	52
LV300,50	Selenium	48
	Thallium	66
LV0,150 (608)	Selenium	58

8. The calcium, sodium, and potassium values for sample LV-400,50 1:00 should be considered estimated due to repeated failure of recovery of these elements in the associated CCV (CCVs were repeated until one finally passed).

9. All reported levels of methylene chloride and acetone in the samples (exception of acetone in LV200,150(609) should be considered as lab artifacts (as indicated by the presence in the method blanks), and sample results for these target compounds can be more accurately represented by edit to nondetection at either the samples' CRDL or the reported level, whichever is greater. The reported value for acetone in LV200,150(609) should be considered estimated. Additionally, reported values for freons or propyl alcohols should also be rejected as lab artifacts.

10. In all cases where two (or more) volatile analyses were run on a given samples, the initial analysis (that NOT labeled "RE") should be used. Only one vial was available for volatile processing, and the reanalyses were therefore performed from vials with subsequent, significant headspace, and the results are therefore possibly biased low. This is evident by comparison of initial and reanalysis of certain sample results that showed similar results for surrogate and internal standards, but lower concentrations of target compounds and tentatively identified compounds.

11. Many volatile samples produced low recovery of one or more internal standards (IS) upon repeated analysis. The CLP protocol requries reanalysis of samples which exhibit an IS with recoveries outside a 50% to 200% range of the daily standard area response. Repeated IS failure is often a result of matrix effect or interference. Some samples in this project showed chromatographic responses and Tentatively Identified Compounds (TICs) which support a matrix effect. However, there are also instances where a depressed, but compliant, recovery was exhibited by blanks or spiked blanks (many with IS recoveries of only 60% to 70% of daily IS#3), indicating system contribution to the sample failures. The samples in this project which failed internal standard recovery criteria were reviewed upon validation to determine if the recovery was of sufficient nature to consider qualification of the sample detection limits; i.e. the reported Instrument Detection Limits (IDLs) may be sufficiently low as to provide assurance that a 10 ppb level of target compound would be detected, even in the event of low recovery. All detected levels of target compounds (exception of methylene choride and acetone, which are rejected) in samples that showed IS failure must be considered estimated, and the bias may be high or low. The following samples were determined to warrent qualification of all detected and nondetected values as estimated; those with a parenthetical notation also showed outlying surrogate recoveries:

SDG No.	Sample ID
592	LV0,150 (d8-toluene at 140%; greater than 138% limit) LV300,150 (d8-toluene at 155%) NSB2 (d8-toluene at 144%

SDG No.	Sample ID, continued
608	LV50,150 4:14 (d8-toluene at 169%)
	LV-50,150 4:40
	LV-150,100 (d8-toluene at 144%)
609	BSS-1
	LV200,150 (d8-toluene at 157%)
	LV630,60
	LV800,100

12. Detected levels of volatile target compounds (those which are not already flagged as "J" and/or "B") should be considered estimated in the following samples (again, only initial analyses discussed); detection limits are not qualified:

SDG No.	Sample ID
592	LV300,50
608	LV0,150
	LV-50,100
	LV-300,50A
	LV-300,100

13. A volatile TIC is present at 2.503' in sample LV300,150(592), but was inadvertantly omitted from the report. It should be characterized as "Unknown", and is at a concentration of "12 ug/kg J".

14. Chloroform was incorrectly reported as detected in the reanalysis of sample NSB2(592). The reported result should be edited to "11 ug/kg U".

15. The reported value of chloroform in sample LV250,50(592) should be considered estimated due to poor correlation between the detected value in the sample (42 ug/kg) and its matrix spikes (250 and 140 ug/kg).

16. All reported detected values of carbazole (semivolatile) should be rejected due to consistent and nonsubtractive interferences in the spectra, which may indicate a different identification for that peak. The results should be changed to reflect the samples' CRDL, or show an elevated CRDL to the originally reported level.

17. Due to an error in reported final extract volume, the following semivolatile samples' detected and nondetected values should be reduced by a factor of four:
    LV750,100, LV800,100, and LV900,100DUP

18. The reported value for benzo(b)fluoranthene should be considered estimated due to integration algorithm in sample LV850,100. Additionally, the detection of acenaphthene in that sample should be rejected.

19. The semivolatile TIC#14 in sample LV0,100 should be rejected--no documentation for the component is present.

20. The reported nondetection of benzo(k)fluoranthene in sample LV50,200(608) should be edited to reflect a level equal to that of benzo(b)fluoranthene in the sample, but qualified as estimated. The detection was overlooked by the integration software.

21. The reported detection of anthracene in sample LV0,0(592), di-nibutylphthalate in LV0,150(592), and acenaphthene in LV100,50-RE(592) should be rejected as the spectra contain numerous interferences that subtraction did not remove, and identification is not conclusive.

22. The reported detections of n-nitrosodiphenylamine and di-n-butylphthalate in LV100,50(592), and 3,3'-dichlorobenzidine in NSB2-RE, should be rejected, and the sample CRDLs reported. These were rejected upon laboratory review, and were inadvertantly reported.

23. Aldol TICs (flagged "A") reported in semivolatile samples should not be considered as sample components. TIC #2 in sample LV250,0 0-1.0'(609) should be flagged as "A".

