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Howard Needles Tammen and Bergendoff

REPORT

## Phase II Assessment

Lake Arterial Project  
Milwaukee, Wisconsin

STS Consultants Ltd  
Consulting Engineers



April 24, 1991

Mr. William Olson  
Howard, Needles, Tammen & Bergendoff  
One Park Plaza, Suite 600  
11270 West Park Place  
Milwaukee, WI 53224

RE: Phase II Environmental Assessment for the Lake Arterial Project in Milwaukee,  
Wisconsin -- STS Project No. 83417XF

Dear Mr. Olson:

STS Consultants, Ltd. is please to present the Report for the Phase II Investigation of  
the Lake Arterial Project.

We appreciate this opportunity to provide engineering and testing services for you. If  
you have any questions with regard to the report, or if we can be of further assistance  
in any way, please feel free to contact us.

Respectfully,

STS CONSULTANTS, LTD.

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# Report

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## PROJECT

PHASE II ENVIRONMENTAL ASSESSMENT  
FOR THE LAKE ARTERIAL PROJECT  
MILWAUKEE, WISCONSIN

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## CLIENT

MR. WILLIAM OLSON  
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*Project No.*

83417XF

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*Date*

APRIL 24, 1991

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## TABLE OF CONTENTS

### **1.0 PROJECT OVERVIEW**

- 1.1 Project Description
- 1.2 Background
- 1.3 Scope of Work
- 1.4 Report Organization

### **2.0 PROCEDURES**

- 2.1 Subsurface Exploration Program
- 2.2 Soil Testing Program
- 2.3 Water Sampling and Testing Program

### **3.0 RESULTS AND INTERPRETATION**

- 3.1 Regional Geology
- 3.2 Hydrogeologic Conditions
- 3.3 Data Assessment

### **4.0 CONCLUSIONS AND RECOMMENDATIONS**

- 4.1 General Qualifications

**APPENDIX** (separate cover)

## APPENDIX

### **1.0 STANDARD PROCEDURES**

- STS Changed Conditions Clause
- STS Field and Laboratory Procedures
  - Subsurface Exploration Procedures
  - Laboratory Procedures
- ASTM Specifications D-1586
- ASTM Specifications D-1587
- STS Soil Classification System
- STS General Notes
- STS Standard Boring Log Procedures
- Soil Screening Procedures
- VOC Parameters
- Summary of Test Procedures
- Landfill Panel

### **2.0 BORING LOGS**

### **3.0 MONITORING WELL CONSTRUCTION DETAILS**

### **4.0 ANALYTICAL TEST RESULTS**

**PHASE II ENVIRONMENTAL ASSESSMENT  
FOR THE LAKE ARTERIAL PROJECT  
MILWAUKEE COUNTY, WISCONSIN**

**1.0 PROJECT OVERVIEW**

**1.1 Project Description**

The State of Wisconsin Department of Transportation (WDOT) is planning a 4 lane divided highway to connect the southern terminus of the Hoan bridge (I-794) in the City of Milwaukee to south Pennsylvania and east Layton Avenue in the City of Cudahy. The approximately 3 mile length of this project is proposed to follow the existing Chicago and North Western Railroad right-of-way. This railroad right-of-way is present to the west of the Hoan bridge and runs in a generally north-south alignment in the cities of Milwaukee, St. Francis and Cudahy. The railroad right-of-way is relatively level and rises in elevation from the Hoan bridge south to Layton Avenue at an average 0.5 percent grade. Hills have been cut and depressions filled to create the relatively level alignment. The right-of-way passes through residential neighborhoods and a few older industrial areas. Undeveloped areas are also present along the tracks.

The WDOT will be acquiring the railroad alignment and portions of adjacent properties as necessary in order to construct the Lake Arterial. As a part of the planning and design process, the WDOT has required an environmental assessment of the entire proposed right-of-way. STS Consultants Ltd., was retained by Howard, Needles, Tammen and Bergendoff (HNTB), the project designer, to complete a Phase I and subsequent Phase II Environmental Assessment for the project. This report defines the work performed by STS to complete the Phase II Environmental Assessment including details of the procedures, results and conclusions of the investigation.

## 1.2 Background

The Phase I Environmental Reconnaissance was completed by STS Consultants in December 1989 (STS Project No. 83240XF) for the Lake Arterial project. The Phase I assessment included a visual review of the property, historical search of property use and ownership, conclusions which defined potential areas of environmental contamination along with recommendations for additional studies to confirm or deny the presence of environmental impairment. The Phase I report prepared by STS identified 24 areas, on and adjacent to the proposed right-of-way, which could contribute to environmental impairment of the project. The environmental issues which are critical to the planning and development of this highway construction project are:

1. Excavation activities during construction which may encounter contaminated soils needing special handling or disposal.
2. Contaminated groundwater which may be encountered which may require special permits before discharge to storm or sanitary sewers.
3. Contaminated properties which may be acquired by the governmental body funding the project resulting in ownership of the contamination.

These issues have been known to cause construction delays and impact the total cost of projects. Discussions between the WDOT, HNTB and STS eliminated 7 (seven) of the properties identified in the Phase I report from further investigation due to apparent limited impacts on construction. Seventeen (17) of the original sites were therefore defined for continued review. The following paragraphs discuss the 17 Areas (properties) where additional studies were performed in the Phase II work scope as previously defined in the Phase I study.

Area 1: Municipal Landfill

The property at the southwest corner of south Pennsylvania and east Layton Avenue in the City of Cudahy historically has been a dump site for the Town of Lake, City of Milwaukee and the City of Cudahy. Planning for the Lake Arterial indicated the property would be used for a Park and Ride Lot with the southern end of the project beginning at this point. Materials disposed on this property could include solid or liquid wastes some of which may be considered hazardous resulting in soil and groundwater contamination which may be difficult and costly to remediate.

Area 2: Miscellaneous Dump Site

Surface fill material, consisting of concrete rubble, foundry sand and miscellaneous debris, was apparent. This site was within the proposed construction zone and could potentially contain substances which could possibly leach metals or solvents.

Area 6: EZ Paintr

Parking lot runoff from the EZ Paintr property was identified in the Phase I review. The runoff flowed to the west side of the railroad track and was piped under the tracks to the east side where the water discharged to open storm water drainage ditches. This runoff, a potential source of impacts to proposed ROW, could contain oils or paint solvents which may impact either soil or groundwater quality within the ROW.

Area 7: Miscellaneous Dump

The northwest corner of Norwich Avenue and the railroad right-of-way was identified through historical research as a possible gravel borrow area and subsequent fill site. No immediate knowledge of material disposed was encountered in the historical literature. However, evidence of similar fill sites in the area suggested the potential for heavy metals, oils or solvents to be present on-site.



Area 8: Miscellaneous Dump

Surficial fill materials observed during the Phase I walkover indicated possible presence of foundry sand, rubble and miscellaneous materials on this property at the northeast corner of Norwich Avenue and the railroad right-of-way. These solid waste materials could contain heavy metals, oils or solvents in sufficient quantities which may affect the cost of construction through additional cleanup and disposal costs.

Area 9: Foundry Fill Dump

The southeast corner of Norwich Avenue and the railroad right-of-way contained foundry sand fill heavily overgrown with trees and other ground cover. Foundry sand may contain heavy metals, oils or solvents which may classify this solid waste as a hazardous waste.

Area 10: Auto Wreckers

The St. Francis Auto Wreckers salvage yard at 4043 S. Pennsylvania Avenue has been in business at this location for many years. The primary business of this facility is the sale of used auto parts. The surface of the property is black and oil soaked probably from a combination of spreading drain oil for dust control and draining of crankcase oil on the ground. The potential for soil and groundwater contamination exists due to oil and gasoline spills and solvent spillage from parts cleaning.

Area 12: Railroad Bridge

The old railroad bridge south of Norwich Avenue over the proposed highway right-of-way included construction materials suspected of containing asbestos. Asbestos containing materials require removal and proper disposal prior to demolition.

Area 15: Tunnel Section

An open cut excavation approximately 25 feet deep was proposed to carry the Lake

Assessment consisted of a program of soil and groundwater sampling, laboratory analysis for substances of concern and, conclusions and recommendations concerning substances identified. This work scope was refined in discussions with representatives of HNTB and WDOT and consisted of the following:

- Data Acquisition and Reduction - This portion of the work scope involved the collection of soil and groundwater samples for characterization and laboratory analytical testing. The components included:
  - Completion of 82 soil borings to depths varying from 5 to 25 feet and 8 test pits to depths of 5 to 12 feet.
  - Installation of groundwater monitoring wells.
  - Analytical testing of soil and groundwater samples.
  - Preparation of tabular summaries of field and laboratory data.
  - Completion of a final report with recommendations for remediation activities.
  
- Data Interpretation and Reporting - The laboratory data was compared to applicable standards and current regulatory guidelines commonly used to assess contaminated soil and groundwater. The need for remediation was established where sufficient data had been accumulated. In those cases where remediation appeared necessary, concepts for cleanup were developed. Where the current data base was considered incomplete, recommendations for additional investigation were proposed.

This report presents the results of the investigation program and the conclusions which have been developed regarding the environmental conditions in the specific areas of the project. In addition, recommendations for remediation are also provided for the areas found to be significantly impacted.

The WDOT and HNTB were advised of the findings of the investigation as well as the conclusion and recommendations in a meeting on August 23, 1990. At that time, STS was notified of several changes to the right-of-way alignment and of a request from WDOT for

additional work. Four properties required additional borings due to this change in alignment. These properties included Sijan Playfield, Ellen Playfield, the vacant property at the northwest corner of Norwich Avenue and the C&NW R.O.W. (2210 E. Norwich), and the Auto Wreckers salvage yard. This additional work scope involved borings, monitoring wells and laboratory analysis. The results of this expanded work scope are included in the general text of this report.

#### 1.4 Report Organization

The purpose of this report is to present the data accumulated during the Phase II investigations in an orderly and readable format. In order to accomplish this task, the organization of this report has been structured to present recurring data and standard procedures once. The specific findings of each property investigated are presented individually while back up data is found in the Appendix.

Section 1.0 Project Overview: summarizes the background information, project objectives and workscope performed for this project.

Section 2.0 Procedures: defines and lists the means and methods to collect valid data concerning the individual Areas investigated.

Section 3.0 Results and Interpretation: presents specific data concerning each Area investigated. The locations are numbered according to the system used in the Phase I report for this project prepared by STS. Because all of the original Areas identified the Phase I were not investigated in the Phase II work scope, some Area numbers are not included in this report.

Section 4.0 Conclusions and Recommendations: summarizes the Areas where significant problems with hazardous substances were encountered. Recommendations are presented for additional work, remedial actions and cost estimates.

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STS Project No. 83417XF  
April 24, 1991

The Appendix includes all supporting documentation including analytical data, boring logs, monitoring well construction diagrams and details of standard procedures used in the investigation.

## 2.0 PROCEDURES

### 2.1 Subsurface Exploration Program

2.1.1 Soil Borings - A total of 82 soil borings were drilled for this investigation with a truck mounted drilling rig and continuous flight, hollow-stem augers. The borings were completed to depths varying from 7 to 25 feet to acquire soil samples and to determine the soil profile. At seventeen (17) of the locations, the boreholes were converted to groundwater monitoring wells.

Eight (8) test pit excavations were also performed at Area I, the southwest corner of Layton and Pennsylvania Avenues, for the purpose of collecting appropriate samples of fill materials at this location and to classify the fill material present. The test pits were dug with a track mounted backhoe to depths which varied with the depth of the fill material encountered. These test pits ranged from 5 to 12 feet in depth which was the limit of fill material at each location. The test pit excavations were halted when natural soils were encountered. The test pits were refilled with the excavated materials to a level and grade consistent with the adjacent topography. The locations of all the borings are illustrated on the Soil Boring Location Diagram (Figure 1A, 1B, 1C) included in this section of the report. A summary of the borings is presented in Table 1 by Area and illustrated on the individual Area diagrams included in the Results section of this report.

**TABLE 1**  
**Soil Borings by Area Location**

<u>Location</u>	<u>Area</u>	<u>Borings/ Test Pits</u>
Southwest corner of Layton and Pennsylvania Avenues	1	BW1, B1B, B2B, B3, BW3B, B4, BW5, TP1 through TP8
East side of right-of-way south of Whitnall Avenue	2	B6, B7
Adjacent to EZ Paints	6	B8
Northwest corner of Norwich Avenue and railroad right-of-way (2210 E. Norwich)	7	B9, B9A
Northeast corner of Norwich Avenue and railroad right-of-way (2314 E. Norwich)	8	B10, B11
Southeast corner of Norwich Avenue and railroad right-of-way	9	B12, HA12
St. Francis Auto Wreckers (4043 S. Pennsylvania)	10	BW13, B14, BW13A, B13 (B,C,D,E)
Old railroad bridge south of Norwich Avenue	12	Asbestos sample
Tunnel section at St. Francis Avenue	15	BW15, BW15A, BW15B, BW15C
Ellen Playfield	17	EP1, EP2
Railroad right-of-way adjacent to Milwaukee Forge north of Oklahoma Avenue	18	B16, BW17, B18, BW19, BW20, B21
Sijan Playfield south of Kinnickinnic Avenue	19	B22 (A,B,C), BW22, BW23, B23 (A,B,C)

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STS Project No. 83417XF  
April 24, 1991

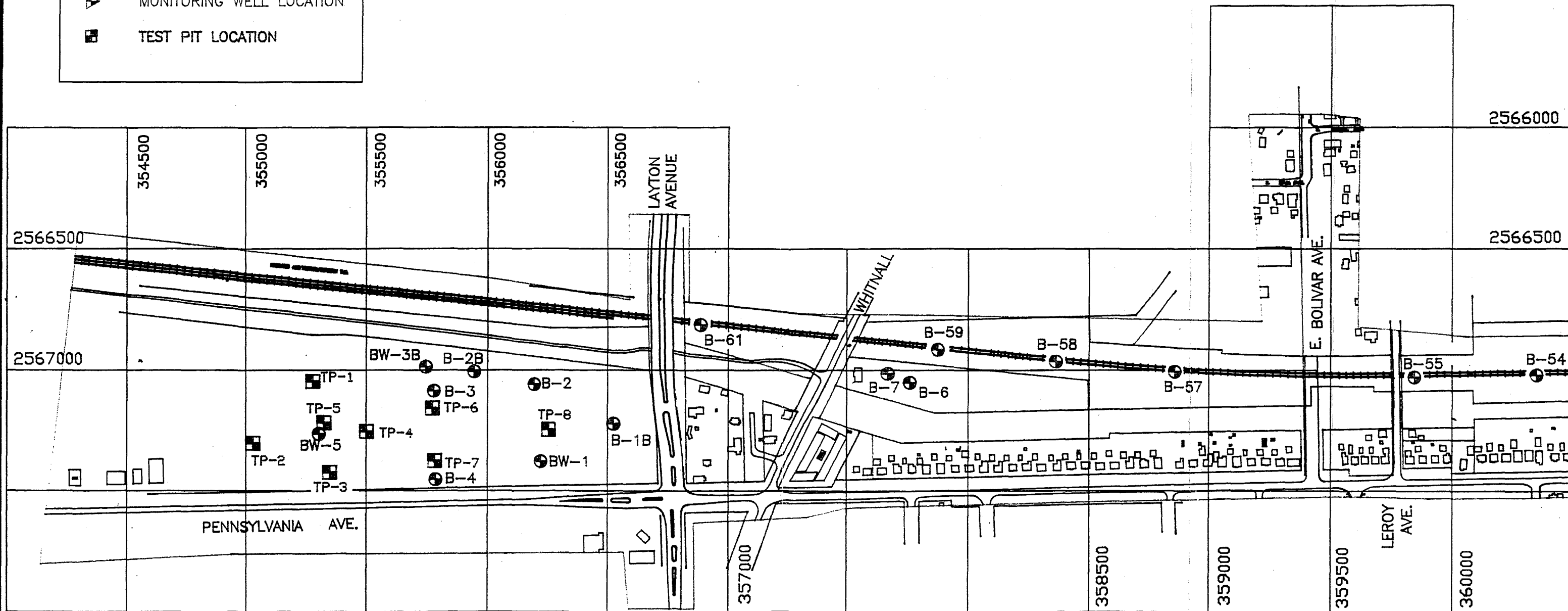
**TABLE 1 (continued)**  
**Soil Borings by Area Location**


<u>Location</u>	<u>Area</u>	<u>Borings/ Test Pits</u>
Former Service Station	20	B23D
Railroad right-of-way from Lake Arterial Stationing 4256 to 4261	22	BW24, B25, BW26
Former Illinois Steel Company north of Conway Avenue	23	B27, B28, BW29
Entire railroad right-of-way from the Hoan Bridge to East Layton Avenue	24	B30 through B61 inclusive

Notes: B = indicates soil boring  
BW = indicates groundwater monitoring well installed in boring  
TP = indicates test pit  
HA = indicates hand auger

LEGEND

- SOIL BORING LOCATION
- ▼ MONITORING WELL LOCATION
- TEST PIT LOCATION

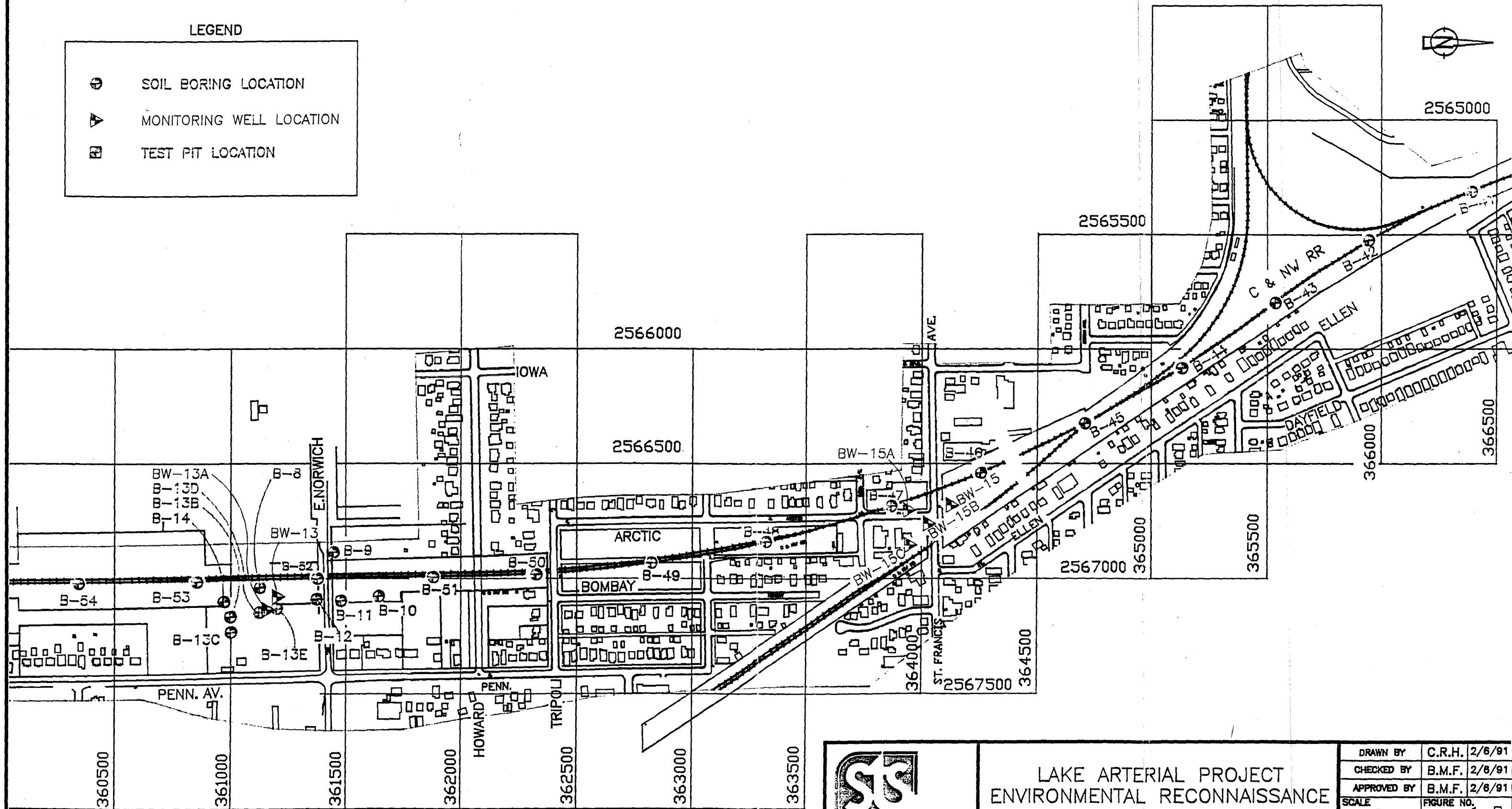


 STS Consultants, Ltd.	PROJECT/CLIENT		DRAWN BY	C.R.H.	2/8/91	
	LAKE ARTERIAL PROJECT ENVIRONMENTAL RECONNAISSANCE PHASE II FIG-1A		CHECKED BY	B.M.F.	2/8/91	
			APPROVED BY	B.M.F.	2/8/91	
	SCALE		FIGURE NO.	1" = 400'		
	STS PROJECT NO.		83417XF			



LEGEND

- ⊙ SOIL BORING LOCATION
- ▼ MONITORING WELL LOCATION
- ⊞ TEST PIT LOCATION



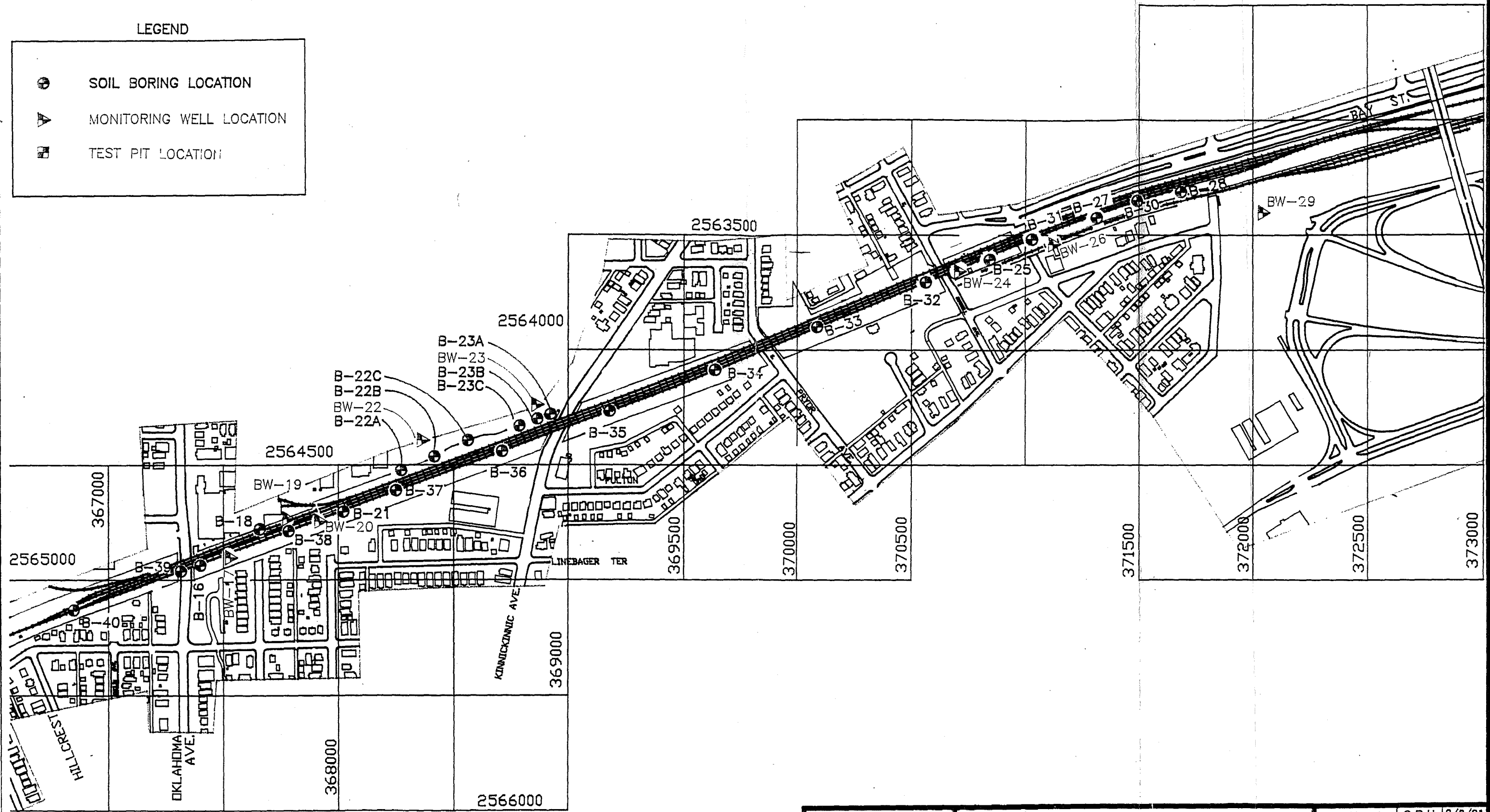
STS Consultants, Ltd.

