City box number [illegible] (XI)

- [x] Title/cover page w/the following info:
  - [x] Company (author) name
  - [x] Report Date
  - [x] Project name
  - [x] Company's job number
  - [ ] City DCLU project number (7-digit number)
  - [ ] City Permit number (6-digit number)
  - [ ] Kroll map index number (3-digit number, w?/E,W,N,S)
  - [ ] Green label
  - [ ] Site address (may be on 1st or 2nd page of text)
- [ ] Executive Summary and associated figures
- [ ] Table of Contents
- [ ] Project Location Plan/Map or Vicinity Map
- [x] Site Plans, Boring Location Plans, or Exploration Plans
- [ ] Survey
- [ ] Geologic Maps
- [x] Cross Sections/Subsurface Profiles
- [ ] Fill or Peat Thickness Maps and Contour Maps
- [ ] Boring Logs
- [ ] Geology Text (if no logs)
- [ ] Soil Classification Key/Boring Log Key
- [ ] Probe Logs
- [ ] Test Pit Logs
- [x] Monitoring Well Logs
- [ ] Cone Penetrometer Logs
- [ ] Shear Wave Velocity Measurements
- [ ] Groundwater Maps
- [ ] GW Elevation Tables/Data
- [ ] Soils Lab Testing (Geotechnical) Summary Tables
  - [ ] Grain Size Analyses/Hydrometer Analyses
  - [ ] Atterberg Limits
  - [ ] Strength tests: Triaxial, Unconfined, Direct Shear
  - [ ] Organic Content
  - [ ] ^{14}C or Radiocarbon Testing
  - [ ] Other_____
- [x] Soil Chemical Analytical Testing Summary Tables
- [x] Water/Groundwater Chemical Analytical Summary Tables
- [ ] Comments_____

3395

- [x] Date Copied 9/8/00 By Suzanne

2/9/99

3395 T-1166-01

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April 30, 1990

microfilmed

3/3

Seattle Engineering Department
Seattle Municipal Building, Room 910
600 Fourth Avenue
Seattle, Washington 98104

Attn: Mr. James B. Robertson

RE: EXPLORATIONS AND TESTING FOR POTENTIAL HYDROCARBON CONTAMINATION - SOUTH LANDER SEWER SEPARATION PROJECT PHASE II.

This letter includes the results of explorations and laboratory analyses for potential hydrocarbon contamination near the intersections of 1st Avenue South and South Holgate Street, and 4th Avenue South and South Walker Street in Seattle, Washington. Our scope of services included the following:

- Drill and sample three soil borings at selected locations along the proposed sewer line routes extending beneath 1st Avenue South and 4th Avenue South.
- Complete the borings as shallow (about 15 feet deep) monitoring wells screened through the water table interval.
- Develop the wells and obtain water samples.
- Send retrieved specimens to a testing laboratory and provide results of chemical analyses of soil and groundwater samples.

Authorization was provided by a March 6, 1990 letter from the Seattle Engineering Department.

PRESIDENT: Earl A. Sibley, P.E.
SR. VICE PRESIDENT: Atef A. Azzam; Raymond P. Miller, P.E.; Harvey W. Parker, P.E.; George Yamane, P.E.
VICE PRESIDENT: Herman H. (Tex) Druebert, P.E.; Richard H. Gates, P.E.; W. Paul Grant, P.E.; Leland B. Jones, P.E.; Thomas E. Kirkland, P.E.; Gerry Millar, R.G.,; Frank W. Pita, P.E., P.G.; Ming-Jiun (Jim) Wu, P.E.
CONSULTANT: William L. Shannon, P.E.