24. TIC#9 in the semivolatile analysis of sample LV630,60(609) should have a value of 360,000 ug/kg, not 36,000 ug/kg.

25. The moisture content of sample LV250,0 (0-1) was not incorporated into the semivolatile reported results. Consequently, all values and detection limits for the semivolatile results of this sample should be increased by a factor of 1.18.

26. The reported values for pyrene in sample NSB2 and pentachlorophenol in BSS-2 should be considered estimated as shown by the poor recoveries of those compounds in the sample matrix spikes (8% and 21% for pyrene, and 12% and 16% for pentachlorophenol).

27. Due to low IS recovery upon repeated analysis for the following samples, the reported semivolatile results and detection limits should be considered estimated:
NSB2 and NSB2-RE, NSB4W and NSB4W-RE, LV100,50(592) and LV100,50(592)-RE.

28. For the semivolatile results of sample LV0,150(592), the "RE" version should be used, but using the "-DL" values for those compounds which were "E" (above calibration range) in the "RE" analysis. In addition, the (chronological) last eight compounds should be considered estimated due to low internal standard recovery.

29. For the semivolatile results of samples LV300,50(592), LV300,150(592), and LV630,60, the compounds which are flagged "E" should utilize results from the "-DL" analyses.

30. The detected semivolatile values in LV50,50(592) should be considered estimated due to elevated internal standard recovery; reported detection limits are acceptable.

31. Due to the fact that the semivolatile container for LV0,0 was broken on receipt, losses of the more volatile and/or labile compounds of the semivolatile fraction may have been lost.

32. Sample LV-400,50 1:00 was reported with incorrect percent moisture values. The reported results and detection limits should be increased by a factor of 1.02.

VOLATILE ANALYSES

Holding times were met for sample processing. Please see the above discussion regarding low recovery of volatile internal standards. Other surrogate outliers in the initial analyses, which do not affect sample reported results are LV50,200(608), LV-250,100(608), LV-400,50 1:00 (608), BSS-2(609), LV250,0 0-1.0'(609) with d8-toluene recoveries of 140%, 140%, 143%, 142%, and 153% respectively (above the limit of 138%).

Sample matrix spikes were performed on samples LV250,50(592), LV0,200(608), and LV300,200(609). All recoveries, relative percent differences, and matrix spike blank recoveries were within recommended/required limits. All instrumental tune and method blank protocol requirements were met.

Initial and continuing calibration standards were within required criteria. The acetone linearity on instrument A (4/5/93) was poor, with lower concentrations producing elevated responses. The low level acetone results for this project are already rejected due to lab contribution.

The field and trip blank were run with soil parameters. Reported results are not affected.

The percent moisture reported for the volatile report form for the reanalysis of LV50,0(592) should be "23%", not 33%. The correct number was used in sample calculations.

SEMIVOLATILE ANALYSES

Holding times were met for sample processing. Surrogate standard recoveries met protocol requirements. All instrumental tune and method blank criteria were met.

Matrix spikes were performed on samples NSB2(592), LV0,150(608), and BSS-2(609). The recoveries on NSB2 and the matrix spike blanks met protocol limits. Outlying recovery values were observed for pyrene in LV0,150(608) and pentachlorophenol in BSS-2. These are discussed earlier in the text. The duplicate correlation values were good, with the exception of that for pyrene in LV0,150 (90 % RPD, above the recommended limit of 36% RPD).

It was observed upon validation that semivolatile quantitative values did not meet protocol. Communications (attached) with the laboratory clarified that internal standrad and calibration standard solutions are double the protocol-required strength. The net result is that there is no calibration standard run at the reported detection limits. The spectra of the samples in this project were reviewed, along with reported IDLs of the instruments, and it was determined that adequate sensitivity exists for unqualified reported detection limits of these samples.

Protocol requirements for initial and continuing calibration linearity and correlations were met, with the exception of the daily standards on system C for 5/4/93 and 5/12/93. The noncompliancies included unallowable exceedences in number of compounds and percent differences (40%D). Qualification is not recommended as a result.

The Forms 5 contained incorrect amount for m/z=441 for some tune files on the Finnegan system (ex. 4/28/93). Inspection of the raw data indicates compliant instrumental tunes.

The protocol requires screening of semivolatile samples to determine the proper extraction method. Sample LV630,60 should have been processed by medium level extraction.

METALS ANALYSES

Holding times were met for sample processing. All requirements of the 91 ASP methods were reviewed for compliance and quality.

As indicated earlier, numerous noncompliancies in the CLP protocol requirements were observed, many affecting sample reported results. The most serious concerns are those pertaining to the arsenic, lead, selenium, and thallium furnace procedures. Instances are present in the analytical sequences where continuing calibration standards (CCVs) failed (sometimes repeatedly) and were rerun until acceptable values were obtained, and sample analyses were then continued (ex. arsenic on 4/30/93 and 5/10/93; lead on 4/28/93 and 5/6/93, selenium on 4/29/93 and 5/10/93, and thallium on 4/29/93 and 5/7/93).

This is in direct violation of protocol requirements, which require recalibration in the event of standard failure.