LAKE ARTERIAL PROJECT  
 ENVIRONMENTAL RECONNAISSANCE  
 PHASE II  
 FIG 1-B

DRAWN BY	C.R.H.	2/6/91
CHECKED BY	B.M.F.	2/6/91
APPROVED BY	B.M.F.	2/6/91
SCALE	1"=400'	FIGURE NO.
		1-B
STS PROJECT NO.		83417XF

LEGEND

- SOIL BORING LOCATION
- ▼ MONITORING WELL LOCATION
- TEST PIT LOCATION



PROJECT/CLIENT  
 LAKE ARTERIAL PROJECT  
 ENVIRONMENTAL RECONNAISSANCE  
 PHASE II  
 FIG-1C

DRAWN BY	C.R.H.	2/8/91
CHECKED BY	B.M.F.	2/8/91
APPROVED BY	B.M.F.	2/8/91
SCALE	1" = 400'	FIGURE NO. 1-C
STS PROJECT NO.		83417XF

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

All downhole drilling, sampling equipment and well materials were decontaminated to avoid introduction of contaminants or cross contamination between samples/borings/wells. This procedure consisted of cleaning all augers, rods, and monitoring well materials with a hot water pressure washer prior to conducting the field work and after completion of each boring.

Soil samples were generally collected at 2.5-foot intervals from the borings. The samples were obtained in general accordance with ASTM Specifications D-1586, "Standard Method for Penetration Test and Split-Barrel Sampling of Soil." A brief description of this sampling method is included in the Appendix Supporting Data of this report. Where necessary, (Area 1), to collect an adequate sample, a 3 inch split barrel sampling device was used in place of the standard 2 inch device described in the ASTM Specification D-1586. Also, at Borings B46 to B61 along the railroad right-of-way, soil sampling by 2 inch Shelby Tube was performed in accordance with ASTM D-1587 "Thin-Walled Tube Sampling of Soils." The thin walled tube soil samplers were decontaminated by scrubbing with a brush using tri-sodium phosphate detergent and a double rinse of municipal tap water.

The recovered soil samples were split and placed in two new glass jars. One was sealed with a plastic lined metal cap the other covered with aluminum foil and capped in the field before returning both to the STS office. The samples were retained at 40° F until PID Screening and classification was complete. Samples selected for submittal to the analytical laboratory were shipped in iced coolers. Chain-of-Custody procedures were adhered to throughout sample classification and delivery to the analytical laboratory.

The drill crew maintained logs of the field exploration activities and documented the general soil types and groundwater conditions observed in the borings. These logs were later reviewed as one information source during preparation of the final boring logs which are presented in the Appendix.

2.1.2 Groundwater Monitoring Wells - Seventeen (17) groundwater monitoring wells were installed at various areas of the right-of-way. The purpose of the groundwater monitoring wells were to: 1) allow for monitoring the groundwater elevation; and 2) collect representative groundwater samples.

The wells were constructed in general conformance with Wisconsin Administrative Code NR141 monitoring well installation procedures. The wells consisted of 10 or 15-foot length (depending on the estimated depth to the groundwater table), 2-inch diameter machine slotted PVC pipe (screen) placed at the bottom of the borehole. The remainder of the well casing, extending above the screen to the ground surface, consisted of 2-inch diameter schedule 40 PVC pipe with threaded joints. Commercially prepared washed silica sand was placed in the annulus between the PVC pipe and the borehole wall to an elevation 2 feet above the top of the screen. Bentonite clay was placed over the silica sand to serve as a seal and prevent surface water intrusion. A concrete cap was placed at the ground surface to anchor a metal protector cover. Two different well protector styles were used (i.e. flush mounted and stickup). The flush mounted protector was installed flush with the ground surface. A water tight screw top cover was used on the protector pipe to prevent surface water intrusion. The flush mount installation is used where ground clearance is critical in traffic areas or where a stickup protector would be obtrusive. The monitoring well construction details are included in the Appendix.

All wells were developed by bailing or pumping. Generally, a minimum of 4 well volumes were removed in wells that did not recharge quickly or 10 well volumes (after 30 minutes of surging and purging) in fast recharging wells. The well development equipment was decontaminated prior to use in the manner as discussed previously.

2.1.3 Elevation Survey - The ground surface elevations at all boring locations and the top of PVC well casing at the well locations were determined by an HNTB survey.

crew using conventional leveling techniques and were also located by HNTB relative to the State Plane coordinate system. The elevations were referenced to USGS datum. The depth to groundwater in the monitoring wells was measured using a Slope Indicator Company water level indicator (Model No. 51453). The ground surface and PVC pipe elevations and the depths to the groundwater table were measured to the nearest + 0.01 foot.

## 2.2 Soil Testing Program

2.2.1 Photoionization Detector Screening - All soil samples, returned to the STS soils laboratory, were screened to identify the presence of volatile organic compounds (VOC's). The screening procedure consisted of testing the head space in each soil container for volatile organic compounds with a photoionization detector (PID). A detailed description of the soil screenings procedure is included in the Appendix.

2.2.2 Visual Classification - The soil samples were visually examined by a STS geo-environmental engineer and classified the basis of texture and plasticity in general accordance with the Unified Soil Classification System (USCS). A brief description of the USCS is included in the Appendix. The estimated group symbols according to this system of classification are indicated in parenthesis following the soil description on the boring logs. Additional information regarding the preparation of the final boring logs from field logs and laboratory data is described on the sheet entitled "Field and Laboratory Procedures" which is included in the Appendix. The boring logs are also included in the Appendix of this report.

The soil stratification indicated on the logs was selected by the engineer on the basis of the field logs and sample observations. The stratification lines should be considered as approximate. The transition between soil types may be gradual in both the horizontal and vertical directions.

The engineer reviewing the soil samples also completed olfactory and visual observations in an attempt to detect the presence of obvious foreign or chemical products in the samples. The observations of the engineer are included in the soil descriptions on the boring logs.

2.2.3 Analytical Testing - Soil samples from the borings were selected for chemical analyses based on the results of the visual observations and PID screening. Samples were submitted to an independent analytical laboratory Enviroscan Inc. of Rothschild, Wisconsin a state certified laboratory (certification no. 737053130). The analytical program varied for each Area investigated depending upon the type of contamination anticipated. A detailed list of quantified soil analytical parameters is presented in the Appendix.

Selected samples were submitted to the laboratory and analyzed for Total Petroleum Hydrocarbons (TPH) using the California LUFT gas chromatography method (GC). This method identifies a specific range of hydrocarbon chains, such as gasoline (lighter fraction) or mid-boiling fraction (covering diesel and motor oils), and compares the GC results to standard hydrocarbon fractions to quantify the amount of TPH in the sample. This method is recommended by the DNR to quantify petroleum impacts and establish cleanup criteria.

Selected soil samples were analyzed for volatile organic compounds (VOC's), which can be found in petroleum products, solvents and degreasers. The list of the VOC parameters included in the analysis is presented in the Appendix.

Selected samples were also analyzed for the presence of eight (8) RCRA metals (which includes arsenic, barium, cadmium, chromium, lead, mercury, selenium and silver). These eight (8) metals, if quantified above specific quantities, is one method required to define the material analyzed as a characteristic hazardous waste. Prior to September 1990, the Extraction Procedure Toxicity (E.P. Tox) analysis was the method required by EPA. However, a new somewhat more stringent test procedure,

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

Toxicity Characteristic Leaching Procedure (TCLP) has replaced the E.P. Tox analysis. Both test procedures have been specified and used in this assessment. After this project was initiated, the TCLP test was proposed to replace the E.P. Tox. Consequently, materials were subsequently submitted for the TCLP analysis. Those samples which have been analyzed under the old procedure are not considered critical to the results of this investigative program.

Additional soil parameters included polychlorinated biphenyls (PCBs) and creosote, which maybe associated with the railroad. A waste profile consisting of; PCB's, pesticides, TCLP metals, pH, phenols, cyanide and sulfide, was performed to characterize landfill waste primarily in Area 1 at the southwest corner of east Layton and south Pennsylvania Avenues.

All analyses were completed using EPA promulgated procedures. The procedures are identified in detail in EPA publication SW846, "Test Methods for Evaluating Solid Wastes. These procedures are summarized in in the Appendix. The scope of the analytical program conducted on soil samples is summarized on Table 2.

**TABLE 2**  
**Soil Analysis Summary**

<u>Area</u>	<u>Samples</u>	<u>Parameters</u>
1	TP2 composite S1, S2, S3 TP4 composite S1, S2, S3 TP5 composite S1, S2, S3 TP8 composite S1, S2, S3	<u>Waste Profile</u> i.e. PCB's pesticides, pH, phenols, cyanide, sulfide, TCLP (8 metals)
	TP1 composite S1, S2 TP3 composite S1, S2 TP6 composite S1, S2 B1B S2 B1B S3	TCLP (8 metals) TPH VOC's
2	B6-S2, B7-S2 composite	E.P. Tox. (8 metals) TPH
6	B8-S3	E.P. Tox. (8 metals) TPH
7	B9-S2, B9A	E.P. Tox (8 metals) TPH
8	B10, B11	
9	B12-S2, HA12 composite	E.P. Tox (8 metals) TPH
10	B14-S6	VOC's
12	Pipe Sample	Asbestos
15	No Soil Samples Groundwater only	
17	EP1, EP2	TCLP (8 metals) TPH
18	B16S1, B18S1 composite B17S1, BW19S1, BW20S1	TCLP (8 metals) TPH



**TABLE 2**  
**Soil Analysis Summary**  
**(Continued)**

<u>Area</u>	<u>Samples</u>	<u>Parameters</u>
19	BW22-S2, 3, 4, 5 composite BW23-S3, 4, 5, 6 composite	TCLP (8 metals), VOC's
20	B22D	TPH
22	S1 of BW24, B25, BW26 composite BW24-S-9, BW26-S2	TCLP (8 metals)
23	B27-S1, B28-S1 composite B28-S3, B27-S3	TCLP (8 metals)
24	Composite surface sample B30,31,32,33 Composite surface sample B34,35,36,37 Composite surface sample B38,39,40,41 Composite surface sample B42,43,44,45 Composite surface sample B46,47,48,49 Composite surface sample B50,51,52,53 Composite surface sample B54,55,56,57 Composite surface sample B58,59,60,61	PCB's
	B31-S2 B38-S2 B48-ST 1 Top B55-ST 1 Top	Creosote
	B34-S2 B45-S2 B52-ST 1 Top B60-ST 1 Top	TPH

The initial laboratory program developed for this Phase II investigation and detailed in STS Proposal No. 2385MP dated April, 1990 presented a wider scope of soil sample analysis. The scope of soil analysis was curtailed during the investigation because the initial assumption, in the Phase I report, of the presence of waste materials at many locations was not confirmed in the test borings. Soil samples collected from these borings did not visually suggest the presence of regulated materials nor did PID screening of the recovered soil sample suggest the presence of volatile organic compounds, in many cases. Although the range of analytical testing remained the same, the quantity of soil samples analyzed decreased.

### 2.3 Water Sampling and Testing Program

2.3.1 Sampling Methods - Groundwater samples were collected from the 17 monitoring wells installed for this investigation. The sampling consisted of purging each well, sampling the water, and submitting the water samples to the analytical laboratory. The locations of the wells are indicated as BW on the Figures 1A, 1B, 1C presented previously.

The well purging was completed with a Teflon bailer by removing a minimum of four (4) well volumes of water, when the wells recharged rapidly, or ten (10) well volumes when recharge was slow. Each well was allowed to recover slightly before collecting a water sample with a clean Teflon bailer.

Water samples, to be analyzed for dissolved metals content, were field filtered prior to containerization. The field filtering consisted of placing the representative sample in a clean one (1) liter glass bottle then transferring the sample by use of a Geopump parastaltic pump through a 0.45 micron disposable high capacity filter (QED Model FF-8200) to the final sample container.

2.3.2 Sample Handling - The method of sample handling and preservation varies with each analytical method. Therefore, several types of containers and preservatives

were needed. Table 3, below, identifies the types of containers and preservatives used for the different analytical tests requirements.

**TABLE 3**  
**Sample Handling**

<u>Container</u>	<u>Preservative</u>	<u>Parameter (Analysis)</u>
Glass 40 milliliter	Cool to 4°C <sub>2</sub> HCL	VOC's
Glass 1 liter	Cool to 4°C	PCB's/Pesticides
Glass 1 liter	Cool to 4°C	Alkalinity, color, pH hardness, total solids, turbidity
Plastic 500 milliliter	HNO <sub>3</sub>	Metals

After collection in the field, the water samples were immediately placed in coolers with ice, transferred to refrigerated storage at the STS office for a short period of storage prior to being shipped to the laboratory in iced coolers. Chain of custody procedures were adhered to throughout sample collection and delivery to the analytical laboratory.

All purging, sampling, and other miscellaneous equipment was thoroughly washed with TSP soap and water and rinsed with distilled water. Field and trip blank samples collected during sampling were analyzed to evaluate the effectiveness of the decontamination and transportation procedures. One (1) field blank and one (1) trip blank were analyzed for VOC's. No detected concentrations of VOC's were found in the blanks indicating that the samples were not cross-contaminated or impacted during transportation.

While sampling each well, pH, temperature, and conductivity were measured with field instruments. The data obtained was reviewed for consistency but was not used to make a significant assessment of water quality.

2.3.3 Analytical Testing - The groundwater analytical testing program was tailored to reflect the anticipated area impacts as identified in the STS Phase I study and the STS proposal for the Phase II study. Areas and corresponding groundwater testing program were performed as summarized in Table 4.

**TABLE 4**  
**Groundwater Testing Program**

<u>Area</u>	<u>Well No.</u>	<u>Parameters</u>
1	BW1, BW2B, BW5	Landfill Panel
10	BW13, BW13A	VOC's, 8 metals
15	BW15 BW15A, BW15B, BW15C	VOC's, 8 metals VOC's
18	BW17, BW19, BW20	VOC's 8 metals
19	BW22, BW23	VOC's 8 metals
22	BW24, BW26	VOC's, 8 metals
23	BW29	VOC's, 8 metals

The landfill panel indicated on Table 4 includes the parameters presented in the Appendix. These parameters include volatile organic compounds, metals and inorganic compounds which maybe soluble in water and are generally found at landfills or uncontrolled waste sites. Area 1, at the southwest corner of east Layton and south Pennsylvania Avenues, is a known municipal landfill used by the old Township of Lake, the City of Cudahy and the City of Milwaukee. The landfill was the only Area where this panel was specified.

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

Volatile organic compounds (VOC's) are commonly analyzed when petroleum or solvent impacts are suspected. VOC's were suspected in Areas 10, 15, 18, 19, 22 and 23. The VOC compounds are listed in the Appendix.

The 8 metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver) are listed in the State of Wisconsin Administrative Code NR140 Groundwater Quality Standards and are the same TCLP metals defined in the soils analysis section of this report. These 8 regulated metals were suspected at the Areas listed because of materials disposed or industry in the area which could be a source for the soluble compounds of these metals.

The Appendix includes the EPA approved analytical procedures used to analyze the water samples. These procedures are in accordance with SW846 "Test Methods for Evaluating Solid Wastes."

### 3.0 RESULTS AND INTERPRETATION

#### 3.1 Regional Geology

A review of geological conditions determined that soil deposits, in the project area generally consist of glacial soils. Sedimentary bedrock is known to exist at a depth of 100 feet or more underlying the glacial soils. The bedrock in the region is almost all buried by glacial deposits. Bedrock was not encountered in any of the exploratory borings. Based upon information from previous geotechnical investigations, bedrock is believed to be a depth of 100 feet or more and consists of dolomitic limestone.

The surface topography of the area has been primarily determined by glaciation. The Lake Michigan lobe of the continental glacier was the principal factor in the formation of the present landscape and covered all of the region of investigation. The receding glacier left the undulating topography generally associated with terminal moraines. Run off water, from the melting glaciers, carried soils which are also indicative of the area. Clays, silts and, sands and gravels are present in varied locations throughout the area.

#### 3.2 Hydrogeologic Conditions

Groundwater elevations were monitored during the duration of the field exploration. The water level data indicates that the groundwater table is relatively shallow and is likely an unconfined water system separate from the underlying bedrock aquifers. Historically, the bedrock water system was used as a source of drinking water, however, the properties in the vicinity of the project area are currently serviced by a municipal water system, whose source of water is Lake Michigan. Because of the shallow depth to groundwater, groundwater flow characteristics in the project area are strongly influenced by surface features, such as lakes and rivers, near surface soil profiles, as well as man-made features such as utility trenches. Shallow groundwater flow across the

project area is generally easterly to northeasterly towards Lake Michigan and follows the general topography of the landscape.

### 3.3 Data Assessment

Concentrations of chemical constituents in soils are not specifically regulated in Wisconsin. However, the Wisconsin Department of Natural Resources (DNR) has established a criteria for assessment of petroleum based soil contamination. The criteria currently used by the DNR is 10 parts per million (ppm) concentration level of TPH as analyzed by the California LUFT method. This concentration level is often utilized as the comparison value for establishing the need for cleanup of sites impacted by petroleum products. The WDNR has published "guideline" cleanup levels for soils contaminated with petroleum products or volatile organic compounds. These guideline standards were used to determine if the presence of these materials would indicate what remedial actions would be necessary.

The cleanup criteria for other organic impacts such as PCB's or pesticides could be considered as low as the analytical detection limit or could be U.S. Environmental Protection Agency (USEPA) or DNR established spill cleanup guidelines.

Currently, no specific DNR criteria are utilized to directly assess the concentrations of inorganic constituents in soils. One approach can be to establish background concentration ranges for these naturally occurring inorganic materials. Due to the large aerial extent being studied, local background data was not specifically developed. The data accumulated was compared to published concentration ranges for naturally occurring inorganic metals in soil. Table 6, presents typical element concentrations in natural soils. These ranges are very broad and reflect variability in soil type across the United States. However, they do provide general guidance if concentrations are excessively high.

**TABLE 6**  
**Typical Element Concentrations in Natural Soils**

<u>Parameter</u>	<u>Units</u>	<u>Typical Concentrations in Natural Soil</u>	<u>Average Concentration</u>
Total Arsenic	ppm	1-50	5
Total Barium	ppm	100-3,000	430
Total Cadmium	ppm	0.01-0.7	0.06
Total Chromium	ppm	1-1,000	100
Total Copper	ppm	2-100	30
Mercury	ppm	0.01-0.3	0.03
Nickel	ppm	5-500	40
Total Lead	ppm	2-200	10
Total Selenium	ppm	0.1-2	0.3
Total Silver	ppm	0.01-5	0.05
Total Zinc	ppm	10-300	50

Adapted from Hazardous Waste Treatment, USEPA, SW874 (April, 1983)

The second criteria which can be utilized for soil concentration assessment is associated with the current hazardous waste regulations. These requirements establish hazardous concentration for use in waste characterization. One criteria relates to the amount of leachable toxic metals present in a sample. If the leachable concentration of the specified compounds exceed hazardous waste values, the material must be managed as hazardous waste. The test procedure currently used for this evaluation is the Toxicity Characteristic Leaching Procedure (TCLP).

In Wisconsin, groundwater quality is regulated, regardless of use, through specific concentration standards published in the Wisconsin Administrative Code NR140. The regulation identifies separate groundwater quality standards for public health and public welfare related compounds. Two (2) levels are presented, the Enforcement Standard (ES) and the Preventive Action Limit (PAL). The PAL's are either 10 or 20 percent of the ES depending on the health effects of the specific compound. When either level has been exceeded at regulated facilities, the DNR requires notification.



subsequently completed on the property in order to obtain representative samples. The samples recovered from the test pits were apparently an incinerator residue consisting of ash, glass and metal. Very little organic content was present. Additional information also was received from the City of Cudahy as to the type and extent of material disposed. City of Cudahy personnel indicated that a part of this parcel which measured approximately 450 x 450 feet at the corner of Layton Avenue and east of Pennsylvania Avenue had been excavated by Cudahy and refilled with municipal trash in the early 1960's. Consequently, another boring, was added in this location where none had been performed or planned, because previous information had indicated that the entire site filled with similar materials. Two additional borings were also added on the County of Milwaukee property, which lies between the landfill and the railroad to confirm a lack of fill (soil or trash) on that portion of the Area.

In total, 8 soil borings, with three of those converted to groundwater monitoring wells, and eight test pits were completed in an effort to characterize conditions on this property. Several of these borings were drilled three times in an effort to recover adequate and representative samples although they are shown as one boring on the location plan.

Borings BW1, B1B, B2, BW2B, B3, B3B, B4 and BW5 along with test pits TP1 through TP8 inclusive, were completed at the approximate locations shown on Figure A1, Area 1 Boring Location Plan, presented in this section of the report. Fill material was encountered in all test pits and boring locations except for B2B and BW3B which are located on the Milwaukee County property. The fill material varied considerably with depth although the content was generally consistent. Incinerated materials consisting of broken glass and bottles, miscellaneous pieces of metal and cans, ash, wire, occasional pottery, wood, bathroom fixtures and other inorganic material was encountered across the site. This fill varied in depth from about 12 feet at BW1, TP1 and B2; to about 3 feet deep at TP7, TP6, B3 and B4, to about 6 to 9 feet at TP1 through TP5 and BW5. Natural soils consisted of 12 inches black silty topsoil underlying the fill which overlaid a brown silty clay to the maximum depth of the borings. The test pits were terminated upon

reaching the natural soil/fill interface whereas the borings were continued to sample the underlying natural soils.

A total of 45 fill and soil samples were collected for classification and selection for analysis from these borings and test pits. PID measurements taken in the field at the time of sample recovery and during test pit excavation, and again after the samples were delivered to the STS soils laboratory indicated moderate detection (generally less than 10 ppm) of volatile organic compounds.

Groundwater monitoring wells were installed in borings BW1, BW3B, and BW5 for the purpose of measuring water levels and providing a sampling point for groundwater monitoring. The groundwater surface was recorded in each well and is reported in the following table referenced to U.S.G.S. datum.

**TABLE A1**  
**Groundwater Elevations Area 1**

<u>Well No.</u>	<u>Groundwater Elev.</u>	<u>Surface Elev.</u>
BW1	675.97	690.4
BW3B	665.22	672.8
BW5	670.08	678.9

These water elevations appear to indicated a groundwater flow direction to the south - southeast which is consistent with the topography and the presence of a creek just to the south of the subject parcel which may be a groundwater discharge point.

The fill samples acquired from each test pit were composited within that test pit for analysis. An individual composite sample from TP2, TP4, TP5 and TP8 were each analyzed for a waste profile. This waste profile included: PCB's, pesticides, pH, phenols, cyanide, sulfide and TCLP for eight metals. A composite of TP1, TP3, TP6, TP7 and

individual boring samples B1B-S2 and B1B-S3 were each analyzed for TCLP metals, TPH and VOC's. The results of these analyses are presented on Table A1-1, Area 1 Soil Laboratory Results, included in this section. Several of the eight TCLP metals were detected including: barium, cadmium, chromium and lead. The concentration of lead in TP5 (14.7 ppm), TP8 (7.59 ppm), and TP7 (12.8 ppm) exceeded the limit for a characteristic hazardous waste. Two (2) additional samples TP2 and TP6 indicated moderate lead levels (3.21 and 4.12 ppm respectively) that do not exceed the lead limit however subsamples from those locations may, if analyzed separately, exceed the limits.

TPH as gasoline and/or diesel (ppm) was quantified in boring B1B samples 2 (23.7) and 3 (21.7). The concentration of TPH exceeds the WDNR guideline cleanup standard. For the remaining parameters listed on the table, no other regulatory limits were exceeded.