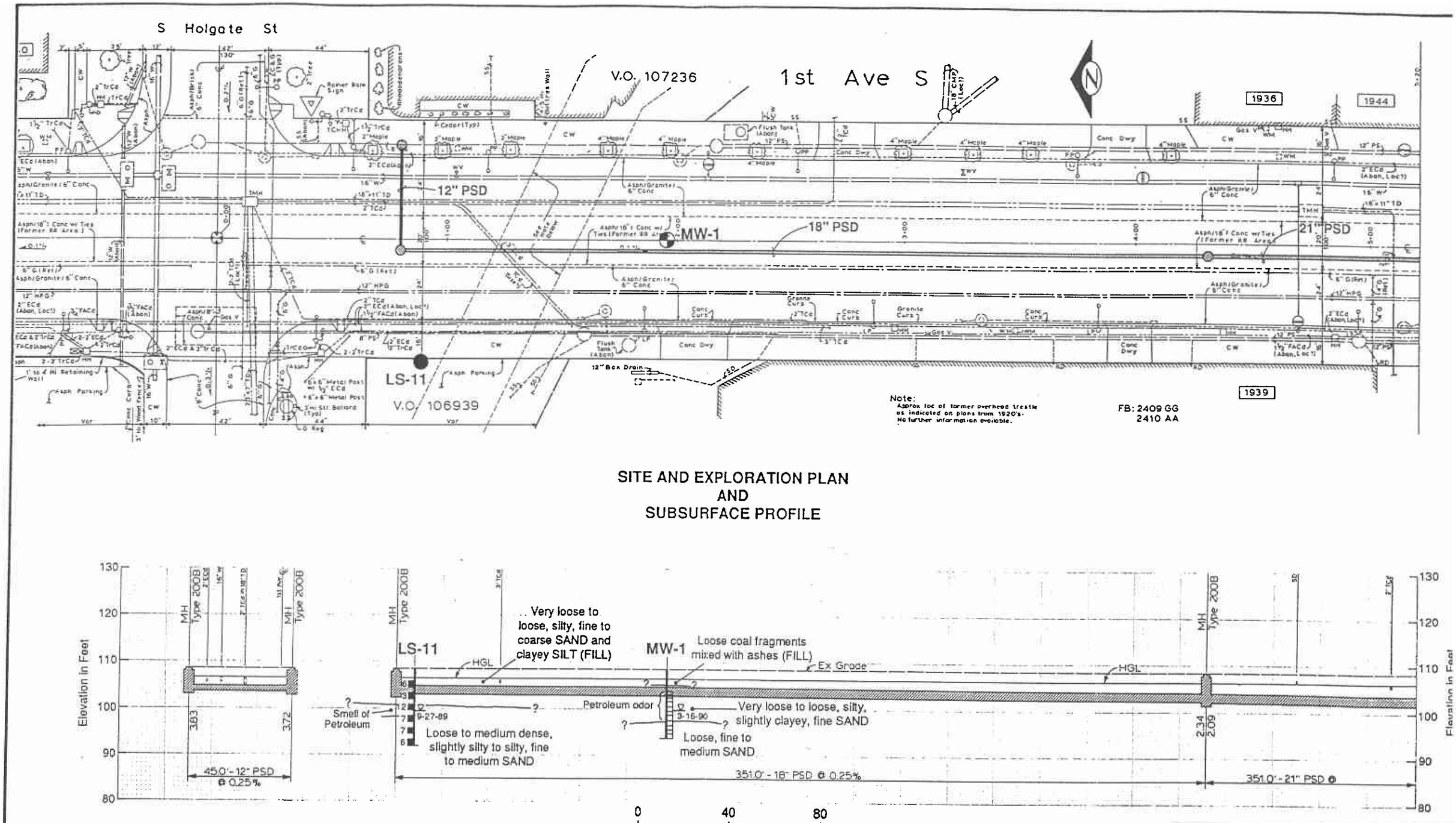
TABLE 1. RESULTS OF SOILS ANALYSES

Boring	Sample No.	Depth (feet)	TPH (ppm)	Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	m,p-Xylenes (ppb)	o-Xylene (ppb)	Lead (ppm)
MW-1	S-2	5.5 - 7	31	650	<10	<1	2	2	<0.1
MW-1	S-4	10.5 - 12	34	170	92	10	71	47	<0.1
MW-2	S-2	5.5 - 7	31	270	120	99	76	42	<0.1
MW-2	S-4a	10.5 - 12	69	61	<10	14	8	<1	<0.1
MW-3	S-2a	5.5 - 7	29	330	<10	17	24	<1	<0.1
MW-3	S-5a	13 - 14.5	23	2	<10	4	<1	<1	<0.1
WDOE Soil Cleanup Standards			200	660	14,000	143,000	Total Xylenes 2,000		500 (proposed)

TABLE 2. RESULTS OF GROUNDWATER ANALYSES

Well	TPH (ppm)	Benzene (ppb)	Ethylbenzene (ppb)	Toluene (ppb)	m,p-Xylenes (ppb)	o-Xylene (ppb)	Total Lead (ppm)
MW-1	<1	710	<10	1	<1	<1	<0.1
MW-2	<1	59	<10	2	<1	<1	2.9*
MW-3	<1	35	<10	<1	<1	<1	3.1*
METRO Standards	15	70	1,400	14,400	Total Xylenes 14,400		3

* High lead concentrations may be related to turbidity of water samples.