In addition to the unacceptable CCVs, other noncompliancies in the furnace data include:

a) failure to run method of standard additions (MSA) when indicated to obtain accurate quantitative value (samples were continually run at increasing dilutions in order to obtain acceptable post-digest spike recoveries; protocol requires MSA be run when this type of matrix interference is evident).
b) incorrect initial calibration levels used (none at CRDL) for furnace runs
c) samples were not run at minimal dilution.
d) unacceptable timegaps in the analysis sequence, sometimes preceeded by and followed by failed standards
e) lead soil prep blank produced a response at CRDL, was reanalysed to be nondetection, but associated samples were not reanalysed.

Noncompliancies evident in the ICP analyses include:

a) iron and calcium determinations in some samples exceeded the linear range, but were not diluted and reanalysed;
b) elevated recovery for sodium in a CCV (5/11/93), at 111% (above the limit of 110%) should have resulted in recalibration;
c) recovery of manganese in the ICP Interference Check Sample was 77%, below the limit of 80%, and required corrective action
d) repeated analysis of CCV until acceptable one was run
e) the analysis sequence should have been concluded with close calibration standards and blanks
f) continuing calibration standards for numerous elements are not at required midrange.
g) absorbances of numerous elements in Interference Check Sample exceed calibration range.

Qualification of ICP data is not recommended in all cases of the above noncompliancies, as either the outlying values are just outside limits, or, in the case of linear range exceedences, additional elevated standard analyses indicated acceptable response.

Matrix spike/duplicate determinations for furnace elements and mercury were run on sample LV100,50 (592), LV0,150(608) and LV630,60(609). Matrix spike/duplicate determinations for ICP elements were performed on samples LV300,50 (592), LV400,50(608), and LV240,0,1-2 (609). In addition to the outlying values noted earlier (which were of significance to warrent qualification), the following values were also outside recommended limits of 75 to 125% recovery or exceeded 20% relative percent difference (or greater than +-CRDL):

SDG	Sample MS/DUP	Element	% Recovery Spike	%RPD Duplicate
592	LV300,50	Antimony	71%	
		Manganese		42 %RPD
		Vanadium		57
592	LV100,50	Mercury		32
608	LV-400,50	Copper	73	
		Silver	63	
		Zinc	60	
		Aluminum		24
		Calcium		22
	LV0,150	Arsenic		34
609	LV250,0	Antimony	73	
		Aluminum		34
		Cadmium		200
		Calcium		58
		Iron		53
		Manganese		50

Serial dilution analyses produced acceptable correlations, with the exception of aluminum in LV250,0 (609), which gave a value of 21% Difference, above the limit of 10% D.

Documentation was incomplete as regards the summary Forms 2A, 2B, and 3 which outline initial and continuing calibration standards, CRDL standards, and blanks results. In cases where more than one analytical sequence was used for a given element the forms were omitted or incomplete. No cover sheet for inorganics, containing the sample ID associations was included in the data package.

The mercury analysis date should read 4/30/93, rather than 4/04/93 for those processed that day.

COMPLIANCY CHART

Project:	Lehigh Valley Railroad Yard Site
SDG Nos:	Huntingdon Lab SDG Nos. 93-592, 93-608, 93-609
Protocol:	1991 NYSDEC ASP

RecDate	SDG No.	Sample ID	Matrix	VOA	BNA	Metals	Other	Noncompl
04-22-93	592	LV 0,0	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 0,50	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 0,100	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 0,150	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 50,0	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 50,50	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 100,50	Soil	OK	NO	NO	OK	1,3,4
04-22-93	592	LV 100,100	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 150,50	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 200,0	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 250,50	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 300,0	Soil	OK	NO	NR	OK	1
04-22-93	592	LV 300,50	Soil	OK	NO	NO	OK	1,3,4
04-22-93	592	LV 300,150	Soil	OK	NO	NR	OK	1
04-22-93	592	NSB 1E	Soil	OK	NO	NO	OK	1,4
04-22-93	592	NSB 2	Soil	OK	NO	NR	OK	1
04-22-93	592	NSB 3	Soil	OK	NO	NR	OK	1
04-22-93	592	NSB 4W	Soil	OK	NO	NR	OK	1
04-23-93	608	LV 0,50	Soil	OK	NO	NR	OK	1
04-23-93	608	LV 0,150	Soil	OK	NO	NO	OK	1,4,6
04-23-93	608	LV 0,200	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-50,100	Soil	OK	NO	NR	OK	1
04-23-93	608	LV 50,150,4:15	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-50,150,4:40	Soil	OK	NO	NR	OK	1
04-23-93	608	LV 50,200	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-100,50	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-150,100	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-200,100	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-250,50	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-250,100	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-300,50	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-300,50A	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-300,100	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-400,50,2:37	Soil	OK	NO	NR	OK	1
04-23-93	608	LV-400,50,1:00	Soil	OK	NO	NO	OK	1,2,4,6