One groundwater sample from each well location (BW1, BW3B and BW5) was submitted to the laboratory for VOC's, soluble metals and indicator parameters indicative of groundwater degradation. Table A1-2 Area 1 Groundwater Results presents the results of these analysis. Volatile organic compounds were not detected. The metals barium and silver exceeded the Preventative Action Limit (PAL) specified in Wisconsin Administrative Code NR140 at wells BW3B and BW5. Chloride exceeds the ES limit in BW1 and the PAL at BW5 while sulfate exceeded the PAL limit in BW1 and BW3B. The indicator parameters are generally compounds which are potentially indicative of groundwater degradation. These compounds may not have specific remediation limits in the regulations but are used as a general indicator of overall water quality. Except for total solids, these values are within common ranges.

**TABLE A1-1**  
**Area 1 Soil Results (ppm) mg/kg**

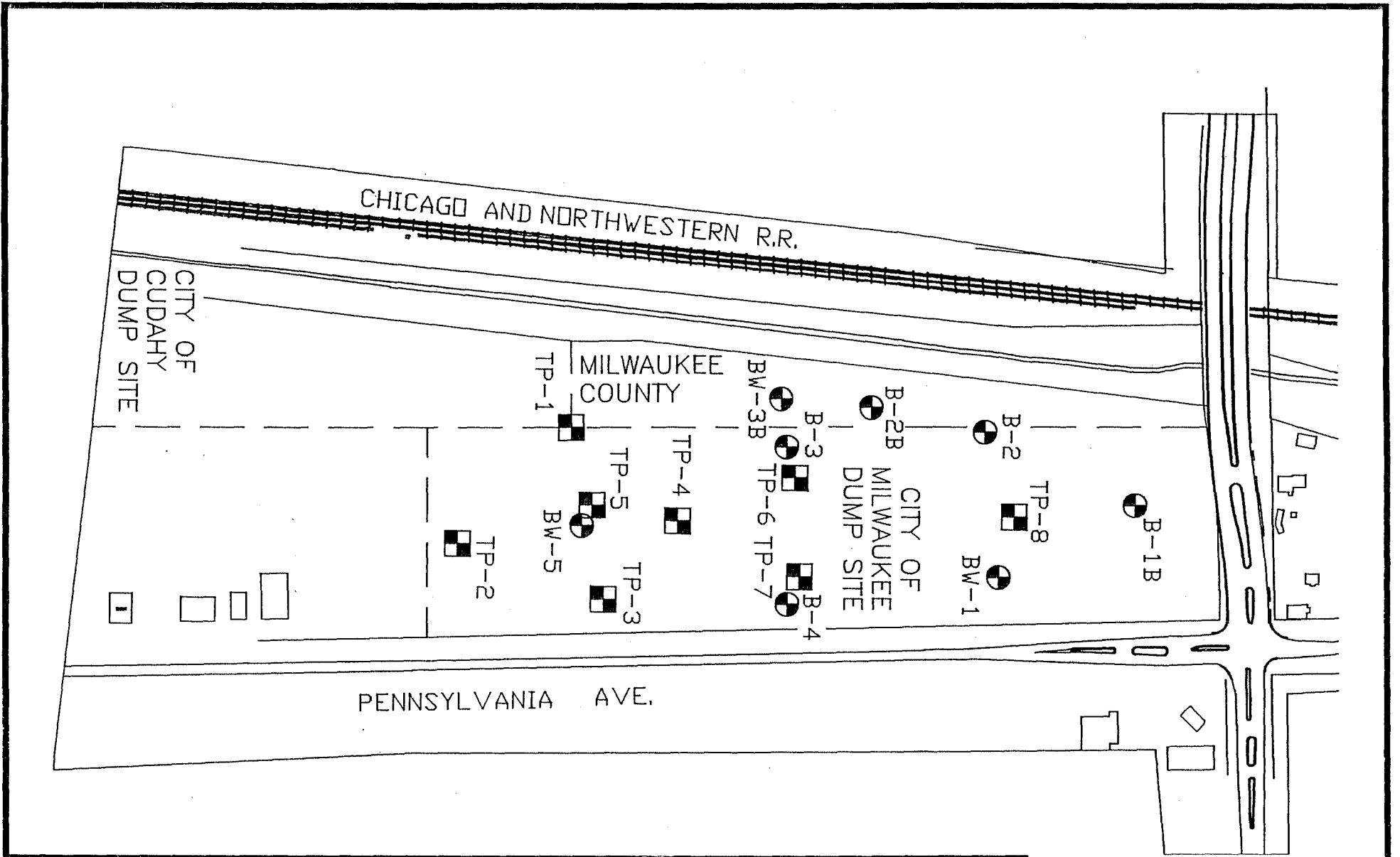
<u>Waste Profile</u>	<u>Limits</u>	<u>Sample Composites</u>									
		<u>TP2</u>	<u>TP4</u>	<u>TP5</u>	<u>TP8</u>	<u>TP1</u>	<u>TP3</u>	<u>TP6</u>	<u>TP7</u>	<u>B1B-S2</u>	<u>B1B-S3</u>
PCB	5	N.D.	N.D.	N.D.	N.D.	—	—	—	—	—	—
Pesticides		N.D.	N.D.	N.D.	N.D.	—	—	—	—	—	—
pH	2<pH<12.5	8.26	8.51	8.29	7.61	—	—	—	—	—	—
Phenols		N.D.	N.D.	N.D.	N.D.	—	—	—	—	—	—
Cyanide		N.D.	N.D.	N.D.	N.D.	—	—	—	—	—	—
Sulfide		N.D.	N.D.	N.D.	N.D.	—	—	—	—	—	—
<u>TCLP Metals</u>											
Arsenic	5.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Barium	100.0	2.21	1.53	3.26	1.08	0.676	0.649	2.27	1.72	0.806	0.834
Cadmium	1.0	0.029	0.037	0.075	0.067	N.D.	0.021	0.240	0.036	0.011	0.010
Chromium	5.0	N.D.	N.D.	N.D.	N.D.	N.D.	0.010	0.290	N.D.	N.D.	2.66
Lead	5.0	3.21	0.699	14.7*	7.59*	0.073	1.25	4.12	12.8*	0.658	1.36
Mercury	0.2	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Selenium	1.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Silver	5.0	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
<u>TPH</u>											
Gasoline	10	—	—	—	—	N.D.	N.D.	N.D.	N.D.	23.7*	N.D.
Diesel	10	—	—	—	—	N.D.	N.D.	N.D.	N.D.	N.D.	21.7*
Total VOC <sup>(1)</sup>	NA	—	—	—	—	N.D.	N.D.	N.D.	N.D.	0.065	0.29
PID Measurement	NA	5-11	3-20	5-18	1-14	1-17	3-5	1-2	2-3	<1	7

Notes to Table 1: N.D. indicates not detected.  
 — indicates not analyzed.  
 \* indicates regulatory exceedence.  
 (1) includes benzene, 1,1 dichloroethylene, ethylbenzene, toluene, xylene.

**TABLE A1-2**  
**Area 1 Groundwater Results (units as noted)**

<u>Parameter</u>	<u>BW-1</u>	<u>BW-3B</u>	<u>BW-5</u>	<u>NR 140 Limits</u>	
				<u>E.S.</u>	<u>PAL</u>
Total VOCug/l (ppb)	N.D.	N.D.	N.D.	N.A.	N.A.
<u>Metals NR140 ug/l (ppb)</u>					
<u>Public Health</u>					
- Barium	16	83	234 <sup>(1)</sup>	1000	200
- Silver	16	20 <sup>(1)</sup>	13 <sup>(1)</sup>	50	10
<u>Public Welfare mg/l (ppm)</u>					
- Chloride	268 <sup>(2)</sup>	58.6	181 <sup>(1)</sup>	250	125
- Iron	0.081	0.009	0.109	0.3	0.14
- Sulfate	154 <sup>(1)</sup>	176 <sup>(1)</sup>	63.7	250	125
- Zinc	0.048	0.019	0.018	5	2.5
<u>Indicators mg/l (ppm)</u>					
Alkalinity as CaCO <sub>3</sub>	688	473	605	N.S.	
Sol. Fluoride	0.7	0.2	0.4	N.S.	
pH (units)	7.37	7.21	7.68		
Total Solids	2140	1010	1070	N.S.	
Turbidity (units)	0.3	N.D.	0.4	N.S.	
NO <sub>3</sub> + NO <sub>2</sub> -N	0.7	1.13	0.96	N.S.	

Notes: N.A. - Not analyzed.  
<sup>(1)</sup> - PAL exceedence.  
<sup>(2)</sup> - E.S. exceedence.  
 N.S. - No standard.



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PHASE II ENVIRONMENTAL RECONNAISSANCE  
 LAKE ARTERIAL PROJECT  
 AREA A-1 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	FIGURE NO.	
1" = 300'	A-1	
STS PROJECT NO.		

83417XF



LAYTON  
 AVENUE

### 3.3.2 Area 2 Miscellaneous Dump

A fill area was identified north of Whitnall Avenue on the east side of the R.O.W. which appeared to contain foundry sand, construction rubble and debris. Foundry sand could contain residues of metals, petroleum hydrocarbons or solvents. The issues, at this location, were those associated with the potential industrial waste (i.e. foundry sand) and if sufficient quantities of heavy metals, petroleum products or solvents were present which could impact the highway construction.

Two (2) soil borings were proposed for this Area to determine fill and soil stratigraphy and to acquire samples for laboratory analysis. Soil borings B6 and B7 were completed at the approximate locations shown on Figure A2, Area 2 Soil Boring Location Plan, included in this section. Both borings were completed to a depth of 16.5 feet with a total of 14 soil samples acquired. The soil boring logs are located in Appendix D. The soils encountered consisted of brown and gray silty clay underlying about 12 inches of black silty topsoil. The borings showed natural soil extending to 16.5 feet in depth and did not indicate a significant depth of fill materials existed on-site. The visual appearance of fill soils is apparently only surficial on this site.

PID measurements taken in the field, at the time of sample recovery, and in the STS soils laboratory, after the samples were delivered by the field crew, did not suggest the presence of VOC's in the soils.

Groundwater monitoring wells were not installed in these borings. However, groundwater levels were noted by the field personnel at the time of drilling. The water table in borings B-6 and B-7 was encountered at a depth of 6 and 7.5 feet, respectively. Because of the fine grained nature of these soils, the short term water level noted may not be indicative of the actual water table.

One soil sample from each boring (B6-S2, B7-S2) was composited into one (1) sample and analyzed for E.P. Toxicity metals and TPH. The results of this analysis is presented on

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

Table A2-1, Area 2 Soil Laboratory Results. The metals barium and cadmium were detected below the hazardous waste limits. TPH analysis of this sample did not detect the presence of hydrocarbons.

**TABLE A2-1**  
**Area 2 Soil Laboratory Results (ppm) mg/kg**

<u>Parameter</u>	<u>Sample Composite</u> <u>B-6 S-2 &amp; B-7 S-2</u>	<u>RCRA</u> <u>Limits</u>
<u>EP Toxicity (metals)</u>		
Barium	0.165	100
Cadmium	0.050	1.0

TPH

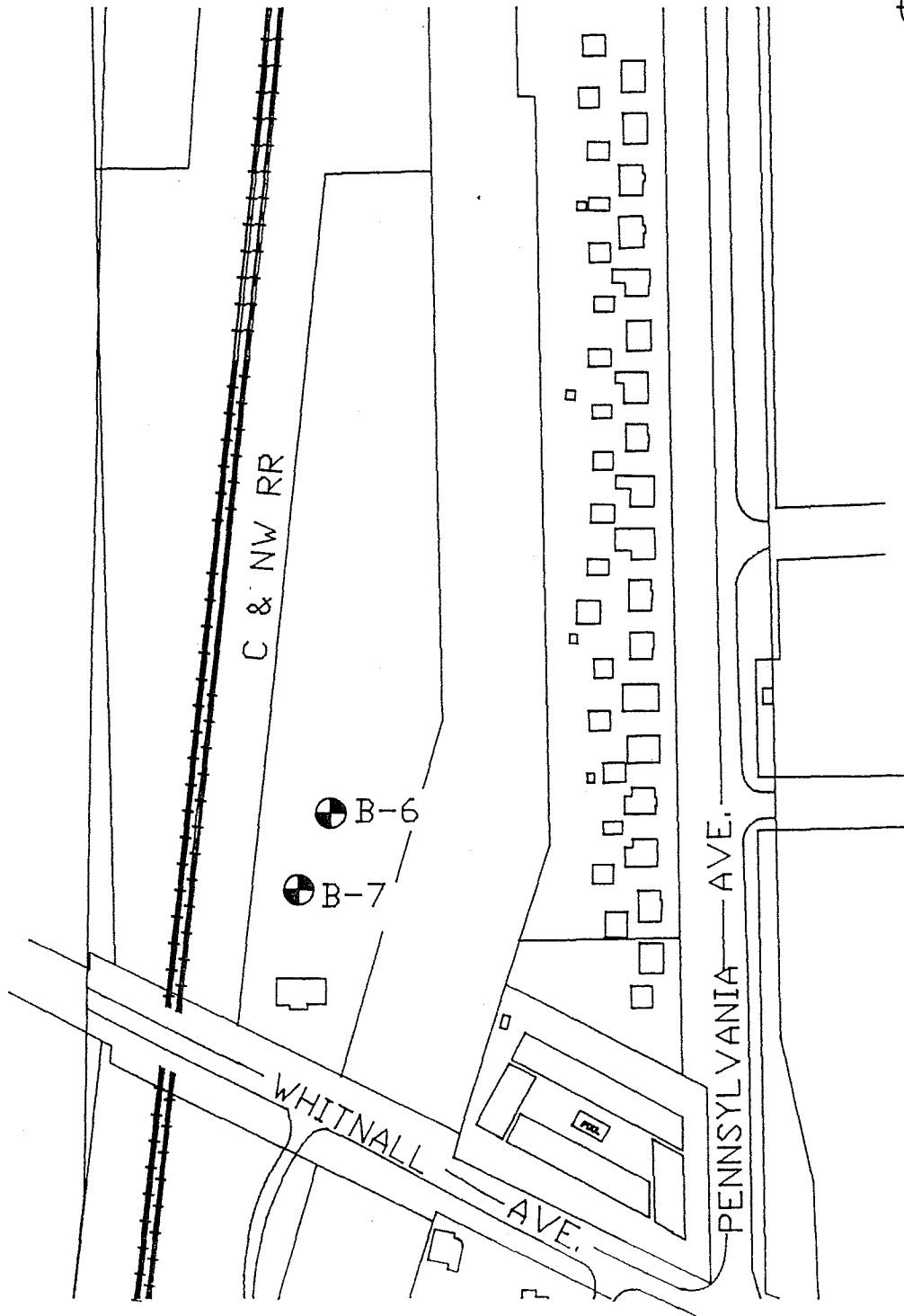
TPH as gasoline and fuel oil not detected.

Note to Table A2-1: EP Toxicity also includes arsenic, chromium, mercury, lead, selenium, silver as not detected.

RCRA - Resource Conservation and Recovery Act.

The results of the field investigations and laboratory analysis do not suggest the presence of hazardous materials in this area.





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PHASE II ENVIRONMENTAL RECONNAISSANCE  
LAKE ARTERIAL PROJECT  
AREA A-2 SOIL BORING  
LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	FIGURE NO.	
1" = 200'	A-2	

STS PROJECT NO.

83417XF

### 3.3.3 Area 6 railroad Right-of-Way Adjacent to EZ Paintr

The EZ Paintr property is adjacent to the proposed Lake Arterial project at the southwest corner of the intersection of Norwich Avenue and the Chicago and Northwestern Railroad (C&NW) right-of-way (R.O.W.). Several storm drain pipes discharged onto the R.O.W. from the EZ Paintr parking lot. The issue at this location was whether spills of paints or solvents in the EZ Paintr parking lot could have discharged through the storm drain pipes to the C & NW R.O.W.

One soil boring was proposed for this area to determine fill and soil stratigraphy and to acquire samples for laboratory analysis. A monitoring well was not installed.

Soil boring (B-8) was completed to a depth of 16.5 feet at a location on the east edge of the R&R tracks where the storm water culvert discharges to an open drainage ditch east of the R&R alignment. A total of seven soil samples were collected from this boring.

The boring location is shown on Figure A6, Area 6 Soil Boring Location Plan, included in this section. The soil boring log, included in the Appendix, presents the stratigraphy of the boring and field investigative data. Brown silty fine sand fill was present to a depth of about 6 feet, at this location, overlying about 2 feet of black clayey silt topsoil. Gray fine sandy silt was then present to the maximum depth of the boring.

PID measurements taken in the field and at the STS soils laboratory, after the samples were delivered by the field crew, did not indicate the presence of VOC's in the soil samples.

Groundwater monitoring wells were not installed. However, groundwater levels were noted by the field personnel at the time of the drilling. The free water surface in boring B8 was noted at a depth of 6.1 feet at completion of the boring. Because of the relatively fine grained nature of the soils encountered in this boring, the short term water level

noted may not be indicative of the actual water table and it should be expected to vary seasonally.

One (1) soil sample (B8-S3) was analyzed for E.P. Tox. metals and TPH. The results of these analyses are summarized on Table A6-1, Area 6 Soil Laboratory Results, with only detected parameters presented. Full data sheets are included in the Appendix. The metals barium, cadmium and chromium were detected. The concentrations of these three metals are below the hazardous waste limits. TPH analysis of this sample was below detection.

**TABLE A6-1**  
**Area 6 Soil Laboratory Results (ppm) mg/kg**

<u>Parameter</u>	<u>Sample</u> <u>B-8 S-3</u>	<u>RCRA</u> <u>Limits</u>
<u>EP Toxicity Metals</u>		
Barium	0.158	100
Cadmium	0.028	1.0
Chromium	0.009	5.0

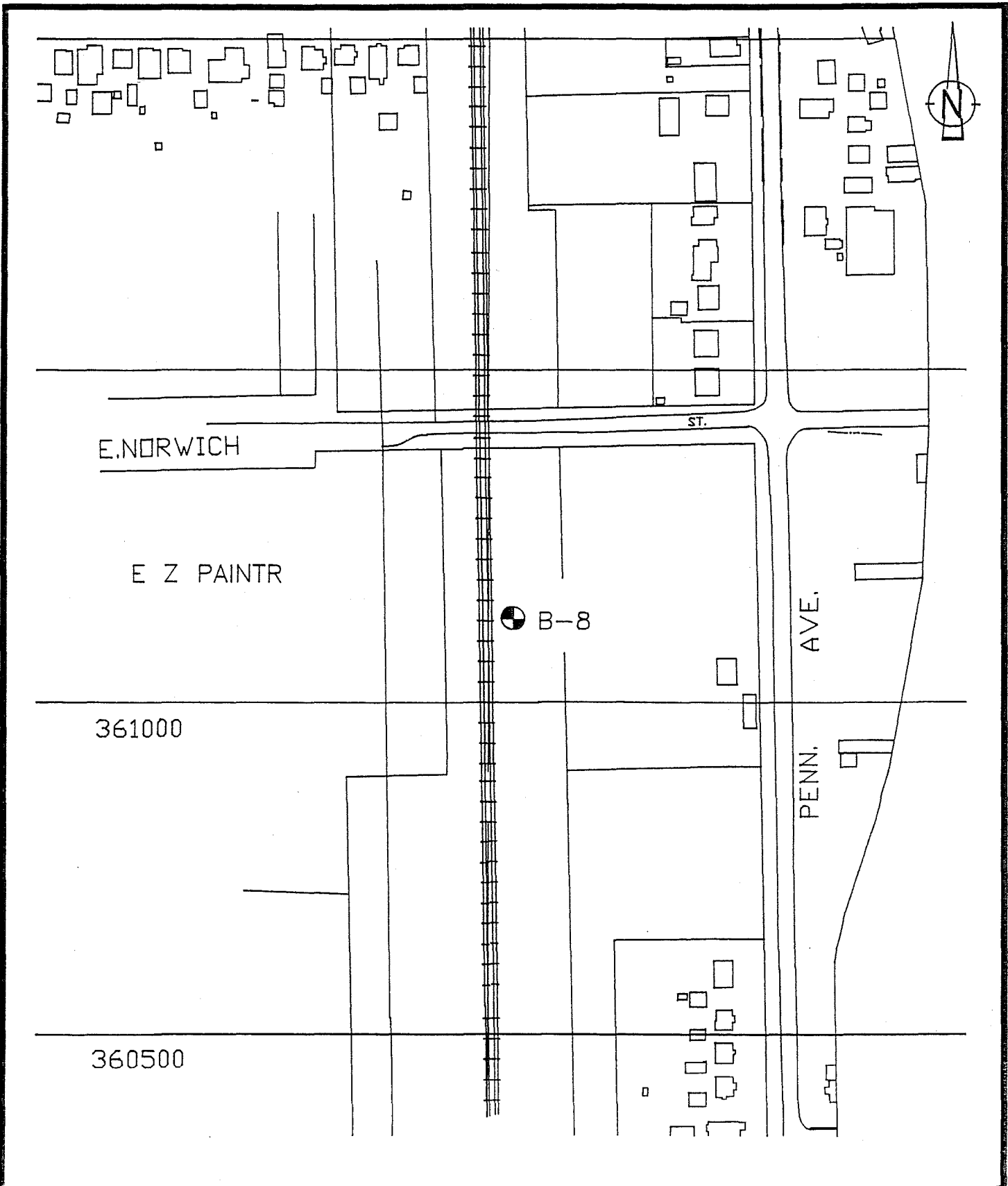
TPH

TPH as gasoline and fuel oil also not detected.

Note: EP Toxicity also includes arsenic, chromium, mercury, lead selenium, silver as not detected.

RCRA - Resource Conservation and Recovery Act.

The results of the field investigation and laboratory analysis does not suggest the presence of hazardous materials in this area.



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PHASE II ENVIRONMENTAL RECONNAISSANCE  
 LAKE ARTERIAL PROJECT  
 AREA A-6 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1" = 200'	FIGURE NO.
STS PROJECT NO.	83417XF	

83417XF

#### 3.3.4 Area 7 Vacant Property

The vacant property at the northwest corner of Norwich Avenue and the C&NW R.O.W. was identified as a possible gravel borrow area and subsequent fill site in the historical literature. The material used to fill the property could have an adverse impact on the construction of the Lake Arterial. The issues at this location were those associated with potential industrial or municipal wastes containing heavy metals, VOC's or petroleum hydrocarbons.

One soil boring was initially performed in the proposed cul-de-sac ending of Norwich Avenue on the west side of the R.O.W. Subsequent discussions with the WDOT indicated the entire property may be acquired by the WDOT therefore an additional boring was proposed and authorized to investigate the remaining property.

Soil borings B9 and B9A were completed at the approximate locations shown on Figure A7, Area 7 Soil Boring Location Plan, included in this section. The soil boring logs, included in the Appendix present the soil stratigraphy determined by the subsurface investigation. Borings B9 and B9A were completed to depths of 16.5 feet below ground surface. Fill soils were encountered to a depth of about 11 feet in B9 and about 12 feet in B9A. The fill soils consisted of brown silty clay to clayey silt with varying amounts of fine to coarse sand. The naturally occurring soils below the fill were classified as brown silty fine to coarse sand to about 14 feet in B9 and gray silty clay to 16.5 feet the maximum depth of both borings.

PID measurements, taken in the field at the time of sample recovery and in the STS soils laboratory after the samples were delivered by the field crew, did not indicate the presence of VOC's in the soil samples collected.

Groundwater monitoring wells were not installed in these borings. However, groundwater levels were noted by the field personnel at the time of the drilling. The free water surface in B9 was approximately 14 feet in depth at the completion of the boring.

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

Because of the fine grained nature of the soils below 14 feet in depth, the short term water level noted may not be indicative of the actual water table and the level should be expected to vary seasonally.

One soil sample from each boring, B9-S2 and B9A-S2, was submitted for analysis of E.P. Toxicity metal and petroleum hydrocarbons respectively. The results of the analyses are presented on Table A7-1, Area 7 Soil Laboratory Results, in this section of the report. The metals barium and cadmium were detected at a level below the hazardous waste limits. TPH analysis of these samples did not detect the presence of hydrocarbons. Groundwater from this Area was not sampled or analyzed because monitoring wells were not installed.