SITE AND EXPLORATION PLAN AND SUBSURFACE PROFILE

LEGEND

LS-11 ● Previously Installed Boring Designation and Approximate Location

MW-1 ◐ Monitoring Well Designation and Approximate Location

South Lander Separation Project Phase II
Seattle, Washington

PLAN AND PROFILE
1st AVE. S.
STA. 0+00 TO STA. 5+10

April 1990 T-1166-01

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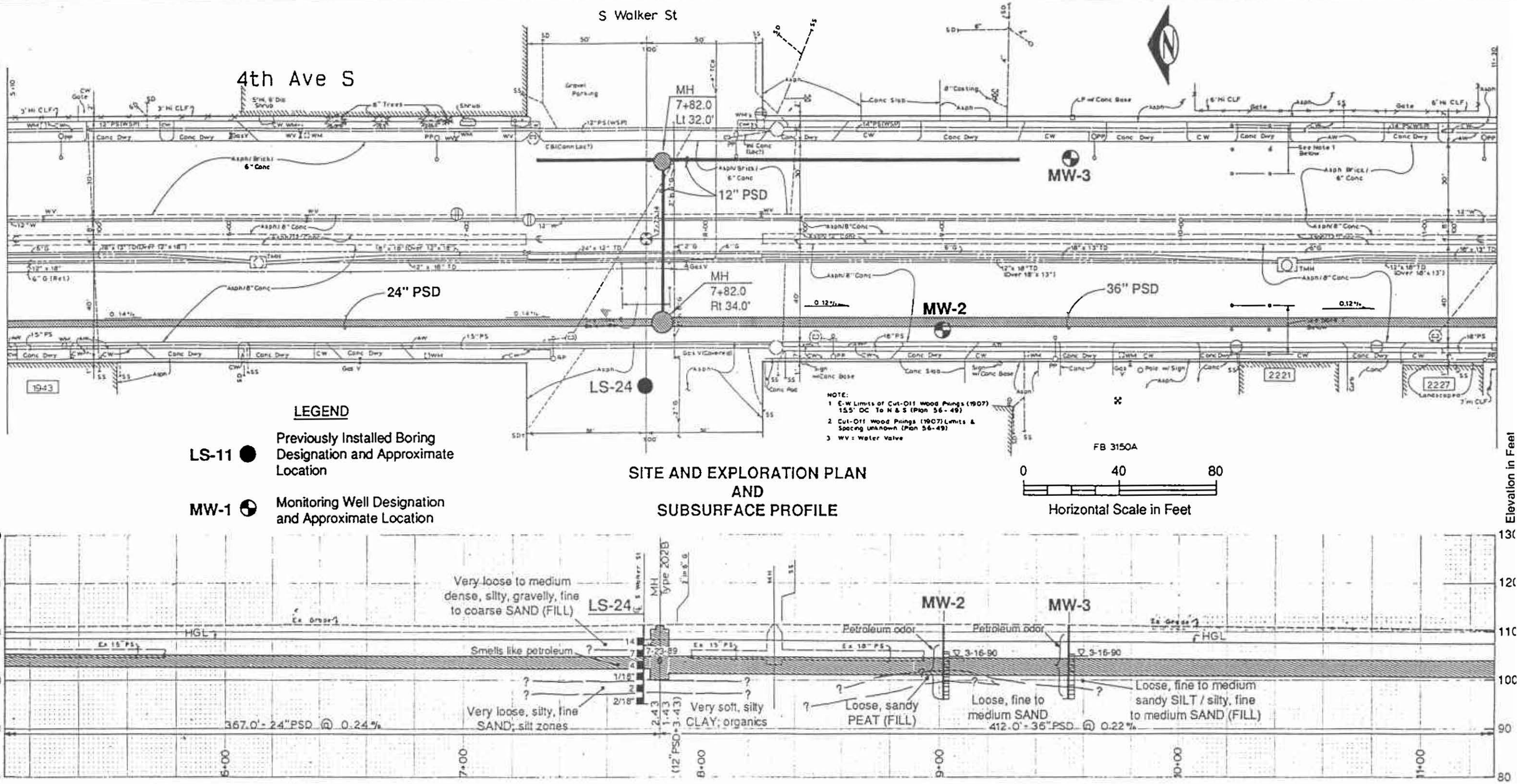
FIG. 1