04-23-93	609	BSS-1	Soil	OK	NO	NR	OK	1
04-23-93	609	BSS-2	Soil	OK	NO	NR	OK	1
04-23-93	609	LV-150,100 Dup	Soil	OK	NO	NR	OK	1
04-23-93	609	LV 200,150	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 250,0,0'-1.0'	Soil	OK	NO	NR	OK	1
04-23-93	609	LV 250,0,1.0'-2.0'	Soil	OK	NO	NO	OK	1,3,4,9
04-23-93	609	LV 250,300	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 250,300 Dup	Soil	OK	NO	NR	OK	1
04-23-93	609	LV 300,200	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 630,60	Soil	OK	NO	NO	OK	1,3,5,9,11
04-23-93	609	LV 700,100	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 750,100	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 800,100	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 850,100	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 900,100	Soil	OK	NO	NR	OK	1,11
04-23-93	609	LV 900,100 Dup	Soil	OK	NO	NR	OK	1,11
04-23-93	609	FLDBLK	Aqueous	NO	NR	NR	OK	8
04-23-93	609	TRPBLK	Aqueous	NO	NR	NR	OK	8

1. Furnace initial calibration did not include standard at CRDL.
   Samples were not processed at minimal dilution.
   Timegaps were present in furnace and ICP analysis sequences.
   No close CCV and CCB for ICP analyses.
   Elements in Int. Ck. Spls exceed calibration range.
   Semivolatile standards at incorrect concentrations.
2. ICP CCV with multiple failures-repeated until acceptable.
3. Iron and/or calcium exceed calibration range in sample.
4. MSA not performed where required.
5. Sample should have been screened for semivolatile extraction.
6. Managanese outside allowable limits in Interference Check Sample.
8. Aqueous volatiles samples run under soil conditions.
9. Sodium at elevated level in ICP CCV.
11. BNA calibration standard exceeds protocol requirements for % difference.

Data Validation Services
Cobble Creek Road P. O. Box 208
North Creek, N. Y. 12853
Phone 518-251-4429

TO: Integrated Environmental Systems

FROM: Judy Harry, Data Validation Services J. Harry

DATE: 6-30-93

RE: Validation of Lehigh Valley Railroad Yard Site data
Huntingdon Analytical Services Reference Number 93-0722

Review has been completed for data package generated by HAS pertaining to eight aqueous and one sediment sample collected at the Lehigh Valley Site. These samples were processed for the CLP target compound list volatiles, semivolatiles, and metals. A field blank was also analysed for volatile components. Six of the aqueous samples were also processed for Total Dissolved Solids, Total Suspended Solids, and Total Organic Carbon. Aqueous matrix spikes/duplicates were performed for the organics and metals analyses. Soil matrix spikes/duplicates were performed only on the organic analyses, and not the metals. Methodologies utilized were those of the 1991 NYSDEC ASP.

In summary, the organic analyses were performed in compliance with the protocol, and deliverables were acceptable for validation. Noncompliancies in the metals processing were observed, and those associated with the lead and selenium analyses were significant enough to warrent consideration of sample data as qualified estimated or unusable. These quality control concerns will be addressed below, as well as noted on the attached compliancy chart.

Edits to the reported sample results, and qualification of sample results as indicated by quality outliers are as follow:

1. Sample SED-1 produced depressed response for volatile internal standards upon repeated analysis, indicating matrix effect. Consequently, the following volatile compound reported values and detection limits in SED-1 should be considered estimated:
   4-methyl-2-pentanone, 2-hexanone, tetrachloroethene, 1,1,2,2-tetrachloroethane, toluene, chlorobenzene, ethylbenzene, styrene, and total xylenes

   Due to (compliant) elevated response of 2-butanone in the daily calibration standard, the reported value of that compound in SED-1 should be considered estimated.

   Due to the detected levels of methylene chloride in the associated method blank, the reported value for that compound in SED-1 should be nondetection at an elevated detection limit of 39 mg/kg.

   Due to the detected levels of acetone in the associated method blank, the reported value for that compound in SED-1 should be considered estimated.

2. The volatile analyses for sample MW-1 included a dilution run to bring the chloroform response within accuracy range. When considering sample levels, the first (undiluted) analysis results should be used for all compounds except chloroform. The dilution chloroform result should be used. In addition, the acetone value of the undiluted run should be considered estimated due to elevated response in that concentration range of the calibration curve.

3. Due to unresolved extraneous mass fragment responses evident in the spectra of the following compounds, their identification should be considered tentative (flagged "N"): dibenzofuran in MW-1 and naphthalene in MW-2

4. The percent solids value documented in the package and used for dry weight values for the volatile and metals results of SED-1 is 33%. The value used for the semivolatile results is 23%; no documentation is provided. The semivolatile results for SED-1 based upon a 33% solids value would be a lowering of reported detection limits and detected values by a factor of 0.70.

5. Due to the detected levels of bis(2-ethylhexyl)phthalate in the associated method blank, the reported value for that compound in SWS-1 should be nondetection at the CRDL of 10 ug/L.

6. The semivolatile TICs reported with the qualifier of "A", including TIC #1 in SED-1, (which should have been flagged as "A" upon reporting), should not be considered as sample components, but as laboratory procedure artifacts.

7. The serial dilution of aluminum in SED-1 produced an outlying value (above 10%D) of 12.4%D, and the aluminum value should be flagged "E" for SED-1. No matrix spike or duplicate evaluation was made for this sediment matrix (exception of mercury), and consequently the effect of matrix on the reported results cannot be determined.