**TABLE A7-1**  
**Area 7 Soil Laboratory Results mg/l**

<u>Parameter</u>	<u>Sample</u> <u>B-9 S-2</u>	<u>Limits</u>
<u>EP Toxicity Metals</u>		
Barium	0.176	100
Cadmium	0.015	1.0

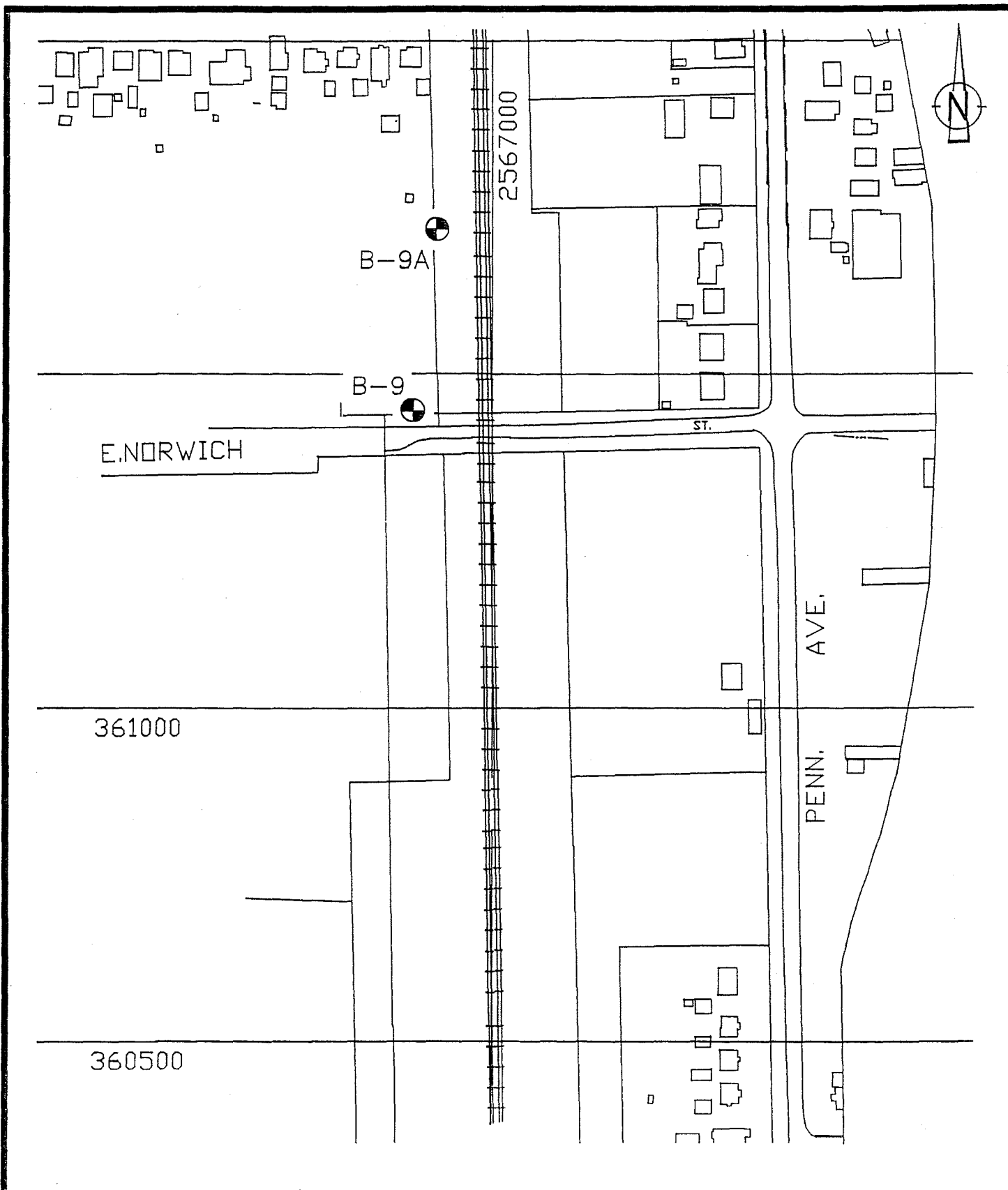
TPH - B9-S2  
TPH as gasoline and fuel oil also not detected.

Note: EP Toxicity also includes arsenic, chromium, mercury, lead, selenium, silver as not detected.

- indicates not analyzed.

N.D. indicates not detected.

The results of the field investigation and laboratory analysis does not suggest the presence of hazardous waste or petroleum materials in Area 7.



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 PHASE II ENVIRONMENTAL RECONNAISSANCE  
 LAKE ARTERIAL PROJECT  
 AREA A-7 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1"=200'	FIGURE NO.
STS PROJECT NO.		A-7

83417XF

### 3.3.5 Area 8 Vacant Property (Miscellaneous Dump)

A fill area was identified on the northeast corner of Norwich Avenue and the C&NW R.O.W. (2314 E. Norwich), which appeared to contain foundry sand and construction rubble and debris. Foundry sand could contain residues of metals, petroleum hydrocarbons or solvents. The issues at this location are associated with the potential industrial waste. This waste may contain sufficient quantities of heavy metals, petroleum products or solvents which could impact the cost of highway construction.

Two soil borings were proposed for Area 8 to determine fill and soil stratigraphy and to acquire samples for laboratory analysis. Groundwater monitoring wells were not installed.

Soil borings B10 and B11 were completed at the approximately locations shown on Figure A8, Area 8 Soil Boring Location Plan, included in this section. The soil boring logs, included in the Appendix, present the specifics of the subsurface investigation. B10 was completed to a depth of 16.5 feet while B11 was terminated at a depth of 21.5 feet. Boring 10 showed a soil profile consisting of fill material to a depth of about 7 feet. The fill material consisted of silty clay and brown fine to coarse sand and gravel. Natural soils were encountered below the fill material which consisted of brown and gray silty clays to a depth of 16.5 feet the maximum depth explored. Boring 11 indicated a soil profile consisting of fill materials to a depth of about 12 feet. This fill consisted of black foundry sand to about 7.5 feet which overlaid silty clay to clayey silt with mixed foundry sand to 12 feet. The natural soil profile, below the fill, consisted of brown silty fine to coarse sand and gravel to 21.5 feet the maximum depth explored.

A total of 16 fill and natural soil samples were collected for classification and selection for analysis. PID measurement, taken in the field, at the time of sample recovery and again after the samples were delivered to the STS soils laboratory,



Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

indicated a moderate detection of volatile organic compounds in B11. PID responses were not evident in B10.

Groundwater monitoring wells were not installed on this property, consequently, groundwater was not sampled or elevations recorded. However, groundwater was noted by the drill crew at the time of the boring and is noted on the boring log. No free water was present in B10 while a free water surface was encountered in B11 at a depth of about 19 feet.

Soil samples were selected for analysis based upon coloration, material type, PID measurements and anticipated contaminants. At B10, samples 2 and 3 were composited at the analytical laboratory for analysis of TCLP metals and TPH. From B11, sample 2 was selected for TCLP metals, sample 3 and 7 were selected for TPH and VOC's, while sample 5 was selected for TPH. The results of these analyses are presented on Table A8-1, Area 8 Soil Laboratory Results included in this section. Three of the 8 TCLP metals were detected including arsenic, barium and mercury at quantified levels less than the hazardous waste limits. VOC analysis indicated total VOC's in B11-S3 at about 49.5 ppm while VOC's were not detected in B10. The main compound present in this analysis was trichloroethylene. TPH analysis of B11-S3 indicated a concentration of 3900 ppm while TPH was not quantified in the other samples analyzed.

Howard, Needles, Tammen and Bergendoff  
 STS Project No. 83417XF  
 April 24, 1991

TABLE A8-1  
 Area 8 Soil Laboratory Results (ppm) mg/kg

<u>Parameter</u>	<u>Sample</u>		<u>RCRA Limits</u>
	<u>B10,S2</u>	<u>B11,S2</u>	
<u>TCLP Metals</u>			
Arsenic	0.16	N.D.	5.0
Barium	0.642	0.335	100.00
Mercury	0.047	N.D.	0.2
	<u>B11,S3</u>	<u>B11,S7</u>	<u>WDNR Guideline Limits</u>
Chloroform	0.006	N.D.	Background or method detection limit
1,1 DCE	0.006	N.D.	
1,2 DCE	0.009	N.D.	
1,2 DCE	0.098	N.D.	
PCE	0.086	N.D.	
1,1,1 TCA	0.007	N.D.	
TCE	49.3	0.023	
Benzene	N.D.	0.001	
Toluene	N.D.	0.02	
Xylene (m,o,p)	N.D.	0.033	
TPH	3900	N.D.	10 ppm

Notes to Table A8-1

TCLP metals also includes cadmium, chromium, lead, silver, selenium as not detected.

N.D. indicates not detected.

N.A. indicates not analyzed.

TCE - trichloroethylene

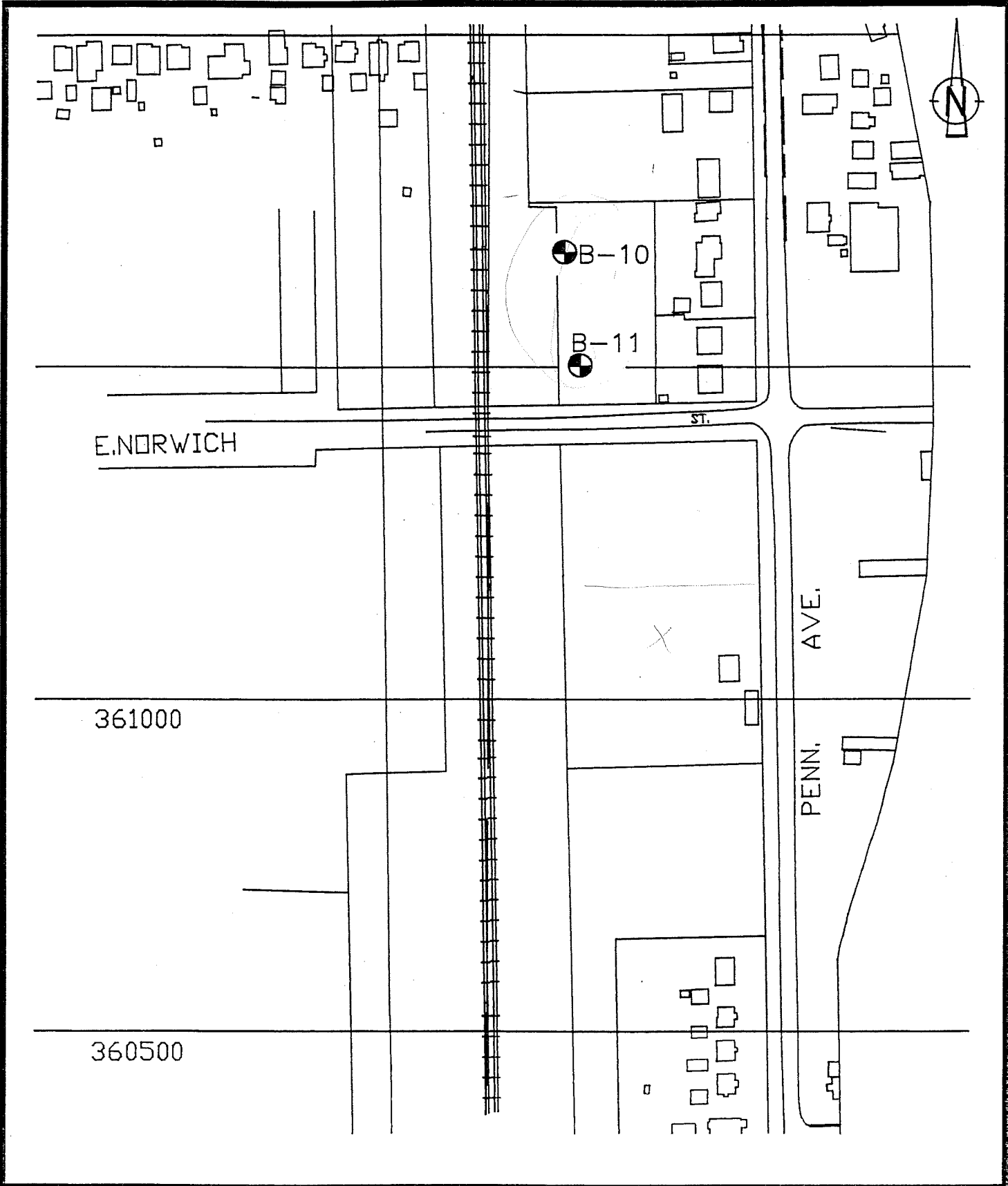
PCE - tetrachloroethylene

DCE - dichloroethylene

DCA - dichloroethane

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

The presence of the relatively high levels of VOC's in B11 may indicate the presence of hazardous waste. Additional sampling and analysis by TCLP for the VOC compounds should be performed to characterize this material. The TPH results from B11 also exceed the WDNR guideline standard for TPH content.



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 AREA A-8 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1"=200'	FIGURE NO.
		A-8
STS PROJECT NO.		83417XF

### 3.3.6 Area 9 Foundry Fill Dump

A foundry sand fill dump site was identified at the southeast corner of Norwich Avenue and the C&NW R.O.W. Foundry sand could contain residues of heavy metals, petroleum hydrocarbons or solvents. The issues at this location were those associated with the industrial waste (i.e. foundry sand) and the potential for heavy metals, petroleum products or solvents to be present which could impact the cost of the highway construction due to disposal of excavated material. The WDNR has generally ruled that foundry sand is a solid waste which requires redisposal if removed from the site.

One soil boring and one hand auger probe were completed in this area to determine fill and soil stratigraphy and to acquire samples for laboratory analysis. Soil boring B12 and hand auger probe HA12 were completed at the approximate locations shown on Figure A9, Area 9 Soil Boring Location Plan, included in this section. The soil boring logs, included in the Appendix, present the specifics on the subsurface investigation. B12 was completed to a depth of 21.5 feet while HA12 was hand augered to about two feet in depth. The hand auger was performed because of access problems for the truck mounted equipment. Fill soils were encountered to about 16 feet in B12 and consisted of brown silty fine to coarse sand and gravel. The natural soils occurring below the fill consisted of brown fine to medium sand trace silt to the maximum depth explored. The hand auger probe at HA12 encountered red and black foundry sand to 2 feet in depth.

PID measurements taken in the field at the time of sample recovery, and at the STS soils laboratory, after the samples were delivered by the field crew, did not indicate the presence of VOC's in the soils.

Groundwater monitoring wells were not installed on this property. However, groundwater levels were noted by the field personnel at the time of drilling. Groundwater was encountered in B12 at a depth of about 14 feet after the boring was completed. Because of the nature of the soil materials encountered in this boring, the short term water

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

level may not be indicative of the actual water table and the level should be expected to vary seasonally.

A total of 8 soil samples were acquired from B12 and one from HA12. One soil sample from each boring was selected and composited as one sample. B12-S2 and HA12 were composited and analyzed for E.P. Tox. metals and TPH. The results of these analyses are presented on Table A9-1, Area 9 Soil Laboratory Results, included in this section of the report. The metals barium, cadmium and chromium were detected. The concentration of these metals are below the hazardous waste limits. TPH analysis of this sample did not detect the presence of hydrocarbons.

TABLE A9-1  
Area 9 Soil Laboratory Results mg/l (ppm)

<u>Parameter</u>	<u>Sample Composite B-12 S-2 &amp; HA-12</u>	<u>RCRA Limits</u>
<u>EP Toxicity Metals</u>		
Barium	0.099	100
Cadmium	0.016	1.0
Chromium	0.013	5.0

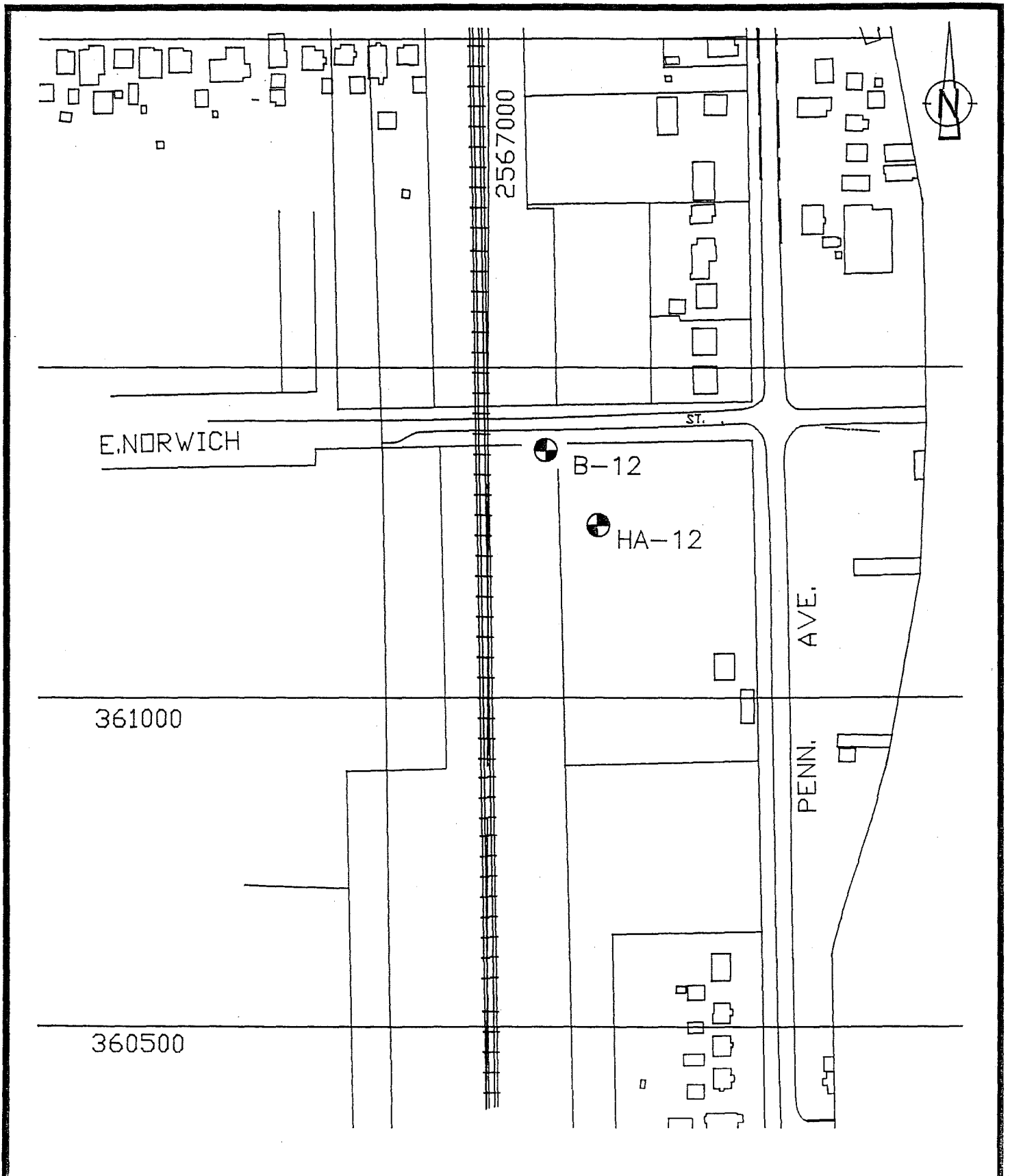
TPH

TPH as gasoline and fuel oil also not detected.

Note: EP Toxicity also includes arsenic, chromium, mercury, lead, selenium, silver as not detected.

RCRA - Resource Conservation and Recovery Act.

The results of the field investigations and laboratory analysis does not suggest the presence of hazardous materials in this area.



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 AREA A-9 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1" = 200'	FIGURE NO.
STS PROJECT NO.		A-9

83417XF

### 3.3.7 Area 10 St. Francis Auto Wreckers

The St. Francis Auto Wreckers salvage yard at 4043 S. Pennsylvania Avenue adjoins the R.O.W. on the east. The salvage yard was originally not included in the Lake Arterial R.O.W. However, due to design revisions and subsequent discussions with the WDOT, approximately the western 80 feet of the salvage yard was proposed to be included in the new highway right-of-way. The salvage yard property grade was raised with foundry sand and petroleum product contamination is apparent on the surface. The presence of petroleum hydrocarbon contamination and the potential for heavy metal and PCB contamination could affect the cost of construction of the Lake Arterial in this area.

Seven soil borings were performed to characterize the soils in this area. Borings B14 and BW13 were initially installed on the eastern edge of the R.O.W. adjacent to the salvage yard to determine if petroleum or solvent contamination was present on the initially proposed R.O.W. After the location design change, additional borings were added on the salvage yard property. BW13A, B13B, B13C, B13D and B13E were performed within the proposed 80 foot width of the salvage yard proposed to be taken for the project. Figure A10, Area 10 Soil Boring Location Plan, presented in this section, shows the location of the borings performed for this investigation. The soil boring logs are presented in the Appendix and indicate the soil stratigraphy of the Area. BW13 and B14 on the railroad right-of-way indicated a different soil profile than the other borings. Fill soil was encountered to a depth of about 4.5 feet in BW13 which consisted of brown clayey silt trace fine to coarse sand while B14 indicated a minor depth of the same fill. Natural soils, below the fill, consisted of brown to gray clayey silt to silty clay some fine to coarse sand, silts and/or fine sand to the maximum depth of the borings. BW13A and B13B were completed to a depth of 16.5 feet on the salvage yard property. These two borings indicated foundry sand fill was present to a depth of about 12 feet in B13B and 14 feet in B13A. Natural soils, encountered below the fill, consisted of gray to black, silt to clayey silt, to the maximum depth of the borings. Borings B13(C, D, E) were performed primarily to obtain near surface samples for analysis. B13(C and D) were completed to a depth of 6.5 feet. B13E was abandoned after



four separate trials could not penetrate more than 0.5 feet. Fill materials consisting of black foundry sand, some coarse concrete fragments, trace glass were encountered to the maximum depth of these borings.

Groundwater monitoring wells were installed in BW13 and BW13A to determine groundwater levels and to provide a sampling point for groundwater monitoring. The groundwater surface was recorded in each well and is reported in the following table referenced to U.S.G.S. datum.

TABLE A10  
Groundwater Elevations Area 10

<u>Well No.</u>	<u>Groundwater Elev.</u>	<u>Surface Elev.</u>
BW13	663.40	668.3
BW13A	664.24	673.6

These water elevations appear to suggest a groundwater flow direction to the west which is consistent with the presence of a drainage ditch, adjacent to the property on the west, and which flows to the east along the northern property line of the salvage yard. However, a minimum of three data points are generally required for evaluation of groundwater flow direction.

A total of 27 fill and soil samples were collected for classification and selection for analysis from these borings. PID measurements taken in the field at the time of sample recovery and again after the samples were delivered to the STS soils laboratory, indicate a moderate detection of volatile organic compounds (N.D. to 55 PID units). The PID measurements are presented on the borings logs located in the Appendix.

Soil samples were selected for laboratory analysis based upon PID measurements, coloration and odors. Volatile organic compounds, total petroleum hydrocarbons, TCLP metals and PCB's were the contaminants suspect in this Area. The following Table A10-1, Area 10 Soil Laboratory Results, presents the results of the laboratory analyses.

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STS Project No. 83417XF  
April 24, 1991

Original laboratory reports are presented in the Appendix. Volatile organic compound analysis was selected from BW13A-S6, B13B-S2, B13D-S2 and B14-S6. Total petroleum hydrocarbon samples were selected for analysis from BW13A-S1 and S3, B13B-S1 and S3, B13C-S3 and B13D-S1. Polychlorinated biphenyl (PCB) samples were selected for analysis from BW13A-S1, B13B-S1 and B13D-S1. TCLP metals were selected for analysis from BW13A-S2, and B13C-S1.

The results, shown on Table A10-1, indicate the presence of several TCLP metals, however at concentrations less than hazardous waste limit. Arsenic, barium, cadmium, lead and silver were identified in borings BW13A and B13C. Total petroleum hydrocarbons were quantified in all of the samples analyzed except one. The TPH levels ranging from no detect to 1,860 ppm are above the WDNR guideline standard of 10 ppm. Polychlorinated biphenyls (PCB's) were detected in two of the three samples analyzed at levels which could be construed as a health threat (4.80 & 474 ppm). Volatile organic compounds were also detected in three of the four samples analyzed.