South Lander Separation Project Phase II
Seattle, Washington

PLAN AND PROFILE
4TH AVE. S.
STA. 5+10 TO STA. 11+30

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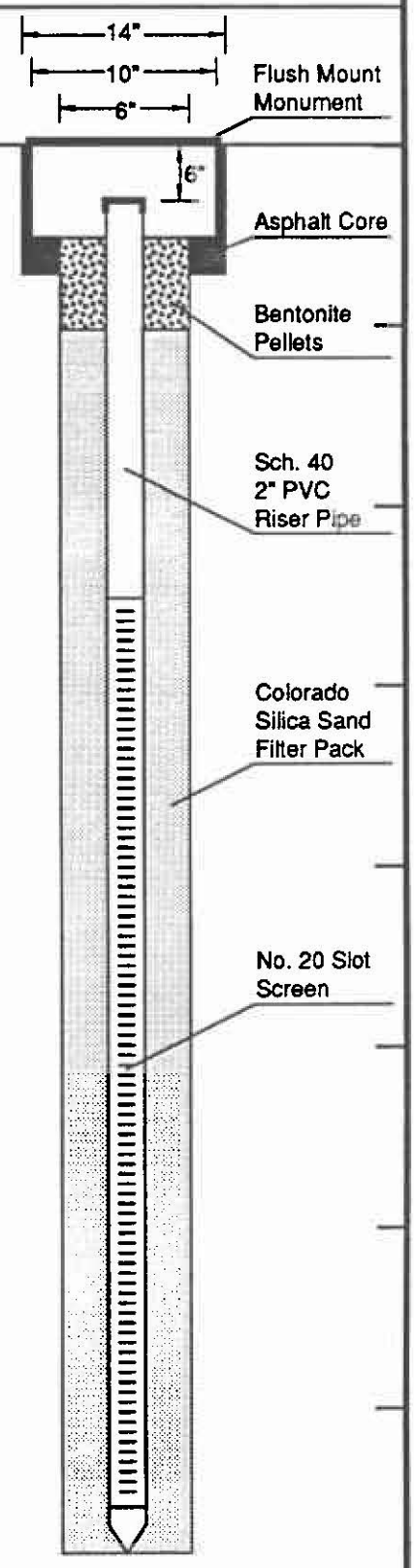
FIG. 2

LOG & AS-BUILT DIAGRAM

GEOLOGIC LOG	Sample	Depth in Feet	Water Level
Driller: Wiota, Inc. Completion Date: 3-14-90 Elevation: Approx. 108 Feet Ground Surface			
Concrete and Asphalt Pavement		1	
Loose, black coal fragments mixed with ashes (Fill)		2	
		3	
Very loose to loose, gray, silty, slightly clayey, fine SAND	1	4	
		5	
- petroleum odor from 5.5 to 7 feet	2 C	6	
		7	
		8	
	3	9	3-16-90
		10	
- petroleum odor from 10.5 to 11 feet		11	
Loose, reddish-black, fine to medium SAND; trace organics	4 C	12	
		13	
	5	14	
NOTE C Chemical Sample Location		15	
Bottom of Well at 15.5 Feet			

AS-BUILT



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South Lander Separation Project Phase II
Seattle, Washington

MONITORING WELL MW-1

April 1990
T-1166-01

FIG. 3

LOG & AS-BUILT DIAGRAM

GEOLOGIC LOG

Driller: Wiota, Inc.
Completion Date: 3-15-90
Elevation: Approx. 111 Feet

Ground Surface

Concrete Pavement

Loose, gray, silty, fine SAND; moist (Fill)