8. The field duplicate of MW-3 produced sufficient variance from MW-3 in results for iron, manganese, zinc, and aluminum as to indicate a consideration of these elemental values as estimated. Iron laboratory duplicate correlation (51% RPD) and the aqueous serial dilution result for aluminum (39% D) also indicate those qualifications.

9. Lead analyses contained numerous procedural concerns (detailed later in this text) which warrent the following considerations:
   Reported values for MW-1, MW-2, GW-4, and SWS-1 are rejected due to:
   a) initial analysis of preparation blank produced a value of 3.6 ug/L (above CRDL)
   b) associated CRA (standard at CRDL) rerun continually with consistent no or poor recovery
   Reported value for GW-5 considered estimated due to no or poor recovery for CRA.
   Reported values for MW-3 and MW-3 DUP considered estimated due to poor field duplicate correlation
   Reported value for SED-1 considered estimated due to analysis following repeated standard failure and analysis time gap.

10. All aqueous selenium reported values and detection limits are considered estimated due to (unreported) failure of the laboratory control sample (LCSW) on repeated analyses. In addition, the samples are processed with associated (unreported) failed calibration standards.

11. Selenium result for SED-1 should be considered estimated due to associated (unreported) outlying calibration standards, and due to the indicated matrix effect shown by a low (51%) post-digest spike recovery. This compound should have been flagged as "W" on the report Form 1.

Other quality issues are discussed below:

VOLATILE ANALYSES

Holding times were met for sample processing. Surrogate recoveries of the samples, and method blank and instrumental tune requirements were all within protocol limits.

The matrix spikes of GW-4 and SED-1, and the aqueous and soil matrix spike blanks produced all recoveries within recommended/required ranges. The duplicate correlation of the soil matrix spikes were very good. An outlying duplicate correlation value of 20% Relative Percent Difference (RPD), above the recommended limit of 14% RPD was observed for the aqueous 1,1-dichloroethene matrix spikes. The matrix spike of GW-4 produced a slightly elevated recovery for surrogate standard d4-dichloroethane (115%; above 114% limit). Results are not affected.

Calibration standards met all required criteria. Internal standard areas and retention times were acceptable, with the above-mentioned exception of the third internal standard response in SED-1.

SEMIVOLATILE ANALYSES

As noted in the case narrative, the initial extraction of several samples failed, and reextractions were performed 6 days from sample receipt. No qualification of reported results is recommended as a result of this extension of holding time, as sample receipt followed collection by one day.

Surrogate recoveries, method blanks, and instrumental tunes were all within protocol requirements. The matrix spikes of MW-1 produced slightly elevated recoveries for 2,4-dinitrotoluene and 4-nitrophenol, but all were reasonable values for the continuous extractor methodologies (protocol limits are based upon separator funnel methodology). The aqueous duplicate correlation values were good.

The matrix spikes of SED-1 produced slightly elevated recoveries for four compounds; the duplicate correlation of the soil matrix spikes were poor for the base/neutral compounds, with relative percent differences of 39 to 75%. These variances are also evident in the surrogate recoveries of the two soil matrix spikes, indicating possible differences in extract volume, internal standard spike addition, and/or extraction partitioning. Aqueous and soil matrix spike blank values were within required limits (phenol was incorrectly flagged as outside limits on the Form 3 for soil matrix spike blank).

Calibration standards met all required criteria. Internal standard areas and retention times were acceptable.

METALS ANALYSES

Holding times were met for sample processing. All requirements of the 91 ASP methods were reviewed for compliance and quality.

As indicated earlier, numerous noncompliancies in the CLP protocol requirements were observed, many affecting sample reported results. The most serious concerns are those pertaining to the arsenic, lead, and selenium furnace procedures. Instances are present in the analytical sequences where continuing calibration standards (CCVs) failed (sometimes repeatedly), and were rerun until acceptable values were obtained, and sample analyses were then continued (ex. lead and arsenic in 6/02/93 sequences and selenium in

6/07/93 sequence). This is in direct violation of protocol requirements, which require recalibration in the event of standard failure. Copies of the protocol pages which specify these requirements are attached to this text.

In addition to the unacceptable CCVs, other noncompliancies in the furnace data include:

a) rerunning the LCSW for selenium over and over until acceptable value was obtained
b) incorrect initial calibration levels used (none at CRDL) for furnace runs
c) gaps of up to 16 hours in the analysis sequence, sometimes preceeded by and followed by failed standards (ex. selenium on 6/07/93 to 6/08/93, and lead on 6/02/93)
d) arsenic soil prep blank produced unacceptable burn correlation the first time, and was reanalysed in a noncompliant sequence at the end of the run;

Noncompliancies evident in the ICP analyses include:

a) elevated recovery for potassium in the ICV (raw data for this standard was omitted from the package) at 111% (above the limit of 110%) should have resulted in recalibration;
b) elevated recovery of cadmium in the LCSW (121%; above the limit of 120%) should have resulted in redigestion and reanalysis of aqueous samples;
c) the ICB did not immediately follow the ICV;
d) failure of sodium recovery in the original CCV2 was not followed by recalibration, but rather by reanalysis of standard to obtain good value
e) the analysis sequence should have been concluded with close calibration standards and blanks
f) continuing calibration standards for numerous elements are not at required midrange.
Qualification of ICP data is not recommended due to the above noncompliancies, as the outlying values are just outside limits.