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 STS Project No. 83417XF  
 April 24, 1991

TABLE A10-1  
 Area 10 Soil Laboratory Results (ppm) mg/kg

<u>Parameter</u>	<u>Sample</u>		<u>RCRA Limits</u>
	<u>BW13A-S2</u>	<u>B13C-S1</u>	
<u>TCLP Metals</u>			
Silver	0.004	0.007	5.0
Arsenic	0.057	N.D.	5.0
Barium	0.391	1.14	100.0
Cadmium	0.009	0.110	1.0
Lead	N.D.	0.416	5.0

							<u>WDNR Guideline Limits</u>
	<u>BW13A-S1</u>	<u>BW13A-S3</u>	<u>B13B-S1</u>	<u>B13B-S3</u>	<u>B13C-S3</u>	<u>B13D-S1</u>	
TPH Gasoline	N.D.	N.D.	N.D.	N.D.	N.D.	5.92	10
TPH Diesel	179*	16.6*	N.D.	2.80	1,860*	23.5*	10
PCB's	4.83	-	N.D.	-	-	474*	5.0

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 STS Project No. 83417XF  
 April 24, 1991

TABLE A10-1  
 Area 10 Soil Laboratory Results (ppm) mg/kg  
 (continued)

	<u>B13B-S2</u>	<u>BW13A-S6</u>	<u>B13D-S2</u>	<u>WDNR Guideline Limits</u>
1,1 DCA	0.002	N.D.	N.D.	
1,2 DCA	0.002	N.D.	N.D.	Background
1,2, DCE	0.102	N.D.	N.D.	or
Ethylbenzene	0.004	N.D.	0.004	method
PCE	0.216	N.D.	N.D.	detection
Toluene	0.009	N.D.	0.002	limit
1,1,1 TCA	0.019	N.D.	N.D.	
TCE	>0.650	N.D.	N.D.	
Xylene (m,o,p)	N.D.	0.012	0.011	

Notes to Table A10-1

TCLP metals also includes cadmium, chromium, lead, silver, selenium as not detected.

N.D. indicates not detected.

N.A. indicates not analyzed.

TCE - trichloroethylene

PCE - tetrachloroethylene

DCE - dichloroethylene

DCA - dichloroethane

Howard, Needles, Tammen and Bergendoff  
 STS Project No. 83417XF  
 April 24, 1991

The samples analyzed for TPH and PCB's indicated levels which exceed the WDNR guideline standards or the EPA cleanup criteria. TPH levels identified on this property are well in excess of the WDNR standard. PCB levels exceed the EPA and WDNR standards and require reporting to the National Response Center (NRC).

Groundwater samples were collected from each well and analyzed for substances of concern. The results of the groundwater analyses is presented in Table A10-2, Area 10 Groundwater Results, included in this section. The groundwater samples were analyzed for VOC compounds and soluble metals. Three VOC compounds were identified with benzene quantified at a level exceeding the NR140 PAL. Two metals were also quantified with the metal barium also exceeding the NR140 PAL.

TABLE A10-2  
 Area 10 Groundwater Laboratory Results (ppb)

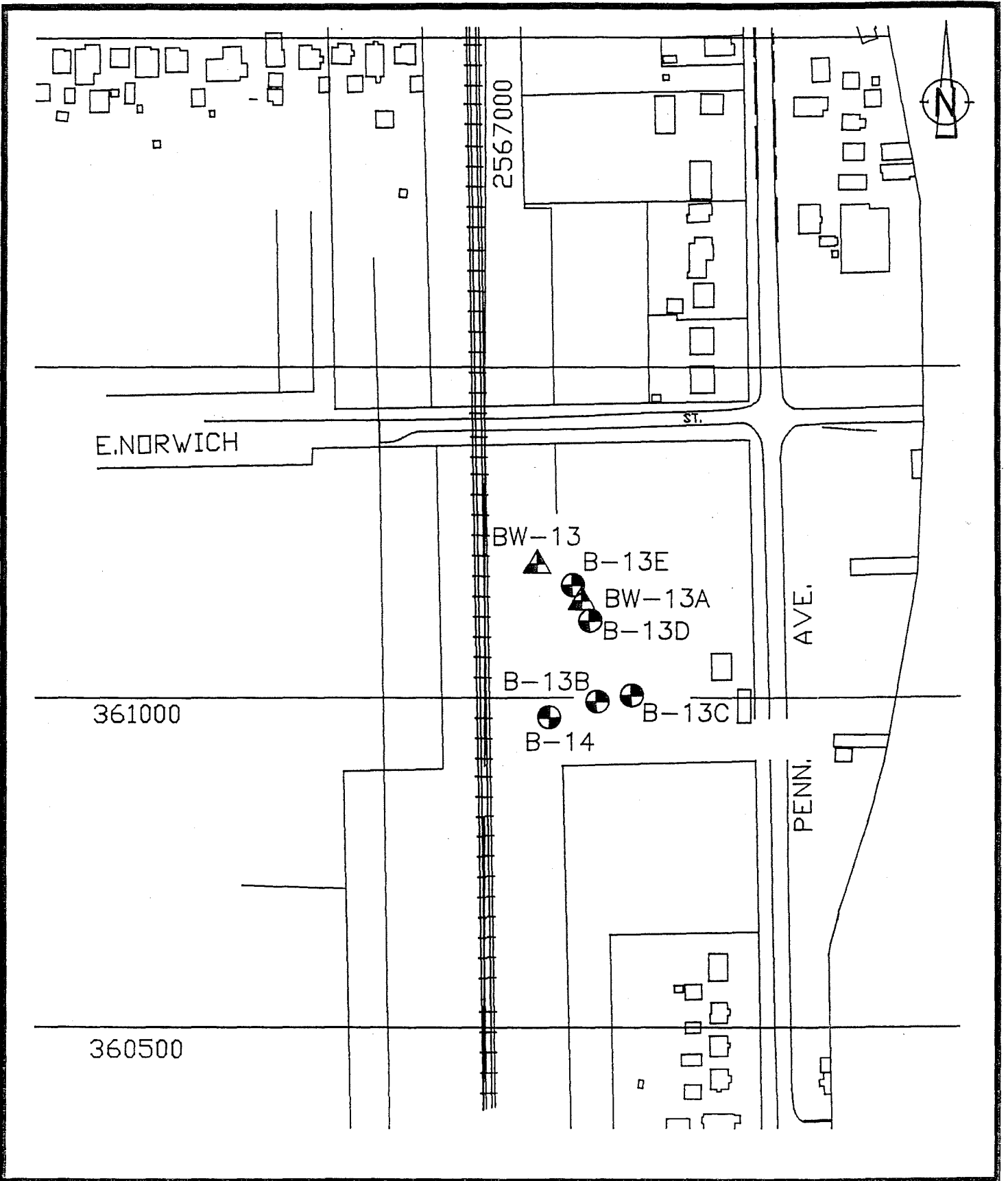
<u>Parameter</u>	<u>Sample</u>		<u>NR 140 Limits</u>	
	<u>BW13A</u>	<u>BW13</u>	<u>E.S.</u>	<u>PAL</u>
<u>VOC's</u>				
Benzene	0.97 <sup>(1)</sup>	N.D.	5.0	0.067
1,1-Dichloroethane	1.08	N.D.	850	85
Toluene	1.20	N.D.	343	68.6
<u>Metals</u>				
Barium	248 <sup>(1)</sup>	84	1000	200
Lead	N.D.	3.4	50	5

Notes to Table A10-2

<sup>(1)</sup> - PAL exceedence

N.D. indicates not detected

The results of the soil and groundwater analyses for environmental contaminants suggest significant impacts to the soils are present while moderate groundwater impacts were identified.



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 AREA A-10 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1" = 200'	FIGURE NO.
STS PROJECT NO.	A-10	

83417XF

### 3.3.8 Area 12 Railroad Bridge South of Norwich Avenue

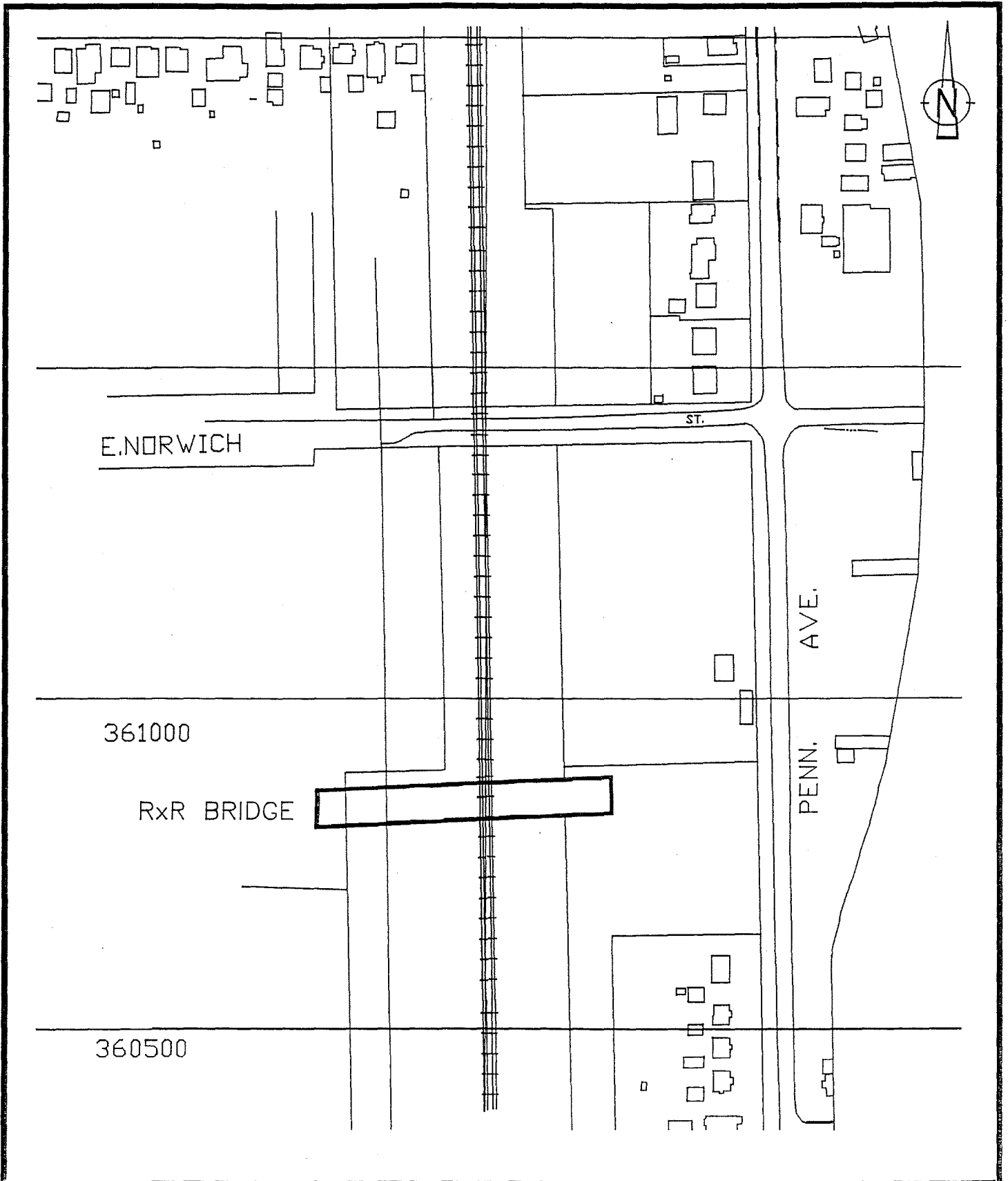
An old railroad bridge exists south of Norwich Avenue which is elevated above the C&NW R.O.W. This elevated bridge was a part of the rail line serving the former Lakeside Power Plant. The issue associated with this bridge was the potential presence of asbestos containing materials (ACM) on the bridge structure which could affect the cost of demolition and thereby impact the Lake Arterial construction.

The suspect ACM occurred on the south face of the bridge as "transite" pipe or more commonly known as asbestos cement pipe. Asbestos cement pipe is a hard and durable, non-friable material which was used in this case as duct work for electrical cables. Five-three inch diameter pipes run the entire length of the bridge which totals approximately 825 lineal feet of pipe.

A sample of one pipe was removed for analysis of asbestos content by the polarized light microscopy and dispersion staining technique. The sample was submitted to the West Allis Memorial Hospital environmental laboratory in West Allis, Wisconsin with the proper of custody for sample identification.

The results of this analysis indicated 50-75 percent chrysotile asbestos and 5-15 percent crocidolite asbestos. The remaining percentage was inert binder materials.

ACM requires removal prior to structure demolition so as not to cause damage to the ACM and subsequent fiber release to the air. Because this material is an ACM, a contractor specializing in asbestos removal techniques is required and the pipe should be disposed as asbestos waste. The original laboratory report is included in the Appendix.



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PHASE II ENVIRONMENTAL RECONNAISSANCE  
 LAKE ARTERIAL PROJECT  
 AREA A-12  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1" = 200'	FIGURE NO.
STS PROJECT NO.	83417XF	

A-12

83417XF



### 3.3.9 Area 15 Tunnel Section

An open cut box tunnel section was proposed to carry the Lake Arterial traffic beneath St. Francis Avenue and the C&NW railroad St. Francis interchange. Previous borings, in this area, were performed for the Milwaukee Metropolitan Sewerage District (MMSD) solids pipe line which is present along the length of the railroad R.O.W. The MMSD boring north of St. Francis Avenue indicated a relatively shallow water table with granular soils extending to depths greater than the tunnel invert elevation. The initial issue associated with construction of the tunnel section was the water quality of the groundwater and whether compounds were present which would require groundwater treatment prior to discharging the groundwater collected during construction dewatering operations.

Additional discussions with the WDOT suggested the former gasoline service station at 2203 St. Francis Avenue would be included in the excavation zone of the tunnel section due to tunnel realignment. Two reports of the subject service station investigation were prepared by Aqua-Tech of Port Washington, Wisconsin and were reviewed by STS, at the request of WDOT, to determine if additional investigations should be performed on the service station property. The issues on the service station site were gasoline contaminated soils and groundwater contamination which would be encountered within the tunnel excavation zone.

One groundwater monitoring well was initially proposed north of St. Francis Avenue to determine groundwater quality. Three additional groundwater monitoring wells were installed on and near the service station property to determine the presence of petroleum product contamination in the groundwater beneath the service station.

Soil borings and monitoring wells were installed at BW15, BW15A, BW15B and BW15C. BW15 was installed as the initial monitoring well north of St. Francis Avenue. BW15A, B and C were installed to monitor groundwater conditions on and near the service station property. The monitoring well locations are shown on Figure A15, Area 15 Soil Boring

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

and Monitoring Well Location Plan, included in this section. The soil boring logs and monitoring well construction diagrams, included in the Appendix present the subsurface stratigraphy and well construction details.

BW15 was completed to 26.5 feet in depth and encountered about 12 inches of black organic topsoil overlying natural clayey or silty fine sands to about 11 feet in depth. Continuing to 26.5 feet, the maximum depth of the boring, gray fine sandy silts were present. BW15A, B and C were completed to depths of 16.5 feet, 17.5 feet and 16.5 feet, respectively. BW15A was completed to the west of the service station property while BW15B and C were completed on the service station property. These three (3) borings encountered the same general soil profile on and near the service station. The soils were generally layered silty clay, silt, and fine to coarse sand to the maximum depths explored.

PID measurements taken in the field at the time of sample recovery, and at the STS soils laboratory after the soils samples were delivered by the field crew, did not indicate the presence of VOC's in borings BW15 or BW15A. However, relatively high VOC readings were present in BW15B and BW15C. These last two (2) borings were completed on the service station property and indicate the probable presence of gasoline contaminated soils.

Groundwater monitoring wells were installed in all four (4) borings in this Area for the purpose of providing groundwater sampling points. A detailed monitoring well construction diagram for each well is included in the Appendix of this report. Groundwater levels in each well were measured in relation to elevations provided by HNTB and are referenced to U.S.G.S. Datum.

TABLE A15  
Groundwater Elevation Area 15

<u>Well No.</u>	<u>Groundwater Elev.</u>	<u>Surface Elev.</u>
BW15	646.83	656.7
BW15A	648.45	657.8
BW15B	647.49	657.4
BW15C	647.81	658.4

These elevations indicated a groundwater flow direction towards the northeast at a depth of about 9 to 11 feet below existing surface topography. Groundwater samples were also taken from each well and analyzed for substances of concern. The results of the groundwater analysis are presented in Table A15-1, Area 15 Groundwater Results, included in this section. Each groundwater sample was analyzed for 34 VOC compounds while the BW15 analysis also included the metals listed in the Wisconsin Administrative Code NR140 Groundwater Quality Public Health Standards. VOC's were not detected in BW15 and BW15A north and west of the service station property while the metal barium was quantified in BW15 at a concentration below the NR140 PAL. VOC's were present in BW15B and C at relatively high levels. The compounds encountered; benzene, ethylbenzene, toluene and xylene are compounds indicative of gasoline.

TABLE A15-A  
 Area 15 Groundwater Results (ppb) ug/l

<u>Parameters</u>	<u>BW15</u>	<u>BW15A</u>	<u>BW15B</u>	<u>BW15C</u>	<u>NR 140 Limits</u>	
					<u>E.S.</u>	<u>PAL</u>
VOC's						
• Benzene	N.D.	N.D.	46.3 <sup>(2)</sup>	7290 <sup>(2)</sup>	0.67	0.067
• Ethylbenzene	N.D.	N.D.	5.62	2430 <sup>(2)</sup>	1360	272
• Toluene	N.D.	N.D.	2.09	19,300 <sup>(2)</sup>	343	68.6
• Xylene (m+o)	N.D.	N.D.	122.28	14,160 <sup>(2)</sup>	620	124
Barium	37	---	---	---	1000	200

Notes to Table A15-A: - indicates not analyzed.

N.D. indicates not detected.

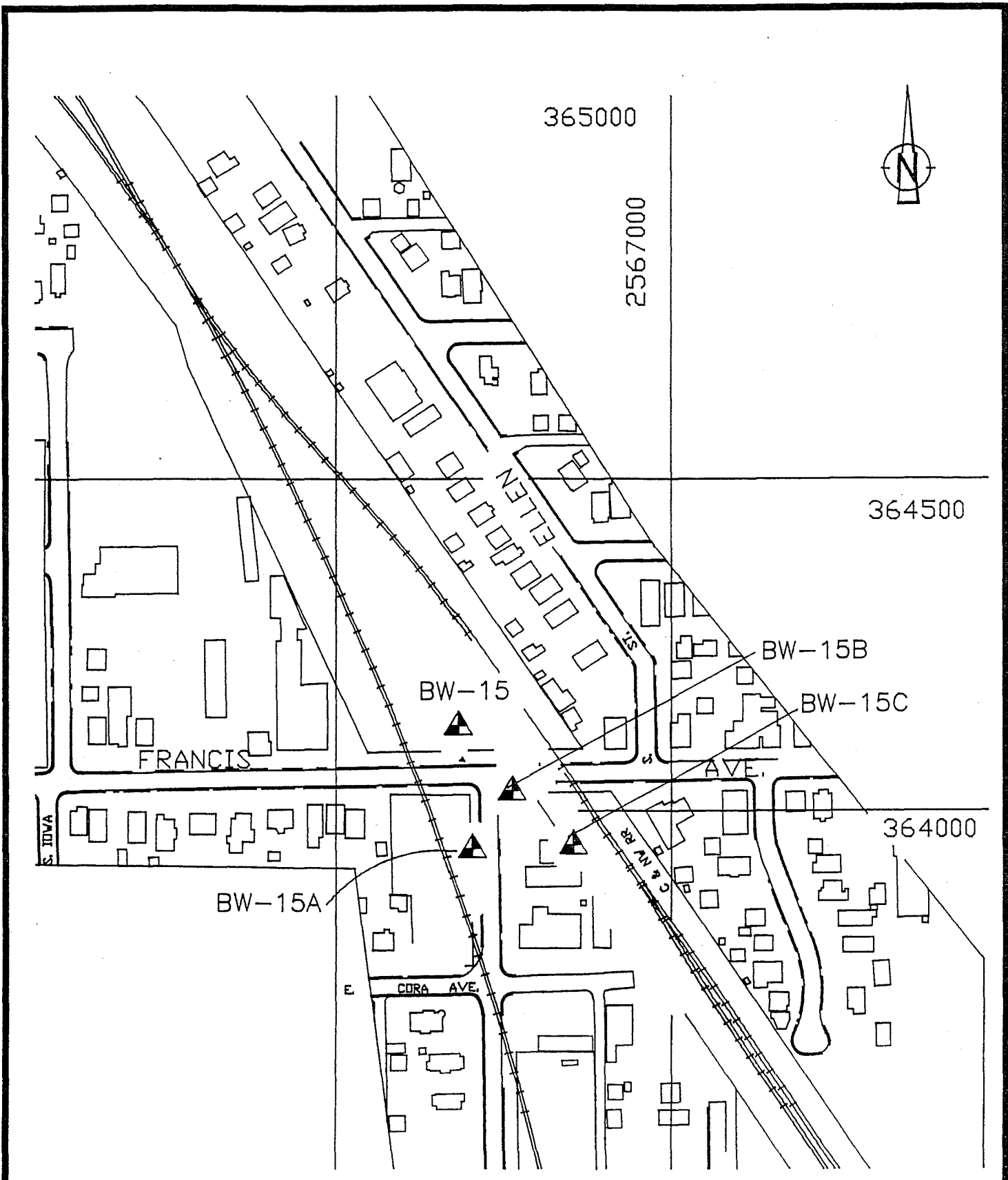
<sup>(1)</sup> exceeds Wisconsin P.A.L.

<sup>(2)</sup> exceeds Wisconsin E.S.

methylene chloride was also present in the VOC results but is considered to be a laboratory contaminant.

Soils samples from these borings were not submitted for analysis since the focus of the assessment was on groundwater quality. The results of the field investigation and laboratory analysis indicate gasoline contamination is apparent in the soils from the PID readings and groundwater beneath the service station property. Groundwater exists at depth of 9 to 11 feet below the existing topography and is moving in a generally northeasterly direction. Groundwater contamination was not detected west or north of the property. Therefore dewatering activities may not require special discharge permits. Dewatering will however change the groundwater flow pattern in the vicinity of the tunnel construction which will cause gasoline contaminated groundwater to flow from the service station property. Other sources of groundwater contamination may also be present in the area of dewatering activities which may not become apparent until groundwater flow patterns are changed through the construction activities.

Additional discussions with WDOT concluded that the present owner of the service station was responsible to secure the necessary help needed in remediating the property prior to WDOT ownership.



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PHASE II ENVIRONMENTAL RECONNAISSANCE  
 LAKE ARTERIAL PROJECT  
 AREA A-15 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	FIGURE NO.	
1" = 200'	A-15	
STS PROJECT NO.		

83417XF

### 3.3.10 Area 17 Ellen Playfield

Ellen Playfield at 1829 E. Fernwood Avenue was not a part of the original workscope proposed for the Lake Arterial. Discussions with the WDOT on August 23, 1990, indicated the alignment would be moved to the east and encroach on the north-west corner of the playfield. Historical information suggested a city of Milwaukee incinerator ash dump also existed at this location. The issues at this location are similar to Area 1 and 19 and include heavy metals, TPH and VOC's.

Two soil borings were proposed and completed for this Area investigation on the northwest corner of the playfield to determine possible fill and soil stratigraphy and to acquire samples for laboratory analysis. Soil borings EP-1 and EP-2 were completed to depths of 16.5 feet in the approximate locations shown on Figure A17, Area 17 Soil Boring Location Plan presented in this section. The soil boring logs are presented in the Appendix and indicate the soil stratigraphy of the Area. Borings EP-1 and EP-2 contained a similar soil/fill profile. Fill soils consisting of silt and clayey silt were present in both borings to a depth of about 7 feet in EP-1 and a depth of about 2 feet in boring EP-2. Fill material consisting of ash, cinders, fine to coarse sand, glass and brick fragments were present to a depth of about 15.5 feet in boring EP-1 and to a depth of about 9.5 feet in boring EP-2. Natural soils were encountered below the fill material which consisted of silt to clayey silt, trace fine sand to 16.5 feet the maximum depth of the borings.

Groundwater monitoring wells were not installed on this property. Groundwater levels were noted by the drill crew at the time of the borings and noted on the boring logs. The groundwater surface was not encountered at the time of the borings and both borings were noted as dry upon completion. Short term water levels should however be expected to fluctuate seasonally because of variations in precipitation and surface runoff.

A total of 14 fill and soil samples were collected for classification and selection for analysis from these borings. PID measurements taken in the field at the time of sample

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

recovery and again after the samples were delivered to the STS soils laboratory, indicated a low detection of volatile organic compounds. The PID measurements are presented on the boring logs located in the Appendix.