- petroluem odor from 4 to 16 feet

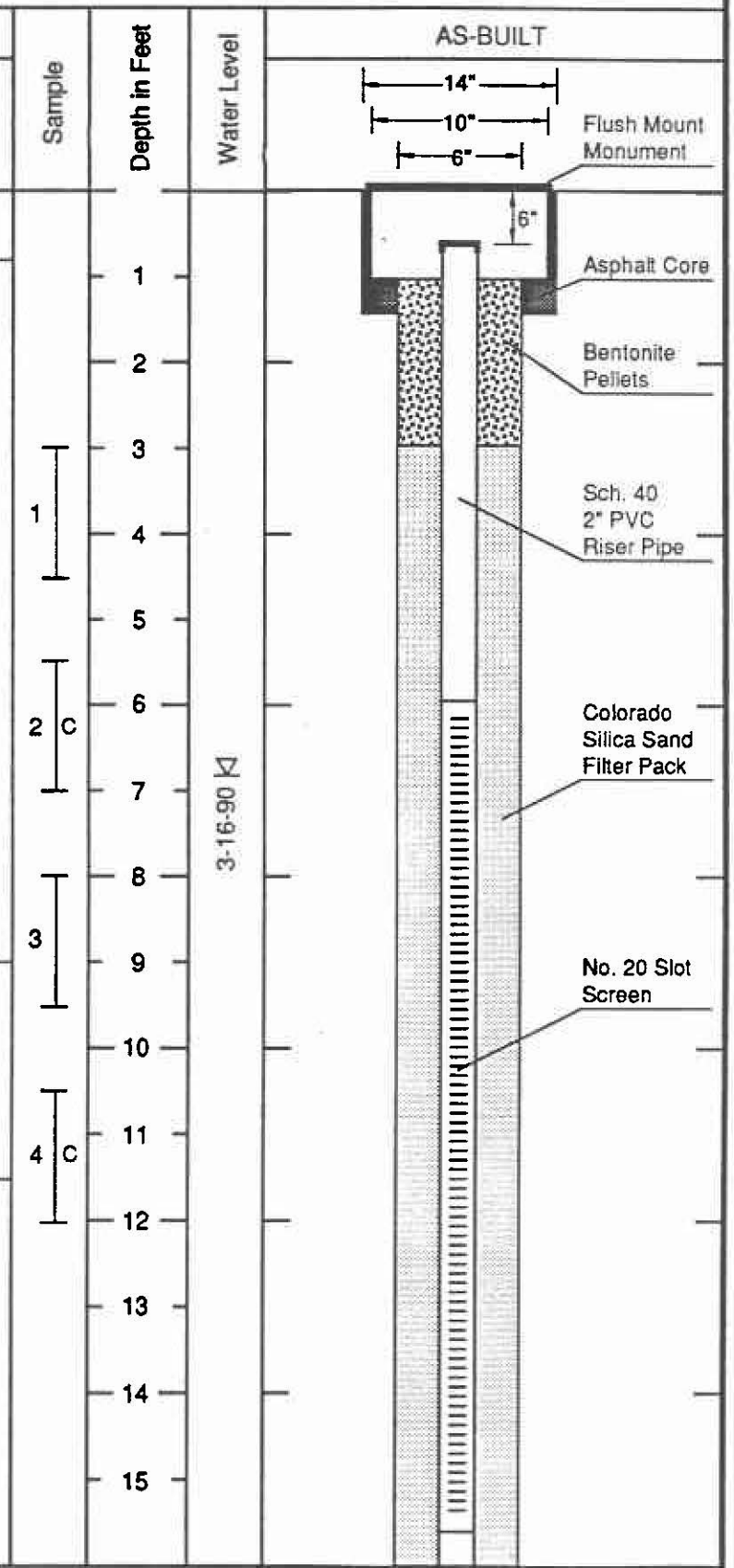
Loose, black, sandy PEAT with occasional debris (glass fragments); petroleum odor (Fill)

Loose, black, fine to medium SAND; petroleum odor

NOTE

C Chemical Sample Location

Bottom of Well at 16.0 Feet



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South Lander Separation Project Phase II
Seattle, Washington