Documentation was incomplete as regards the summary Forms 2A, 2B, and 3 which outline initial and continuing calibration standards, CRDL standards, and blanks results. In cases where more than one analytical sequence was used for a given element (arsenic, lead, selenium, thallium, and mercury), the forms were omitted or incomplete. No cover sheet for inorganics, containing the sample ID associations and required verbatim statement was included in the data package.

WET CHEMISTRY ANALYSES

TSS, TDS, and TOC results were reviewed for compliance, calculation algorithm, standard acceptability, and transcription. Reported values are substantiated by the raw data.

COMPLIANCY CHART

Project: Lehigh Valley Railroad Yard

SDG Nos: Huntingdon Analytical Services Reference No.93-0722

Protocol: 1991 NYSDEC ASP

RecDate	Sample ID	Matrix	VOA	BNA	Metals	Other	Noncompl
05-13-93	MW-1	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	MW-2	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	MW-3	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	GW-4	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	GW-5	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	TF-1	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	SWS-1	Aqueous	OK	OK	NO	OK	1,2,3
05-13-93	MW-3 Dup	Aqueous	OK	OK	NO	OK	1,2,3
05-14-93	SED-1	Soil	OK	OK	NO	OK	1,3,4,5
05-13-93	FB-1	Aqueous	OK	NR	NR	NR	

1. ICV for potassium with outlying recovery (1991 NYSDEC ASP pg. E-131)
   ICB did not follow ICV (pg. E-134)
   Furnace initial calibration do not have standard at CRDL (pg. E-131)
   Sodium with outlying recovery in CCV2; system not recalibrated (pg. E-131)
   ICP sequence did not close with CCV and CCB (pg. E-134)
   CCV levels not at midrange for most elements (pg. E-132)

2. Cadmium recovery in LCSW outside allowable limits-no action taken (pg. E-140-141)
   Sodium recovery in LCSW outside allowable limits-unacceptable action taken (pg. E-129, E-140-141).

3. Arsenic and/or lead and/or selenium with CCV failure and not recalibrated (pg. E-129 and E-131).
   Lead and/or selenium analysis sequences contained time gaps not followed by recalibration (pg. E-130 and 132).

4. Arsenic soil preparation blank analytical spike failed duplicate burn correlation; repeated later in noncompliant sequence (pg. E-129 and E-143).

5. No soil matrix spikes were performed for this project (pg. E-136).

including Performance Evaluation samples, received from an external source, but it also includes all required QA/QC samples (matrix spikes, analytical/post-digestion spikes, duplicates, serial dilutions, LCS, ICS, CRDL standards, preparation blanks and linear range analyses) except those directly related to instrument calibration or calibration verification (calibration standards, ICV/ICB, CCV/CCB). A "frequency of 10%" means once every 10 analytical samples. **NOTE**: Calibration verification samples (ICV/CCV) and calibration verivication blanks (ICB/CCB) are not counted as analytical samples when determining 10% frequency.

In order for the QA/QC information to reflect the status of the samples analyzed, all samples and their QA/QC analysis must be analyzed under the same operating and procedural conditions.

If any QC measurement fails to meet contract criteria, the analytical measurement may not be repeated prior to taking the appropriate corrective action as specified in Exhibit E.

The Laboratory must report all QC data in the exact format specified in Exhibits B and H.

Sensitivity, instrumental detection limits (IDL's), precision, linear dynamic range and interference effects must be established for each analyte on a particular instrument. All reported measurements must be within the instrumental linear ranges. The analyst must maintain quality control data confirming instrument performance and analytical results. In addition, the Laboratory shall establish a quality assurance program with the objective of providing sound analytical chemical measurements. This program shall incorporate the quality control procedures, any necessary corrective action, and all documentation required during data collection as well as the quality assessment measures performed by management to ensure acceptable data production. As evidence of such a program, the Laboratory shall prepare a written Quality Assurance Plan (QAPP) (see Section III) which describes the procedures that are implemented to achieve the following:

Maintain data integrity, validity, and useability.

Ensure that analytical measurement systems are maintained in an acceptable state of stability and reproducibility.

Detect problems through data assessment and establishes corrective action procedures which keep the analytical process reliable.

Document all aspects of the measurement process in order to provide data which are technically sound and legally defensible.

This section outlines the minimum QA/QC operations necessary to satisfy the analytical requirements of the protocol. The following QA/QC operations must be performed as described in this Exhibit.

1. Instrument Calibration
2. Initial Calibration Verification (ICV) and Continuing Calibration Verification (CCV)
3. CRDL Standards for AA (CRA) and ICP (CRI)
4. Initial Calibration Blank (ICB), Continuing Calibration Blank (CCB), and Preparation Blank (PB) Analyses.
5. ICP Interference Check Sample (ICS) Analyses
6. Spike Sample Analysis (S)
7. Duplicate Sample Analysis (D)
8. Laboratory Control Sample (LCS) Analysis
9. ICP Serial Dilution Analysis (L)
10. Instrument Detection Limit (IDL) Determination
11. Interelement Corrections for ICP (ICP)
12. Linear Range Analysis (LRA)
13. Furnance AA QC Analyses

1. Instrument Calibration

Guidelines for instrumental calibration are given in EPA 600/4-79-020 and/or Exhibit D, Part V. Instruments must be calibrated daily or once every 24 hours, and each time the instrument is set up. The instrument standardization date and time must be included in the raw data.