Soil samples were selected for laboratory analysis based upon PID measurements, coloration, materials and odors. Volatile organic compounds, total petroleum hydrocarbons and TCLP metals were the contaminants suspected in this Area. The following Table A17-1, Area 17 Soil Laboratory Results, presents the results of the laboratory soil analyses. The original laboratory reports are presented in the Appendix. A composite sample of boring EP-1 samples 4, 5 and 6; and a composite sample of boring EP-2 samples 2, 3 and 4 were analyzed for the TCLP metals. Leachable barium was detected in boring EP-1 while leachable barium, cadmium, chromium, lead and silver were detected in boring EP-2. The quantified levels of these metals are below the characteristic hazardous waste limits for these materials. Total petroleum hydrocarbon analysis was also performed on these two composite samples. The TPH results indicated the presence of diesel fuel in boring EP-2 at concentrations above the general WDNR guidelines. TPH was not detected in boring EP-1. Volatile organic compound analysis was also performed on these two composite samples which did not detect any of the compounds in the analytical method.

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 STS Project No. 83417XF  
 April 24, 1991

TABLE A17-1 Ellen Playfield  
 Area 17 Soil Laboratory Results mg/l (ppm)

<u>Parameter</u>	<u>Sample</u>		<u>RCRA</u> <u>Limits</u>
	<u>TCLP Metals</u>	<u>EP1,S4-5-6</u>	<u>EP2,S2-3-4</u>
Barium	1.35	0.701	100.0
Cadmium	N.D.	0.023	1.0
Chromium	N.D.	0.015	5.0
Lead	N.D.	1.72	5.0
Silver	N.D.	0.005	5.0
			<u>WDNR</u> <u>Guideline</u> <u>Limits</u>
TPH (Diesel) (ppm)	N.D.	51.1	10.0

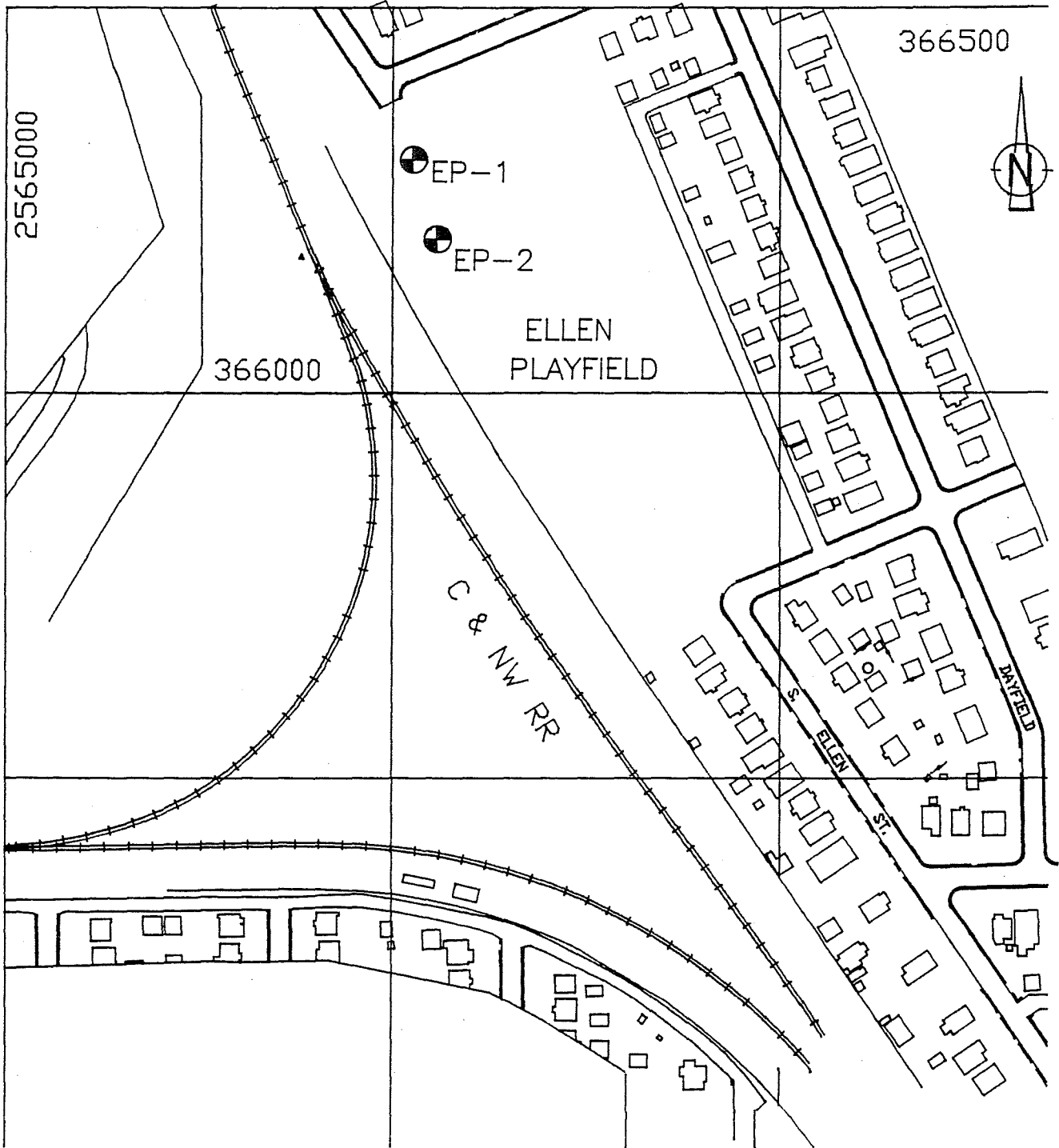
VOC's not detected in samples analyzed

Notes to Table A17-1

TCLP also includes arsenic, mercury, selenium  
 N.D. indicates not detected

The results of the field investigation of the Area suggest the presence of petroleum fuel contamination on a portion of the site. WDNR's position on fuel spills has been to remove the source of the contamination to the guideline limit of less than 10 ppm. However, because these soils will probably not be excavated, remediation may not be required.





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 AREA A-17 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1"=200'	FIGURE NO.
STS PROJECT NO.	83417XF	A-17

### 3.3.11 Area 18 Railroad R.O.W. Adjacent to Milwaukee Forge

Milwaukee Forge, an old industrial metal forging facility on east Oklahoma Avenue, lies adjacent to the C&NW railroad R.O.W. and the proposed Lake Arterial R.O.W. Drop forging and metal castings are the primary business activity of this company. Potential cross-over contamination to the railroad R.O.W. was considered the primary issue in this Area. Underground storage tanks containing fuel oil are present on the Milwaukee Forge property therefore, TPH as diesel was a potential contaminant. Other issues included heavy metals and solvents from the metals working operation.

Six (6) soil borings, three of which were converted to groundwater monitoring wells, were proposed along the length of the railroad alignment, from Oklahoma Avenue north to the north property line of the Milwaukee Forge facility. Figure A18, Soil Boring Location Plan, indicates the approximate location of soil borings and monitoring wells located along this stretch of the R.O.W. The soil boring logs are included in the Appendix.

The borings which were completed in this location are labeled B16, BW17, B18, BW19, BW20 and B21. All six (6) were extended to 16.5 feet in depth with the exception of BW20 which was completed to 19.4 feet in depth. The soil stratigraphy indicated by these borings suggests natural brown and gray silt as the predominate soil type with varying amounts of fine sand and clay. Some fill soils were encountered in B16 and B17 which are considered to be the result of raising and leveling the right-of-way topography at the approach to the railroad bridge crossing Oklahoma Avenue.

A total of 43 soils samples were acquired along this stretch of the alignment. PID measurements, taken in the field, at the time of sample recovery, and at the STS soils laboratory after the samples were delivered to the office, did not indicate the presence of VOC's in any of the samples.

Groundwater monitoring wells were installed in borings BW17, BW19 and BW20 as shown on Figure A18. Well construction details are included in the Appendix. The groundwater surface was measured in each well and is reported in the following table referenced to U.S.G.S. datum.

**TABLE A18  
 Groundwater Elevations Area 18**

<u>Well No.</u>	<u>Groundwater Elev.</u>	<u>Surface Elev.</u>
BW17	626.20	630.0
BW19	625.92	627.5
BW20	625.34	627.0

The groundwater table in this area appears to exist approximately 2 to 4 feet below existing grades and may be flowing in a generally northerly to northeasterly direction.

Due to the lack of fill soils and apparent VOC impacts, the proposed laboratory testing program was reduced in this Area. Sample S1 from borings B16B, B18 and B21 were composited into one sample and analyzed for TCLP metals. Also, sample S1 from borings BW17, BW19 and BW20 were composited into one sample for TPH analysis. The results, presented on Table A18-1, Area 18, Soil Laboratory Results, indicated the metal barium was detected. This concentration of barium is well below the regulatory limit for this metal. The table also presents the results of the TPH analysis. TPH was not detected in the composite sample.

**TABLE A18-1  
 Area 18 Soil Laboratory Results (ppm) mg/l**

<u>Parameter</u>	<u>Limits</u>	<u>Sample</u>
<u>TCLP Metals</u>		<u>B-14 S-6</u>
Barium	100	0.319

TPH was not detected.

Note: TCLP includes arsenic, cadmium, chromium, lead, mercury, selenium, silver as not detected.

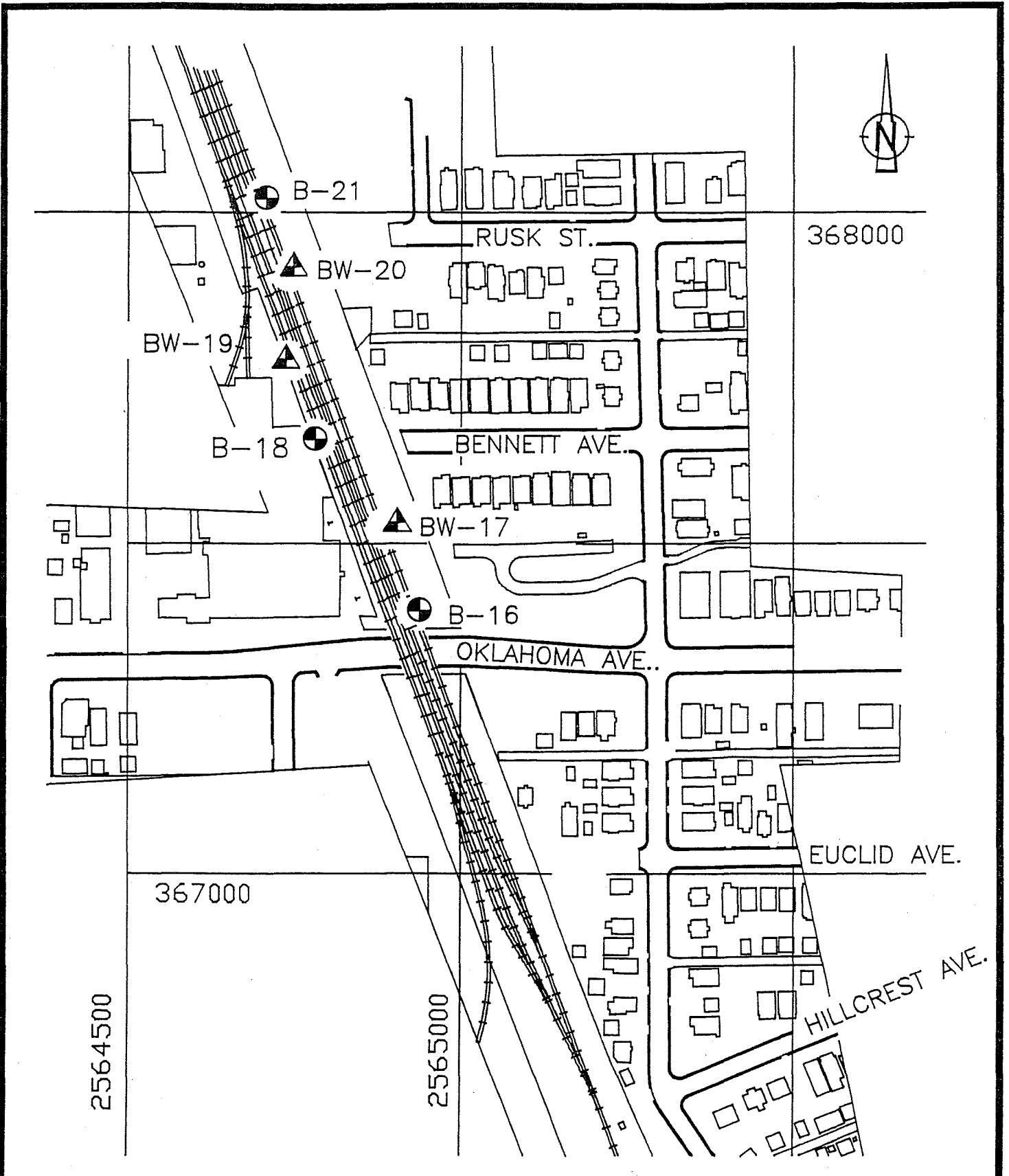
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 STS Project No. 83417XF  
 April 24, 1991

One groundwater sample from each monitoring well in this Area (BW17, BW19, BW20) was submitted to the laboratory for analysis of VOCs and soluble metals. Table A18-2, Groundwater Analytical Results, presents the results of the analysis. The 34 VOC's included in the analytical method were not detected. The metals analysis detected barium and lead in the groundwater, however, the concentration of these metals is below the Wisconsin Administrative Code NR140 regulatory limits. The results of the field investigation and laboratory analysis do not suggest the presence of hazardous materials in this Area.

**TABLE A18-2**  
**Area 18 Groundwater Analytical Results (ppb) ug/l**

<u>Parameter</u>	<u>Sample</u>			<u>NR140 Limits</u>	
	<u>BW-13</u>	<u>BW-19</u>	<u>BW-20</u>	<u>E.S.</u>	<u>PAL</u>
VOC's	N.D.	N.D.	N.D.		
<u>Metals</u>					
Barium	8	23	92	100	200
Lead	2.1	N.D.	N.D.	50	5

Notes: N.D. indicates no detect. Metals also includes arsenic, cadmium, chromium, mercury, selenium, silver as not detected.



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 AREA A-18 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	10/4/90
CHECKED BY	B.M.F.	10/4/90
APPROVED BY	K.R.H.	10/4/90
SCALE	FIGURE NO.	
1" = 200'	A-18	
STS PROJECT NO.		

83417XF

### 3.3.12 Area 19 Sijan Field

Sijan Field at 2821 S. Kinnickinnic Avenue was previously identified as a former clay borrow pit and a city of Milwaukee incinerator ash landfill in the Phase I report. The city of Milwaukee used the property to dispose of burned municipal trash from incinerator operations. The issues at this location included the presence of heavy metals in the incinerator ash and the possible disposal of solvents and petroleum products.

Two soil borings converted to groundwater monitoring wells were initially proposed and completed in this Area. Because of impacts encountered in one of these borings, the program was expanded at the request of WDOT to investigate the soils which would be excavated for retaining wall construction along the common property line of the existing railroad right-of-way and Sijan Field.

A total of eight (8) soil borings were then performed to define the extent of potential environmental impacts. The original borings, BW-22, and BW-23 were completed to depths of 21.5 and 16.5 feet respectively. These two borings were converted to groundwater monitoring wells. An additional six shallow borings, B-22 (A,B,C) and B-23 (A,B,C) were completed to depths of about 6 feet along the alignment of the proposed retaining walls. The boring location are shown of Figure A19, Boring Location Plan Area 19, presented in this section. The soil borings logs for each location are presented in the Appendix.

The soil stratigraphy identified in BW-22 and BW-23 indicated about 13 to 15 feet of fill material consisting of fine to coarse sand, some ash and cinders, trace glass and wood overlaid natural gray silty clay to the maximum depth of the borings. The shallow borings B-22 (A,B,C) and B-23 (A,B,C), completed to a depth of 6 feet also indicated fill materials consistent with the two deeper borings (BW-22 and BW-23). The borings did not penetrate the entire fill depth at B-22 (A,B,C). However, natural soils were encountered in B-23 (A,B,C) at depths of about 4 feet, 1 foot and 4 feet respectively. The natural soils encountered consisted of brown clayey silt to silt with trace to some fine sand.

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

PID measurements taken in the field at the time of the soil borings and again at the STS soils laboratory indicated a low to moderate presence of volatile organic compounds. The response of the meter is presented on the individual borings logs located in the Appendix.

Groundwater monitoring wells were installed in BW-22 and BW-23. A well construction diagram for each well is presented in the Appendix. The groundwater surface as measured in each well is reported in the following Table, referenced to U.S.G.S. datum.

TABLE A 19  
Groundwater Elevations Area 19

<u>Well No.</u>	<u>Groundwater Elev. USGS</u>	<u>Surface Elev. USGS</u>
BW-22	611.08	627.80
BW-23	600.95	607.80

The groundwater surface varies across this property and is present at a depth of 16.7 feet in boring BW-22 and at a depth of 6.9 feet in BW-23. The considerable difference in the water table elevations may be due to the difference in topography and the past clay mining of the area. The slope or flow of the water table appears to be to the north based upon the surveyed elevations. However, three wells are required for an adequate directional determination. Based upon the slope of the land and area topographic maps, the water table probably flows towards the northeast.

A total of 34 soil samples were recovered during the drilling program for classification and to provide samples for laboratory analysis. Soil samples selected for laboratory analysis were chosen based upon material, coloration, odor and PID measurements. Soil samples were composited over depth in all eight borings for analysis of TCLP metals, TPH and VOC's.

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April 24, 1991

The samples composited in each boring are shown on the following table, Table A 19-1, Area 19 Soil Analytical Results along with the analytical results. Of the eight metals analyzed in the laboratory method, five (5) were detected. These were arsenic, barium, cadmium, lead and silver. One of these (lead) exceeded the federal limits for a characteristic hazardous waste (5.0 mg/kg). This occurred at boring BW-23 composite sample S3, 4, 5, 6. Because this was a composite of four individual samples, the lead content of one or more of the samples may be greater than 5 mg/kg. TPH as diesel was quantified in the six samples analyzed from B-22 (A, B, C) and B-23 (A, B, C). The analytical results suggest a relatively high diesel content of these samples. The WDNR guideline cleanup standard of 10 ppm has been exceeded in all six samples. Samples from BW-22 and 23 were not submitted for TPH. VOC's were quantified in borings BW-22 and 23. The compounds 1,2 dichloroethylene and toluene were detected at relatively low levels. WDNR guideline cleanup standards have required removal to a no detection level in the past. Borings B-22 (A, B, C) and B-23 (A, B, C) were not submitted for VOC analysis. Sincere there was no evidence of volatile chemicals during screenings and no odors were noted in the samples.



**TABLE 19A1-1**  
**Area 19 Soil Analytical Results (ppm) mg/kg**

Parameter	Units	Sample Composites								RCRA Limits
		BW22 S2,3,4	B22A S2,3	B22B S2,3	B22C S2,3	BW23 S3,4,5,6	B23A S1,2	B23B S1,2	B23C S1,2	
<u>TCLP Metals</u>										
Arsenic	mg/l	N.D.	0.065	N.D.	N.D.	N.D.	N.D.	0.122	0.156	5.0
Barium		1.56	0.95	1.18	0.775	1.34	0.553	0.473	0.450	100.0
Cadmium		0.163	0.017	0.03	0.007	0.099	0.005	N.D.	0.012	1.0
Lead		0.854	1.93	1.93	N.D.	5.0*	0.092	0.118	N.D.	5.0
Silver		N.D.	0.005	0.007	N.D.	N.D.	N.D.	N.D.	0.009	5.0
<u>TPH</u>										
Diesel	mg/kg	—	164	275	309	—	507	28.6	28.3	10
<u>VOC</u>										
1,2 Dichloroethylene	mg/kg	0.010	—	—	—	N.D.	—	—	—	No detection
Toluene	mg/kg	0.016	—	—	—	0.006	—	—	—	No detection

Notes to Table 1:

N.D. indicates not detected.

— indicates not analyzed.

\* indicates regulatory exceedence.

(1) includes benzene, 1,1 dichloroethylene, ethylbenzene, toluene, xylene.

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 STS Project No. 83417XF  
 April 24, 1991

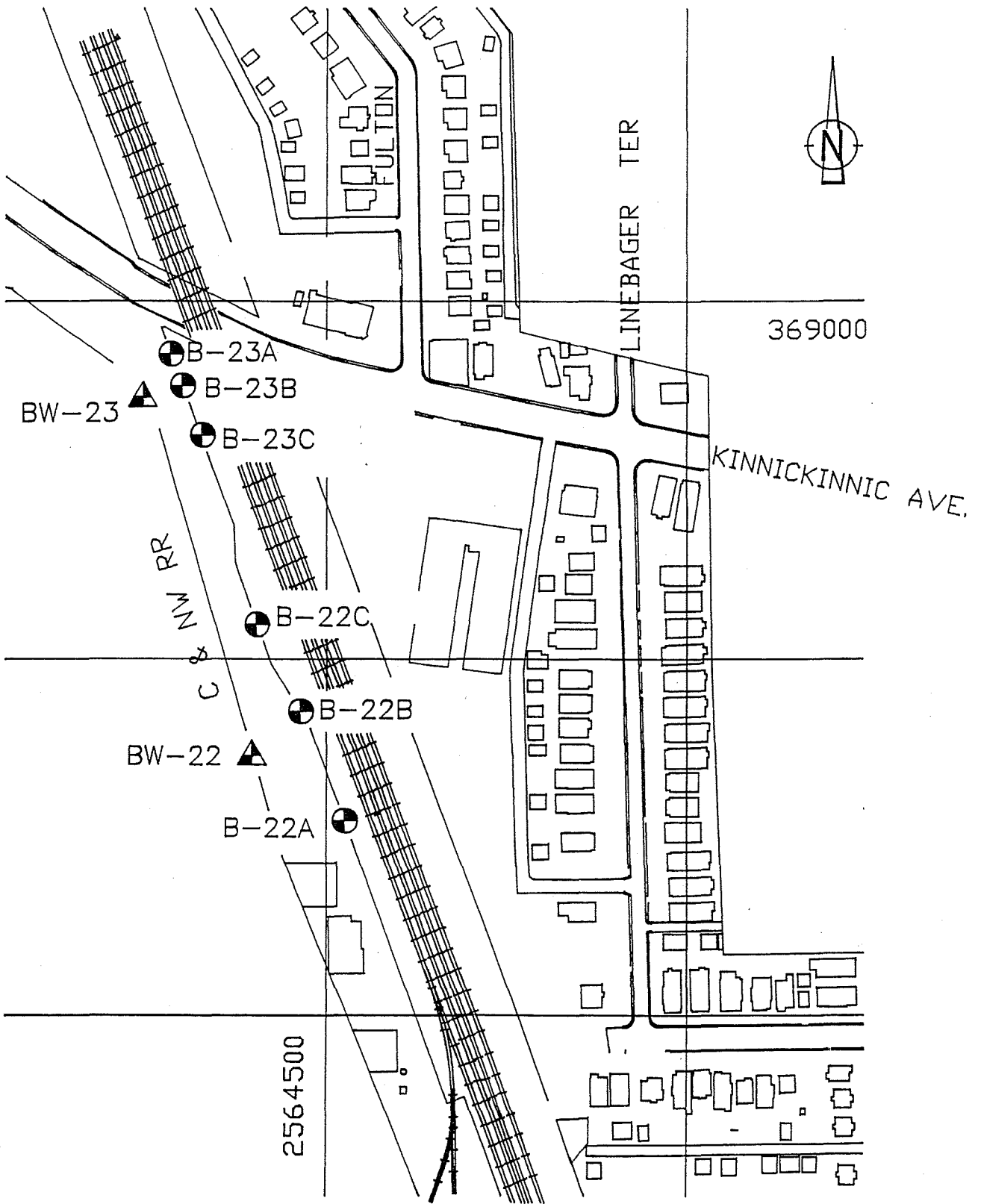
Groundwater was sampled and analyzed from the two monitoring wells installed on the property. The following table, Table A19-2, Area 19 Groundwater Analytical Results, indicates the results of the analysis. Analysis of the water from BW-22 and BW-23 included VOC's and Wisconsin Administrative Code NR 140 Public Health metals. VOC's were not detected. Three metals were present which were detected at levels less than the limits specified in the code.

TABLE A19-2  
 Area 19 Groundwater Analytical Results (ppb) ug/l

<u>Parameter</u>	<u>Sample</u>		<u>NR140 Limits</u> <u>E.S.</u> <u>PAL</u>	
	<u>BW-22</u>	<u>BW-23</u>		
VOC's	not detected			
<u>Metals</u> - Public Health				
· Arsenic	N.D.	0.0088	5.0	5
· Barium	0.011	0.105	1000	200
· Silver	0.009	N.D.	50	10

Notes: N.D. indicates no detect. Metals also includes arsenic, cadmium, chromium, mercury, selenium, silver as not detected.