MONITORING WELL MW-2

April 1990
T-1166-01
FIG. 4

LOG & AS-BUILT DIAGRAM

GEOLOGIC LOG

Driller: Wiota, Inc.
Completion Date: 3-15-90
Elevation: Approx. 111 Feet

Ground Surface

Concrete Pavement

Loose, gray, fine to medium sandy SILT / silty, fine to medium SAND; wood fragments; moist (Fill)

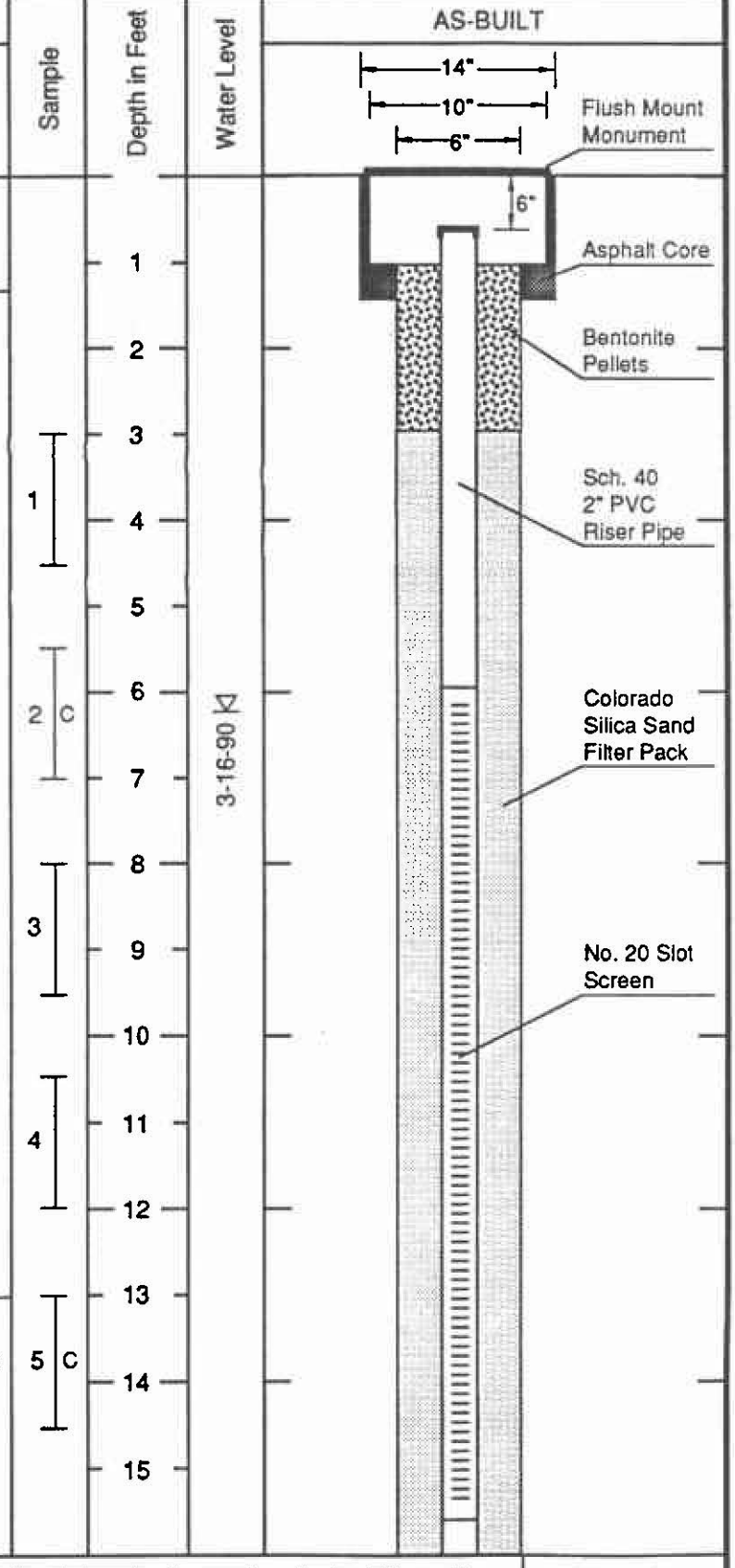
- petroluem odor from 1.5 to 16 feet

NOTE

C Chemical Sample Location

Loose, black to reddish-black, fine to medium SAND; wood fragments; petroleum odor

Bottom of Well at 16.0 Feet



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South Lander Separation Project Phase II
Seattle, Washington