For atomic absorption systems, calibration standards are prepared by diluting the stock metal solutions at the time of analysis. Date and time of preparation and analysis must be given in the raw data.

Calibration standards must be prepared fresh each time an analysis is to be made and discarded after use. Prepare a blank and at least three calibration standards in graduated amounts in the appropriate range. One atomic absorption calibration standard must be at the CRDL except for mercury. The calibration standards must be prepared using the same type of acid or combination of acids and at the same concentration as will result in the samples following sample preparation.

Beginning with the blank, aspirate or inject the standards and record the readings. If the AA instrument configuration prevents the required 4-point calibration, calibrate according to instrument manufacturer's recommendations, and analyze the remaining required standards immediately after calibration. Results for these standards must be within ±5% of the true value. Each standards concentration and the calculations to show that ±5% criterion has been met, must be given in the raw data. If the values do not fall within this range, recalibration is necessary.

The ±5% criteria does not apply to the atomic absorption calibration standard at the CRDL.

Calibration standards for AA procedures must be prepared as described in Exhibit D, Part V.

Baseline correction is acceptable as long as it is performed after every sample or after the continuing calibration verification check. For cyanide and mercury, follow the calibration procedures outlined in Exhibit D, Part V. One cyanide calibration standard must be at the CRDL. For ICP systems, calibrate the instrument according to instrument manufacturer's recommended procedures. At least two standards must be used for ICP calibration. One of the standards must be a blank.

2. Initial Calibration Verification (ICV) and Continuing Calibration Verification (CCV)

2.1 Initial Calibration Verification (ICV)

Immediately after each of the ICP, AA and cyanide systems have been calibrated, the accuracy of the initial calibration shall be verified and documented for every analyte by the analysis of EPA Initial Calibration Verification Solution(s) at each wavelength used for analysis. When measurements exceed the control limits of Table 1 - Initial and Continuing Calibration Verification Control Limits for Inorganic Analyses, the analysis must be terminated, the problem corrected, the instrument recalibrated, and the calibration reverified.

If the Initial Calibration Verification Solution(s) are not available from EPA, or where a certified solution of an analyte is not available from any source, analyses shall be conducted on an independent standard at a concentration other than that used for instrument calibration, but within the calibration range.

An independent standard is defined as a standard composed of the analytes from a different source than those used in the standards for the instrument calibration.

For ICP, the Initial Calibration Verification Solution(s) must be run at each wavelength used for analysis. For CN, the initial calibration verification standard must be distilled. The Initial Calibration Verification for CN serves as a Laboratory Control Sample; thus it must be distilled with the batch of samples analyzed in association with that ICV. This means that an ICV must be distilled with each batch of samples analyzed and that the samples distilled with an ICV must be analyzed with that particular ICV. The values for the initial and subsequent continuing calibration verifications shall be recorded on FORM II-IN for ICP, AA, and cyanide analyses, as indicated.

2.2 Continuing Calibration Verification (CCV)

To ensure calibration accuracy during each analysis run, one of the following standards is to be used for continuing calibration verification and must be analyzed and reported for every wavelength used for the analysis of each analyte, at a frequency of 10% or every 2 hours during an analysis run, whichever is more frequent. The standard must also be analyzed for every wavelength used for analysis at the beginning of the run and after the last analytical sample. The analyte concentrations in the continuing calibration standard must be one of the following solutions at or near the mid-range levels of the calibration curve:

1. EPA Solutions

2. NBS SRM 1643a

3. A laboratory-prepared standard solution

Table 1.
INITIAL AND CONTINUING CALIBRATION VERIFICATION CONTROL LIMITS FOR INORGANIC ANALYSES

Analytical Method	Inorganic Species	% of True Value (EPA Set) Low Limit	High Limit
ICP/AA	Metals	90	110
Cold Vapor AA	Mercury	80	120
Other	Cyanide	85	115

The same continuing calibration standard must be used throughout the analysis runs for each Sample Delivery Group of samples received.

Each CCV analyzed must reflect the conditions of analysis of all associated analytical samples (the preceding 10 analytical samples or the preceding analytical samples up to the previous CCV). The duration of analysis, rinses and other related operations that may affect the CCV measured result may not be applied to the CCV to a greater extent than the extent applied to the associated analytical samples. For instance, the difference in time between a CCV analysis and the blank immediately following it as well as the difference in time between the CCV and the analytical sample immediately preceding it may not exceed the lowest difference in time between any two consecutive analytical samples associated with the CCV.

If the deviation of the continuing calibration verification is greater than the control limits specified in Table 1 - Initial and Continuing Calibration Verification Control Limits for Inorganic Analyses, the analysis must be stopped, the problem corrected, the instrument must be recalibrated, the calibration verified and the reanalysis of the preceding 10 analytical samples or all analytical samples analyzed since the last good calibration verification must be performed for the analytes affected. Information regarding the continuing verification of calibration shall be recorded on FORM II-IN for ICP, AA and cyanide as indicated.