The results of the field investigations and laboratory analysis of this Area suggest the presence of petroleum contaminated soils which may require remediation along the position of the proposed retaining walls. The presence of the heavy metal lead in one of the borings performed on the playfield should not impact the Lake Arterial project if construction is not performed off of the presently anticipated right-of-way.



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 AREA A-19 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1"=200'	FIGURE NO.
STS PROJECT NO.	83417XF	A-19

### 3.3.13 Area 20 Former Service Station

The property at the southeast quadrant of Kinnickinnic Avenue and the C&NW right-of-way formerly contained a service station. Construction of retaining walls along the right-of-way line for the Lake Arterial project could encounter petroleum contaminated soils which may impact the proposed construction. Discussions with the WDOT in a meeting August 23, 1990 indicated a realignment of the Lake Arterial right-of-way to the east which necessitated the construction of the retaining walls. A boring was proposed and completed which was not a part of the original scope of work for this project.

Soil boring B-23 D was completed to a depth of 16.5 feet to determine if the soils to be excavated for the retaining wall were impacted by a petroleum fuel. The location of the boring is shown on Figure A20, Area 20 Soil Boring Location Plan included in this section. The soil boring log for this location is included in the Appendix and presents the specifics of the soil stratigraphy.

Boring B-23D indicated a soil profile consisting about 1 foot of fill soil overlying natural silt with varying amounts of clay and fine sand to the maximum depth of the boring.

PID measurements taken in the field at the time of the boring and in the STS soils laboratory when the soils were classified, did not indicate the presence of VOC's in the samples collected.

A groundwater monitoring well was not installed in this boring. Water was not observed in the borehole by the drill crew when the boring was advanced. However, short term water level measurements in an open borehole may not be an accurate indication of the actual water table on a site. A better indication in fine grained soils may be color change in the natural soils from brown to gray which was observed at a depth of about 12

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

feet. This change may indicate saturated condition below that depth. The water table may therefore be encountered at a depth of about 12 feet.

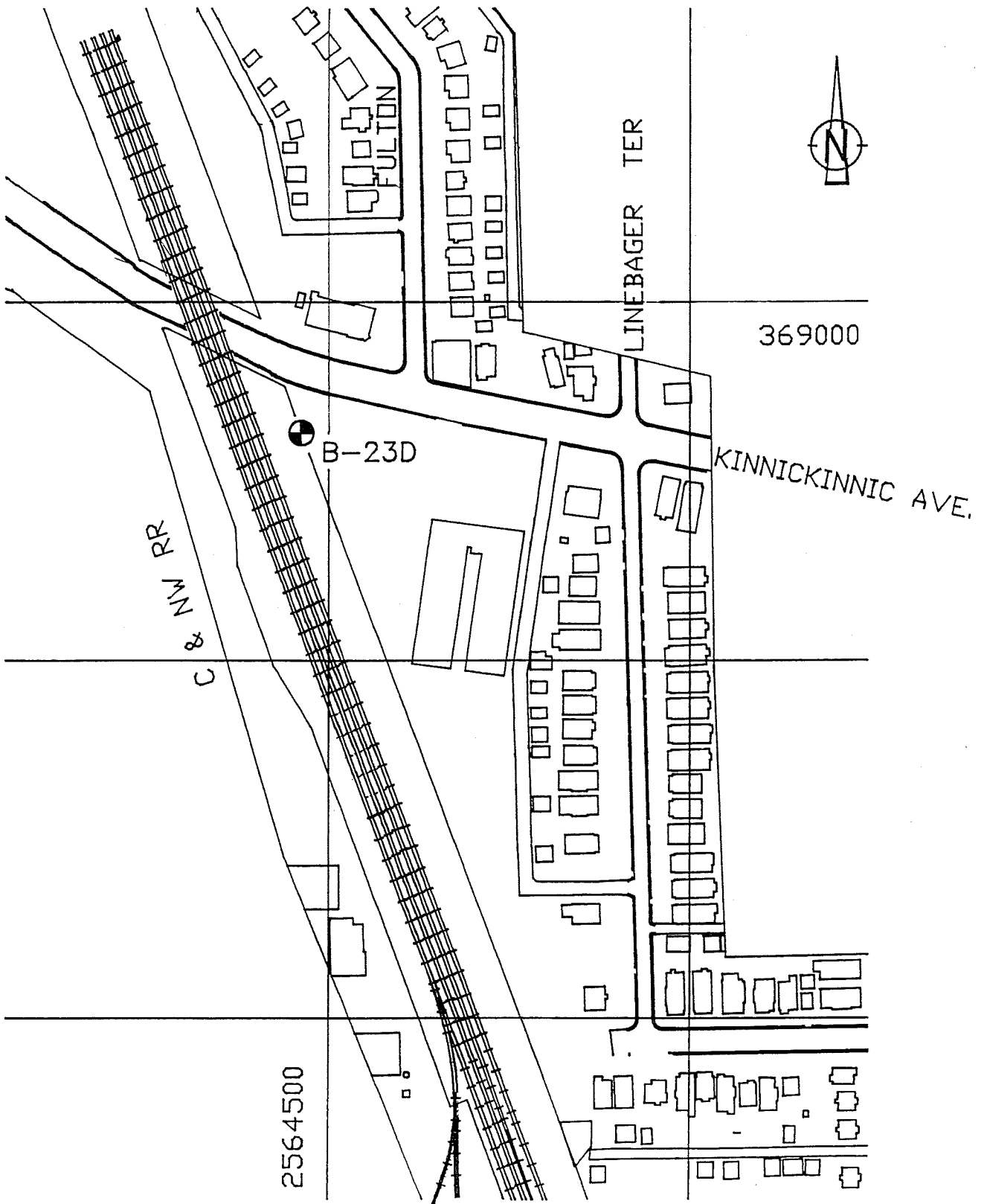
A total of seven (7) soil samples were recovered from this boring for classification and laboratory analysis. A composite of the top two soil samples (S-1 and S-2) were submitted to the laboratory for TPH analysis. The results of this analysis are presented in the following table, Table A20-1 Area 20 Soil Laboratory Analytical Results included in this section. These samples were selected because the construction of the retaining wall along this section was not expected to require excavation greater than the 4 foot nominal frost depth required for footing protection. The results of the sample analysis did not detect the presence of petroleum hydrocarbons in the upper 4 feet of this boring.

TABLE A20-1  
Area 20 Soil Laboratory Results (ppm) ug/g

<u>Parameter</u>	<u>Sample Composite B23D, S-1,2</u>	<u>WDNR Guideline Limits</u>
TPH (Diesel)	N.D.	10

Note: N.D. indicates not detected

Based upon this investigation, soil samples along the proposed retaining wall do not have evidence of contamination.



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 AREA A-20 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/18/90
CHECKED BY	B.M.F.	9/18/90
APPROVED BY	K.R.H.	9/18/90
SCALE	1" = 200'	FIGURE NO.
		A-20
STS PROJECT NO.		83417XF

3.3.14 Area 22 Lake Arterial Station 4256 to 4261

A soil boring previously performed for the Milwaukee Metropolitan Sewerage District (MMSD) indicated black oily material at a depth of about 15 feet. Foundry sand fill was also observed in this boring according to the MMSD boring logs. The issues associated with this Area included heavy metals, petroleum hydrocarbons and possible VOC's associated with the possible industrial fill.

Three (3) soils borings were proposed for this Area with two (2) borings converted to groundwater monitoring wells. BW24, B25 and BW26 were completed to depths of 26.5 feet, 16.5 feet and 21.5 feet, respectively. The approximate location of the borings is shown on Figure A22, Area 22 Soil Boring Location Plan. All three (3) of these borings indicated fill soils varying 6 to 16 feet in depth. Because the railroad grade is on a raised embankment along this section, the fill depths are consistent with the visual observations. BW24 indicated the greatest fill depth which is also consistent with its location nearest to Russell Avenue and the railroad bridge overpass. Fill soils consisting of various layers of silt and fine sand, silts and brick fragments, silty clays and crushed limestone were encountered to 16 feet in depth. Organic soils, typical of marsh deposits, were then encountered to 26 feet. Silt and fine sand ended the boring at 26.5 feet. B25 also encountered varying layers of soil fill to about 9 feet overlying natural soils consisting of silts and fine sand to 16.5 feet the maximum depth of the boring. BW26 indicated fill consisting of sand and silt overlying a crushed limestone layer to about 6 feet in depth. Natural soils consisted of silts and fine sands to 21.5 feet in depth.

A total of 27 soils samples were recovered from these borings for classification and testing. PID measurements taken at the time of sample recovery and at the STS soils laboratory after delivery by the field crew, did not indicate the presence of VOC's in the samples. No oily type material was encountered.

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STS Project No. 83417XF  
April 24, 1991

Groundwater monitoring wells were installed in BW24 and BW26 to provide for water level measurements and a sampling point for the groundwater. The groundwater surface was recorded in each well and is reported in the following table referenced to U.S.G.S. datum.

**TABLE A22**  
**Groundwater Elevations Area 22**

<u>Well No.</u>	<u>Groundwater Elev.</u>	<u>Surface Elev.</u>
BW24	585.78	603.30
BW26	586.54	600.80

These water elevations appear to indicate a groundwater flow direction to the south which is inconsistent with general flow to Lake Michigan but could be explained if a stream or pond was previously present near Russell Street as indicated by the natural organic soils and sand encountered in BW24. However, three (3) sampling points are normally required to determine groundwater flow direction. Enough data is not available to determine the actual direction of groundwater flow.

A composite of fill soils from BW24, B25 and B26 was analyzed for TCLP metals. BW24-S9 and BW26-S2 were submitted for TPH analysis. The results presented on Table A22-1, Area 22 Soil Laboratory Results, included in this section indicated the metal barium and silver were detected. The concentrations of these metals is however below the regulatory limit for a hazardous waste. The table also presents the results of TPH analysis. TPH was not detected in the samples analyzed.



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 April 24, 1991

TABLE A22-1  
 Area 22 Soil Laboratory Results (ppm) mg/l

<u>Parameter</u>		<u>Sample</u>		
<u>TCLP Metals</u>	Composite <u>B-26,25,24</u>	BW-24 <u>S-9</u>	BW-26 <u>S-2</u>	RCRA <u>Limits</u>
Barium	0.261	--	--	100.0
Silver	0.005	--	--	5.0
TPH	--	N.D.	N.D.	10

Notes: N.D. indicates no detect.

-- indicates not analyzed.

TCLP includes arsenic, cadmium, chromium, mercury, lead, selenium as not detected.

One (1) groundwater sample from each well in this Area (BW24, BW26) was submitted to the laboratory for analysis of VOC's and soluble metals. Table A22-2, Area 22 Groundwater Laboratory Results, presents the results of the analysis. The 34 compounds included in the analytical method were not detected. The metals analysis detected barium in BW24 and BW26 and also lead and silver in BW26. However, the concentrations of these metals were below both the PAL and the enforcement standard.

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STS Project No. 83417XF  
April 24, 1991

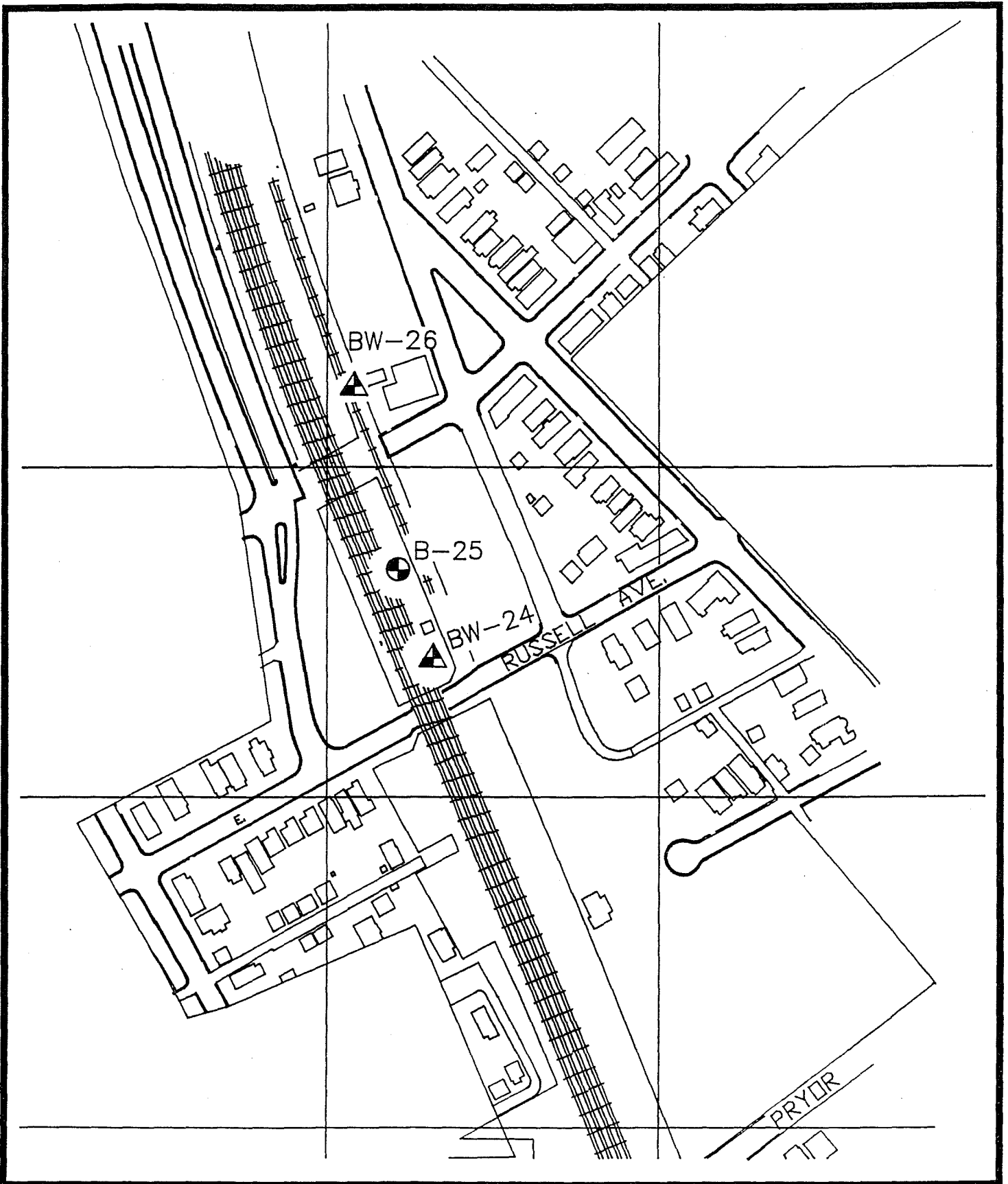
**TABLE A22-2**  
**Area 22 Groundwater Laboratory Results (ppb) ug/l**

<u>Parameter</u>	<u>Sample</u>		<u>NR140 Limits</u>	
	<u>BW-24</u>	<u>BW-26</u>	<u>E.S.</u>	<u>PAL</u>
VOC's	N.D.	N.D.		
<u>Metals</u>				
Barium	104	49	1000	200
Lead	N.D.	3.4	50	5
Silver	N.D.	8.0	50	10

Notes: N.D. indicates no detect.

Metals include arsenic, cadmium, chromium, mercury, selenium as not detected.

The results of the field investigation and laboratory analysis do not suggest the presence of hazardous materials in this Area.



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 AREA A-22 SOIL BORING  
 LOCATION PLAN

DRAWN BY C.R.H. 9/7/90

CHECKED BY B.M.F. 9/27/90

APPROVED BY K.R.H. 9/27/90

SCALE 1" = 200'

FIGURE NO. A-22

STS PROJECT NO.

83417XF

### 3.3.15 Area 23 Former Illinois Steel

The Illinois Steel Company, a primary manufacturer of steel, occupied this lake front property from the 1860's to about 1930. Historical records indicated the lake shore and other parts of the property may have been used to dispose of slag and other steel mill wastes. The issues associated with this former industrial property are heavy metals, VOC's and petroleum hydrocarbons which may have been disposed on the property.

Three (3) soil borings were proposed for this Area, within the R.O.W. of the Lake Arterial, to determine fill and soil stratigraphy and to acquire samples for laboratory analysis. Soils borings B27, B28 and BW29 were completed at the approximate locations shown on Figure A23, Area 23 Soil Boring Location Plan presented in this section. The soil boring logs are presented in the Appendix.

These borings were extended to 16.5 feet in depth with B28 reaching 15 feet. The soil stratigraphy indicated by these borings suggest fill soils are present at B27 and B28 to a depth of about 7 feet. These fill soils, consisted of silts and fine sands in B28 while B27 indicated crushed limestone to 7 feet. The natural soils present below the fill in these two (2) borings consist of silty clay and silt in B27 while B28 indicated silt and/or fine to coarse sand. BW29 indicated natural soils were present the full depth of the boring. Topsoil was present within the top 1.5 feet. While fine to coarse sand was then encountered to about 4 feet. Silty clay to clayey silt was present to the maximum depth of the boring (16.5 feet) with a layer of fine sand between 9 to 11 feet.

A total of 20 soil samples were acquired along this stretch of the alignment. PID measurements, taken in the field, at the time of sample recovery, and at the STS soils laboratory after the samples were delivered to the office, did not indicate the presence of VOC's in any of the samples.

A groundwater monitoring well was installed in boring BW29 as shown on Figure A23. Well construction details are included in the Appendix. The groundwater surface was measured

in this well and referenced to U.S.G.S. datum as shown in the following table.

**TABLE A23**  
**Groundwater Elevation Area 23**

<u>Well No.</u>	<u>Groundwater Elev.</u>	<u>Surface Elev.</u>
BW29	590.15	597.00

The groundwater table appears to exist at a depth of about seven (7) feet below present grades.

Due to a lack of apparent VOC impacts in this Area based upon screening results and observed odors, the proposed laboratory testing program was reduced. A composite fill soil sample from B27 and B28 was submitted for TCLP metals analysis. TPH was analyzed in B28-S3 and B27-S3. The results of these analyses are presented in Table A23-1, Area 23 Soil Laboratory Results. The metals barium, lead and silver were detected in the composite sample. The concentration of these metals is however, below the regulatory limit for classification as a hazardous waste. TPH analysis of the two (2) soil samples did not detect petroleum hydrocarbons.

**TABLE A23-1**  
**Area 23 Soil Laboratory Results (ppm) mg/l**

<u>Parameter</u>	<u>Sample</u>		<u>RCRA</u>
<u>TCLP Metals</u>	<u>Composite B-27 - 28</u>		<u>Limits</u>
Barium	0.164		100
Lead	0.057		5
Silver	0.005		5
	<u>B-28 S-3</u>	<u>B-27 S-3</u>	
TPH	N.D.	N.D.	10

Notes: N.D. indicates no detect.

TCLP metals include arsenic, cadmium, chromium, mercury, lead, selenium as not detected.

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

One (1) groundwater sample from the monitoring well at BW29 was submitted for analysis of VOC's and soluble metals. Table A23-2, Groundwater Analytical Results, presents the results of the analysis. The 34 VOC's included in the analytical method were not detected. The metals analysis detected barium in the groundwater, however, the concentration of this metal is below the regulatory limit.

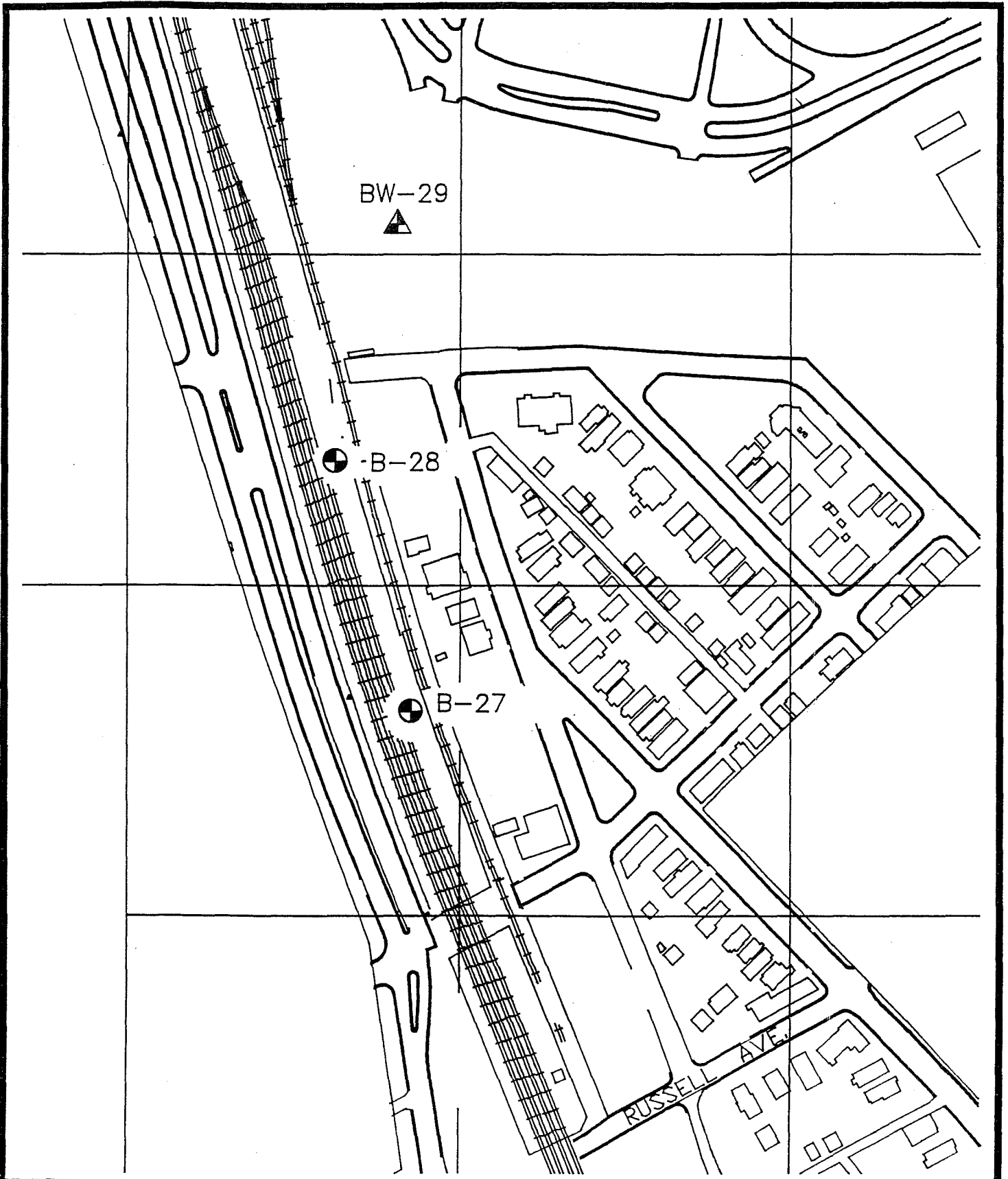
**TABLE A23-2**  
**Area 23 Groundwater Laboratory Results (ppb) ug/l**

<u>Parameter</u>	<u>Sample BW-29</u>	<u>NR140 Limits</u>	
		<u>E.S.</u>	<u>PAL</u>
VOC's	N.D.		
<u>Metals</u>			
Barium	22.0	1000	200

Notes: N.D. indicates no detect.

Metals include arsenic, cadmium, chromium, mercury, selenium as not detected.

The results of the field investigation and laboratory analysis does not suggest the presence of hazardous materials in this area.



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 PHASE II ENVIRONMENTAL RECONNAISSANCE  
 LAKE ARTERIAL PROJECT  
 AREA A-23 SOIL BORING  
 LOCATION PLAN

DRAWN BY	C.R.H.	9/27/90
CHECKED BY	B.M.F.	9/27/90
APPROVED BY	K.R.H.	9/27/90
SCALE	1"=200'	FIGURE NO.
		A-23
STS PROJECT NO.		83417XF

### 3.3.16 Area 24 Railroad Right-Of-Way

The C&NW right-of-way (R.O.W.) is proposed as the corridor alignment for the Lake Arterial project. The C&NW R.O.W. extends from Jones Island in Milwaukee (at the north end of the project) south through the cities of Milwaukee, St. Francis and Cudahy. The Lake Arterial project is proposed to exit the railroad R.O.W. just south of Layton Avenue in the City of Cudahy. Concerns were raised by the WDOT, during the initial discussions of the work scope, as to the probability of contaminants distributed over the entire length of the proposed right-of-way. The potential contaminant issues finalized in these discussions were petroleum hydrocarbons primarily from fuel oil and lubricating oils, polychlorinated biphenyls (PCB's) from diesel engine transformers and creosote deposits from treated wood rail ties.