MONITORING WELL MW-3

April 1990
T-1166-01

FIG. 5

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ENVIRONMENTAL CHEMISTS

Date of Report: April 2, 1990
Date Submitted: March 16, 1990
Project: T-1166-01

RESULTS OF ANALYSES OF SOIL SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS
BY IR (EPA METHOD 418.1)
Results Reported as µg/g (ppm)

Sample #	Total Petroleum Hydrocarbons (ppm)
MW-1/S-2	31
MW-1/S-4	34
MW-2/S-2	31
MW-2/S-4a	69
MW-3/S-2a	29
MW-3/S-5a	23

Quality Assurance	
Method Blank	<10
MW-1/S-2 (Duplicate)	29
MW-1/S-2 (Matrix Spike) Spiked @ 500 ppm Percent Recovery	74%
MW-1/S-2 (Matrix Spike Duplicate) Spiked @ 500 ppm Percent Recovery	80%

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: April 2, 1990
Date Submitted: March 16, 1990
Project: T-1166-01

RESULTS OF ANALYSES OF SOIL SAMPLES FOR BTX AND ETHYLBENZENE USING THE HEADSPACE METHOD
Results Reported as ng/g (ppb)

Sample #	Benzene	Toluene	Et-Benzene	Xylene *m,p*	Xylene *o*
MW-1/S-2	650	<1	<10	2	2
MW-1/S-4	170	10	92	71	47
MW-2/S-2	270	99	120	76	42
MW-2/S-4a	61	14	<10	8	<1
MW-3/S-2a	330	17	<10	24	<1
MW-3/S-5a	2	4	<10	<1	<1
Quality Assurance					
Method Blank	<1	<1	<10	<1	<1
MW-2/S-4a (Duplicate)	42	15	<10[a]	<1	<1
MW-2/S-4a (Matrix Spike) Spiked @ 150 ppb Percent Recovery	41%	38%	77%	42%	40%
MW-2/S-4a (Matrix Spike Duplicate) Spiked @ 150 ppb Percent Recovery	63%	51%	77%	66%	58%

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: April 2, 1990
Date Submitted: March 16, 1990
Project: T-1166-01

RESULTS OF ANALYSES OF ~~WATER~~ SOIL SAMPLES FOR EP-TOX METALS IN ACCORDANCE WITH "TEST METHODS FOR EVALUATING SOLID WASTE" EPA SW-846, 3rd EDITION
Results Reported as mg/L (ppm)

Sample #	Lead (ppm)
MW-1/S-2	<0.1
MW-1/S-4	<0.1
MW-2/S-2	<0.1
MW-2/S-4a	<0.1
MW-3/S-2a	<0.1
MW-3/S-5a	<0.1

Quality Assurance

Method Blank	<0.1

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: April 2, 1990
Date Submitted: March 16, 1990
Project: T-1166-01

RESULTS OF ANALYSES OF WATER SAMPLES
FOR TOTAL PETROLEUM HYDROCARBONS
BY IR (EPA METHOD 418.1)
Results Reported as mg/L (ppm)

Sample #	Total Petroleum Hydrocarbons (ppm)
MW-1/W-1	<1
MW-2/W-2	<1
MW-3/W-3	<1
Quality Assurance	
Method Blank	<1
MW-1/W-1 (Duplicate)	<1
MW-1/W-1 (Matrix Spike) Spiked @ 10 ppm Percent Recovery	87%
MW-1/W-1 (Matrix Spike Duplicate) Spiked @ 10 ppm Percent Recovery	68%

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Date of Report: April 2, 1990
Date Submitted: March 16, 1990
Project: T-1166-01

RESULTS OF ANALYSES OF WATER SAMPLES
FOR BTX AND ETHYLBENZENE
USING THE HEADSPACE METHOD
Results Reported as ng/mL (ppb)

Sample #	Benzene	Toluene	Et-Benzene	Xylene *m,p*	Xylene *o*
MW-1/W-1	710	1	<10	<1	<1
MW-2/W-2	59	2	<10	<1	<1
MW-3/W-3	35	<1	<10	<1	<1
MW-4/W-4	<1	<1	<10	<1	<1
Quality Assurance					
Method Blank	<1	<1	<10	<1	<1