3. CRDL Standards for ICP (CRI) and AA (CRA)

To verify the linearity near the CRDL for ICP analysis, the Laboratory must analyze an ICP standard (CRI) at two times the CRDL or two times the IDL, whichever is greater, at the beginning and end of each sample analysis run, or a minimum of twice per 8 hour working shift, whichever is more frequent, but not before Initial Calibration Verification. This standard must be run by ICP for every wavelength used for analysis, except those for Al, Ba, Ca, Fe, Mg, Na and K.

To verify linearity near the CRDL for AA Analysis, the Laboratory must analyze an AA standard (CRA) at the CRDL or the IDL, whichever is greater, at the beginning of each sample analysis run, but not before the Initial Calibration Verification.

Specific acceptance criteria for the two standards will be set by NYSDEC in the future. In the interim, the Laboratory must analyze and report these Standards on FORM II (PART 2)-IN.

4. Initial Calibration Blank (ICB), Continuing Calibration Blank (CCB), and Preparation Blank (PB) Analyses

4.1 Initial Calibration Blank (ICB) and Continuing Calibration Blank (CCB) Analyses

A calibration blank must be analyzed at each wavelength used for analysis immediately after every initial and continuing calibration verification, at a frequency of 10% or every 2 hours during the run, whichever is more frequent. The blank must be analyzed at the beginning of the run and after the last analytical sample. NOTE: A CCB must be run after the last CCV that was run after the last analytical sample of the run. The results for the calibration blanks shall be recorded on FORM III-IN for ICP, AA and cyanide analyses, as indicated. If the magnitude (absolute value) of the calibration blank results exceeds the IDL, the result must be so reported in µg/L on FORM III-IN, otherwise report as IDL-U. If the absolute value blank result exceeds the CRDL (Exhibit C), terminate analysis, correct the problem, recalibrate and reanalyze the preceding 10 analytical samples or all analytical samples analyzed since the last good calibration blank.

4.2 Preparation Blank (PB) Analysis

At least one preparation blank (or reagent blank), consisting of deionized, distilled water processed through each sample preparation and analysis procedure (See Exhibit D, Part V), must be prepared and analyzed with every Sample Delivery Group, or with each batch[1] of samples digested, whichever is more frequent.

The first batch of samples in an SDG is to be assigned to preparation blank one, the second batch of samples to preparation blank two, etc. (see FORM III-IN). Each data package must contain the results of all the preparation blank analyses associated with the samples in that SDG.

This blank is to be reported for each SDG and used in all analyses to ascertain whether sample concentrations reflect contamination in the following manner:

1) If the absolute value of the concentration of the blank is less than or equal to the Contract Required Detection Limit (Exhibit C), no corrective action is required.

2) If any analyte concentration in the blank is above the CRDL, the lowest concentration of that analyte in the associated samples must be 10x the blank concentration. Otherwise, all samples associated with the blank with the analyte's concentration less than 10x the blank concentration and above the CRDL, must be redigested and reanalyzed for that analyte (except for an

CASE NARRATIVE

Client: IES/NES

HAS Reference Number: 93-0722

Project Reference: Lehigh Valley Railroad

General:

This data package consists of samples that arrived at this facility on 5/14/93. All analyses conform to NYS-ASP protocol, with any exceptions noted below.

Volatiles:

A second method blank (VBLKW2) was analyzed on 5/17/93 after sample MW-1 due to. chloroform exceeding the upper limit of the calibration. Since this is a carryover check, no Form IV is included for this blank.

The recovery of internal standard #3 for sample SED1 was <50%. Since similar recoveries were obtained in the MS and MSD no reanalysis was performed.

Semi-Volatiles

Samples MW-3, GW-4, GW-5, TF1, SWS-1, MW-3Dup were originally extracted by continuous liquid liquid extractions on 5/19/93. Due to a prep lab error, the cooling water for the continuous liquid liquid extractor was not turned on. This resulted in the sample extracts drying up. The samples were then reextracted on 5/20/93, day past the five day holding time from the validated time of sample receipt, which was 5/14/93. However, it is within the 10 day holding time for reextraction.

Due to software limitations, the soil blank spike acceptance limits are hand written on the blank spike form.

Metals:

The serial dilutions for aluminum, manganese and sodium were outside of the acceptable limits. This indicates the presence of interferences in the sample. Therefore, the data associated with these analytes should be viewed with caution.

Iron duplicated poorly. Although the sample was well mixed when it was digested, the sediment in this sample may have contained particles with varying amounts of iron.

Two calibrations were run for selenium. On the second run, no CCV was run immediately following the CRA. The only data affected is LCSW. Since this standard read 10.7 (True Value = 10.0) and had excellent post-spike recovery (103.8%), it is believed that the data for this run will in no way be compromised by the omission of this CCV. All other QC samples in this run were well within acceptable limits.

The mercury data for the soil sample was accepted even though the final CCV was low. A sample not associated with these samples was run which caused massive suppression of the mercury signal for a considerable time. This sample had been run before and this result was expected. It is believed that the data for the mercury on this soil sample is valid and accurate and was in no way affected by this unrelated sample.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

AP. Clifton 6/4/93

Andrew P. Clifton Date
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