Thirty-two (32) shallow soil borings, equally spaced on 500 foot centers, were proposed for investigating the railroad right-of-way to determine soil stratigraphy and to acquire samples for laboratory analysis. The borings were numbered consecutively from B30, at the north end of the project, to B61 at the south end of the proposed R.O.W. The boring log for each location is presented in the Appendix. The approximate location of each boring is shown on Figure A24 (A, B, C), Area 24 Boring Location Plan, included in this section. The specific procedures performed to complete and sample these borings were detailed previously in Section 2 of this report, however, in general these borings were completed through the track ballast with an additional surface soil sample taken at the east edge of the ballast where the existing soil and ballast rock met.

A generalized profile of the railroad track subgrade includes about 5 to 6 feet of crushed rock ballast overlying sand, silt or clay depending upon the boring location. All these borings were completed at least two sample depths into the underlying soils or about 3 to 4 feet below the ballast. The soil profile varies with the location of the right-of-way in relation to the adjacent grades. The right-of-way is generally on fill



Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

soils from the Hoan Bridge to south of Kinnickinnic Avenue. The remaining R.O.W. is generally on a natural soil subgrade where higher ground elevations were cut to level the railroad grade.

Ninety-six (96) soil samples were acquired for classification and sample selection. PID measurements taken in the field at the time of sample recovery and in the STS laboratory, after the samples were delivered by the field personnel, did not indicate the presence of VOC's in the soils.

Soil samples from each of four consecutive borings were composited for analysis of PCB's. A total of eight composite samples were analyzed for PCB's. Individual soil samples were selected and analyzed for TPH or creosote. Four (4) samples were selected for each TPH or creosote analysis. Table A24-1, Right-of-Way Soil Laboratory Results, presented in this section, shows the results of the analysis. For the PCB analysis, the edge of ballast surface samples were composited from each of four consecutive borings. The results show detection of PCB's in the parts per billion range which is well below the WDNR guideline cleanup standard of 5 parts per million. Cresote and TPH samples were selected from the top of the sample immediately beneath the ballast. Soils which may have appeared discolored or oily were submitted if available. No detection of creosote was reported. TPH was detected at three of the four locations submitted for analysis. Only one of these (B45) indicated a concentration above the WDNR 10 parts per million guideline cleanup standard.

Howard, Needles, Tammen and Bergendoff  
 STS Project No. 83417XF  
 April 24, 1991

**TABLE A24-1 R.O.W.  
 Right-of-Way Soil Laboratory Results**

Parameter	<u>PCB's (ppm) mg/kg</u>							
	Composite Samples							
	B30,31 32,33	B34,35 36,37	B38,39 40,41	B42,43 44,45	B46,47 48,49	B50,51 52,53	B54,55 56,57	B58,59 60,61
PCB's	N.D.	0.331	N.D.	0.091	0.281	0.046.6	N.D.	0.052

	<u>Creosote (ppm) ug/g</u>			
	Sample			
	<u>B-31</u>	<u>B-38</u>	<u>B-48</u>	<u>B-55</u>
Creosote	N.D.	N.D.	N.D.	N.D.

	<u>TPH (ppm) ug/g</u>			
	Sample			
	<u>B-34</u>	<u>B-45</u>	<u>B-52</u>	<u>B-60</u>
TPH (diesel)	N.D.	25.5*	7.1	6.3

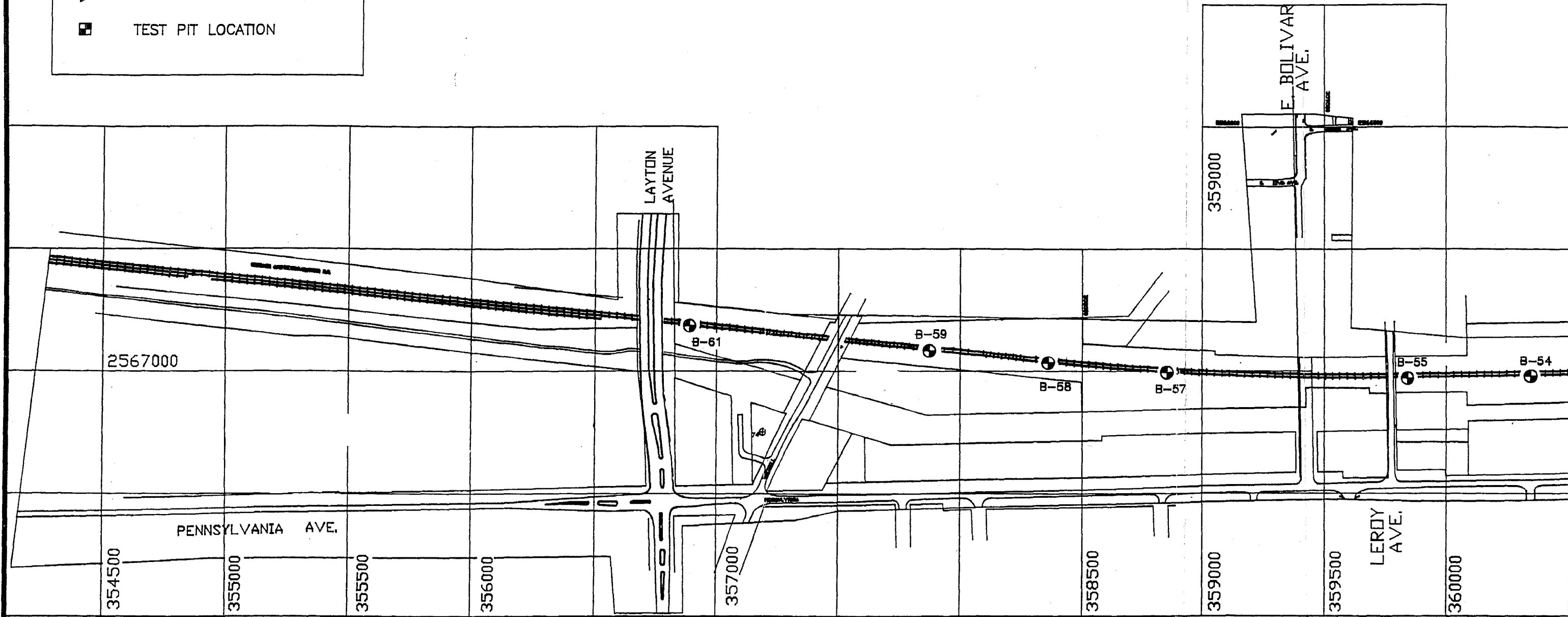
Note: \* indicated exceedence of WDNR guideline of 10 ppm.  
 N.D. indicates no detect.


Groundwater was not encountered in any of these shallow borings nor were groundwater monitoring wells installed.

The results of the field investigation and laboratory analysis of the entire C&NW R.O.W. did not suggest significant impacts due to PCB's, creosote or TPH.

LEGEND

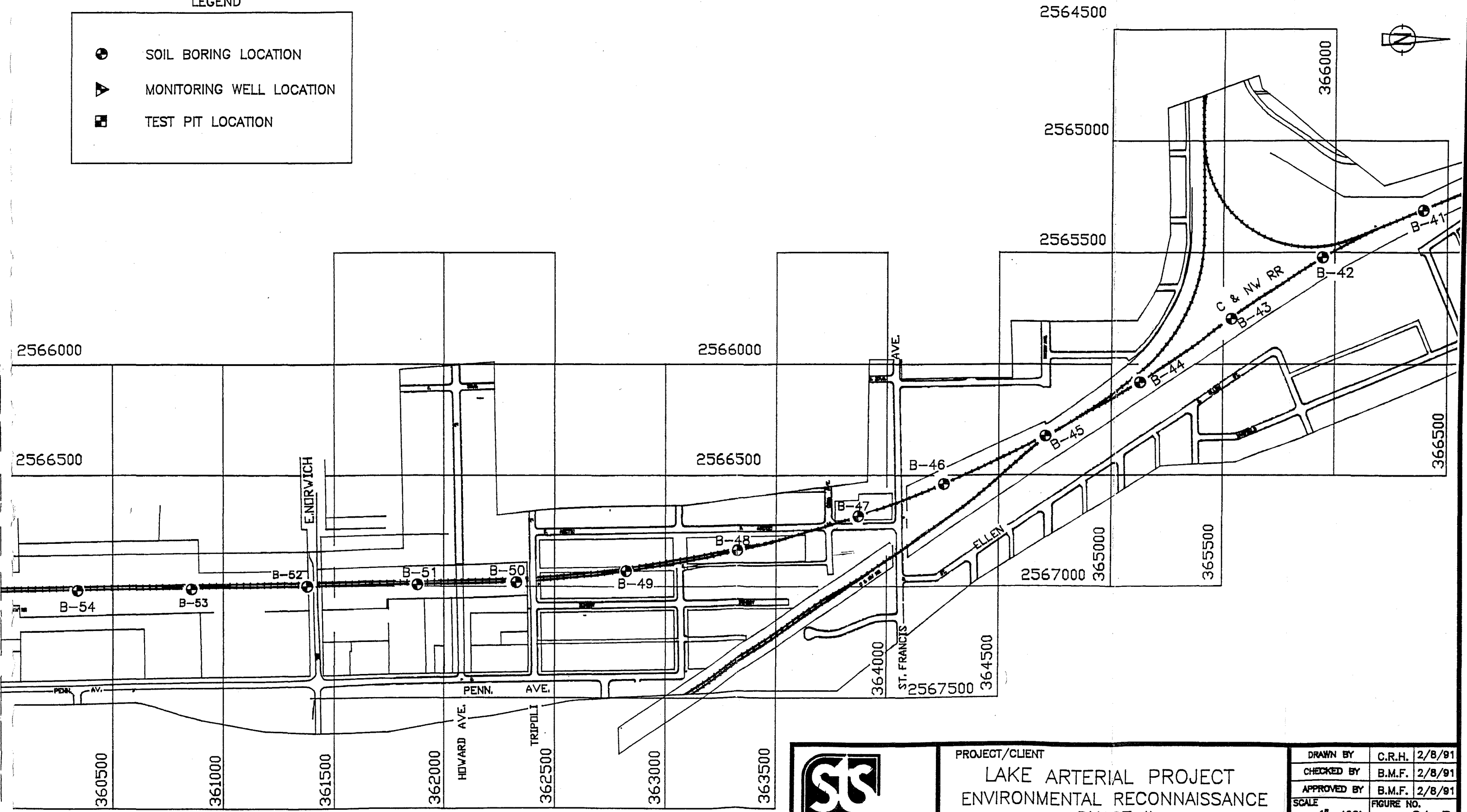
- ⊕ SOIL BORING LOCATION
- ▼ MONITORING WELL LOCATION
- TEST PIT LOCATION




 STS Consultants, Ltd.	PROJECT/CLIENT		DRAWN BY	C.R.H.	2/8/8	
	LAKE ARTERIAL PROJECT ENVIRONMENTAL RECONNAISSANCE PHASE II RAILROAD SOIL BORING LOCATIONS		CHECKED BY	B.M.F.	2/8/8	
			APPROVED BY	B.M.F.	2/8/8	
	SCALE	1"=400'	FIGURE NO.	24-A		
	STS PROJECT NO.		83417XF			

LEGEND

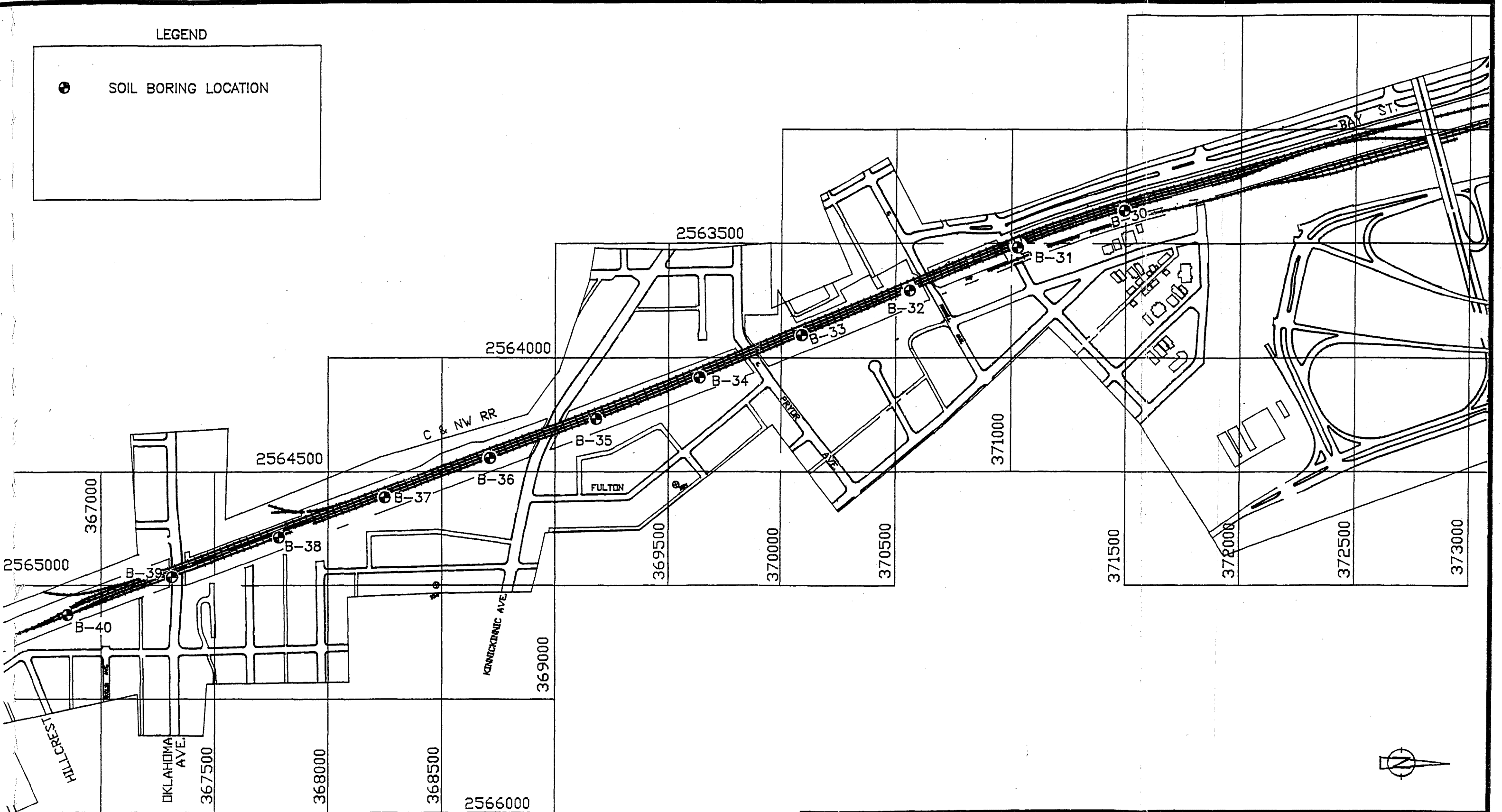
- SOIL BORING LOCATION
- ▼ MONITORING WELL LOCATION
- TEST PIT LOCATION



 STS Consultants, Ltd.	PROJECT/CLIENT		DRAWN BY	C.R.H.	2/8/91	
	LAKE ARTERIAL PROJECT ENVIRONMENTAL RECONNAISSANCE PHASE II		CHECKED BY	B.M.F.	2/8/91	
			APPROVED BY	B.M.F.	2/8/91	
	RAILROAD SOIL BORING LOCATIONS		SCALE	1" = 400'	FIGURE NO.	24-B
			STS PROJECT NO.		83417XF	

LEGEND

● SOIL BORING LOCATION



PROJECT/CLIENT  
 LAKE ARTERIAL PROJECT  
 ENVIRONMENTAL RECONNAISSANCE  
 PHASE II  
 RAILROAD SOIL BORING LOCATIONS

DRAWN BY	C.R.H.	2/8/91
CHECKED BY	B.M.F.	2/8/91
APPROVED BY	B.M.F.	2/8/91
SCALE	1"=400'	FIGURE NO. 24-C
STS PROJECT NO.		83417XF

#### 4.0 CONCLUSIONS AND RECOMMENDATIONS

This section presents the conclusions and the recommendations developed by STS Consultants, Ltd. from the data analysis for each Area investigated. To reiterate the purpose of the study, STS completed the environmental assessments discussed herein to; 1) identify conditions that could influence the schedule and cost of the Lake Arterial project, and 2) to provide conceptual plans for additional study or clean up of areas found to be adversely impacted by contaminants. The conclusions and recommendations in this section were developed to met those objectives.

The investigated Areas have been divided into three subgroups for ease of discussion. These subgroups include 1) Areas where no further action is recommended at this time, 2) Areas where WDOT involvement has changed due to potential environmental issues, and 3) Areas requiring further action.

##### 1) Areas where no further action is recommended

Nine of the sixteen areas studied were found to have no evidence of substantial contamination which would have adverse impacts upon the construction of the Lake Arterial project. These areas are listed as follows:

- Area 2 Miscellaneous Dump Site - north of Whitnall Avenue
- Area 6 EZ Paintr runoff
- Area 7 Miscellaneous Dump on northwest corner of Norwich and R.O.W.
- Area 9 Foundry Fill Dump on southeast corner of Norwich and R.O.W.
- Area 18 Right-of-Way adjacent to Milwaukee Forge
- Area 20 Former Service Station at southeast corner of Kinnickinnic and R.O.W.
- Area 22 Station 4256 to 4261 of Lake Arterial
- Area 23 Illinois Steel Company area
- Area 24 C&NW R.O.W.

The results of the field investigations and laboratory analysis performed near these areas did not indicate substantial presence of hazardous chemicals or environmental conditions which may adversely impact construction. Therefore, no further actions are recommended at this time.

2) Areas where WDOT involvement has changed

The municipal landfill area (Noted Area 1) on the south end of the proposed alignment (southwest of Layton and Pennsylvania Ave) was investigated during this project. During initial conceptual design stages, an entrance/exit ramp was considered for this location. The Phase II investigation consisting of borings and test pit exploration was conducted within one property known to have a historic use as a municipal landfill by several area communities. Testing of soil/fill samples collected from 8 test pits indicated the presence of leachable lead at 3 locations above levels classified as hazardous under The Resource Conservation and Recovery Act and Wisconsin Statute NR 181 (now NR600). When the results were presented, to WDOT, a decision was made to consider alternative alignment configurations so therefore no further action is required on this site.

3) Areas where further action is recommended

Six areas were identified during the course of the investigation which are likely to require further action by WDOT or others. Additional study is recommended for two areas, remediation is appropriate at one site and modified construction approaches are needed for the remaining three areas. The conclusions by area and associated recommendations are presented in the following paragraphs.

The two areas where additional study is recommended are Area 10, St. Francis Auto Wreckers and Area 8 at northeast corner of Norwich Ave and the C&NW R.O.W. The Phase II study identified the presence of hazardous material contamination but not the extent of these impacts. Further investigation is necessary to establish the magnitude of the problem and identify feasible remediation options.

Area 10 Auto Wreckers is apparently contaminated with Total Petroleum Hydrocarbons (gasoline, diesel, motor oils) and polychlorinated biphenyls (PCB's) which complicate the assessment. The extent and magnitude of the PCB's will probably control the complexity of remediation to be required by the WDNR. Two of three samples analyzed for

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

PCB's indicated detectable concentrations with widely variable levels. Additional investigations and sampling of materials are necessary to define the extent of these impacts.

The recommendations include a grid based sampling program over the entire site. The dimensions of the grid are anticipated to be 60' x 60'. Since the entire property is stained and access is difficult due to the location of auto bodies, a program of hand auger sampling at random, accessible points within the grid area is recommended. Two samples should be collected at each location at depths of 0-8" and 9"-16". All samples should be extracted in the laboratory but PCB testing should be performed on the shallow sample first and on the lower sample only if detected levels of PCBs approaching the clean-up criteria are found. The data may be augmented by installation of 3 groundwater monitoring wells and subsequent testing of the groundwater quality for TPH, PCBs, VOCs and selected dissolved metals. The well installation may be performed subsequent to PCB testing to reduce the need for unnecessary decontamination of the drilling equipment. The results of this investigation can be compared to DNR clean-up criteria (TPH less than detection and PCBs at 5 ppm) and NR 140 groundwater standards to allow assessment of the remediation options.

Area 8 - northeast corner of Norwich - showed evidence of solvent and TPH impacts in one of the two borings advanced on the site. The extent of this contamination and the potential for the material to be considered hazardous should be evaluated. Recent hazardous waste amendments expanded the toxicity criteria for classification as a hazardous waste to extend to certain volatile solvents. Once the extent of the problem and associated variability of detected concentrations is known, the potential for classification as hazardous can be addressed. STS recommends placement of 3-4 soil borings to depths of 20' to 25' near the boring where solvents were detected with 1 or 2 converted to groundwater monitoring wells. Samples should be classified and screened with the PID with selected analyses for VOCs and TPH.



Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

Remediation, pursued by the current owners, is the action recommended for Area 15 Woods Service Station near the tunnel section. The site is apparently impacted by petroleum materials in both soil and groundwater. The approach to remediation will need to be reviewed by DNR. We recommend that WDOT monitor the progress of the clean-up to establish if groundwater impacts will continue during tunnel construction. If possible, a separate method for handling construction water may need to be addressed in the bid document for this portion of the highway.

The three areas for which modified construction practices are recommended include 1) Area 12 - the Railroad Bridge, 2) Area 17 - Ellen Playfield and 3) Area 19 - Sijan Playfield. Area 12 the Railroad Bridge, will require demolition for the Lake Arterial project. The asbestos containing pipe on the south face of the bridge will require removal prior bridge demolition. State of Wisconsin rules requires ACM removal by certified and trained personnel. Disposal is required at a licensed facility. Estimates for removal, transportation and disposal of this material may range from \$5 to \$10 per lineal foot of pipe.

Both Area 17 (Ellen Playfield) and Area 19 (Sijan Playfield) have been identified as areas where fill materials were deposited. Soils at both locations contained TPH levels above the DNR clean-up criteria of less than detection. Only limited excavation is anticipated in the area, associated with highway utility trenches (Area 17) or retaining wall construction (Area 19). Therefore, extensive study of the extent of contamination appears unnecessary and, it is our recommendation that provisions be made in the construction specification to segregate impacted materials, stockpile on site while analytical testing is underway and then dispose properly in a landfill. Alternatively, a separate excavation contract can be established, prior to construction, to remove materials and replace with clean fill. The estimate of costs for removal may range from \$65-\$85 per yard of excavated material. This figure includes excavation, testing, transportation and landfill fees.

#### 4.1 General Qualifications

This report has been prepared as for an environmental contamination evaluation of the subject right-of way. The focus of the study was selected accordingly. This report should not be utilized for any purpose other than evaluating the environmental characteristics of the soils and groundwater at the time of this study. The results, conclusions, and recommendations presented in this report are based on the data obtained from the specific boring locations and at specific times. If variations are noted in the future, our firm should be informed. It may be necessary to conduct additional on-site explorations and observations to determine the characteristics of these variations and provide an opportunity to re-evaluate the conclusions in this report.

The conceptual details and cost estimates provided in this report are considered "order of magnitude." They were developed for guidance in understanding the approximate scope of effort that might be need to complete remediation of the environment on the project.

This environmental reconnaissance was also completed to identify some past and current property uses and related economic liabilities. STS assumes no responsibility for the discovery and elimination of hazards that could possibly cause accidents, injuries or damage. Compliance with the recommendations and/or suggestions contained in this report in no way assures elimination of hazards or the fulfillment of a property owner's obligation under any local, state, or federal laws or any modifications. It is the responsibility of the property owner to notify authorities of any conditions that are in violation of the current legal standards.

Factual information regarding operations, conditions, and test data were obtained, in part, from the client, outside agents and third parties and have been assumed by STS to be correct and complete. Because the facts stated in this report are subject to professional interpretation, they could result in differing conclusions. In addition, the findings and conclusions contained in this report are based on various quantitative factors as they existed on or near the date of the study.

Howard, Needles, Tammen and Bergendoff  
STS Project No. 83417XF  
April 24, 1991

STS prepared this report at the request of its client. STS assumes responsibility for the accuracy of the report's contents, subject to what is stated elsewhere in this section, but recommends the report be used only for the purpose intended by the client and STS when the report was prepared. The report may be unsuitable for other uses and reliance on its contents by anyone other than the client is done at the sole risk of the user. STS accepts no responsibility for application or interpretation of the results by anyone other than the client.

This report reflects conditions, operations, and practices as observed on the date of the site visit. Changes or modifications to procedures and/or facilities made after the site visit are not included.