NW

40005542

~~90627S~~

Port of Seattle
Terminal 115
LUST # 5011

1/1

EMCON

PORT OF SEATTLE

P.O. BOX 1209 • SEATTLE, WA 98111 • (206) 728-3000

MESSAGE

Roger Nye
NW Regional Office

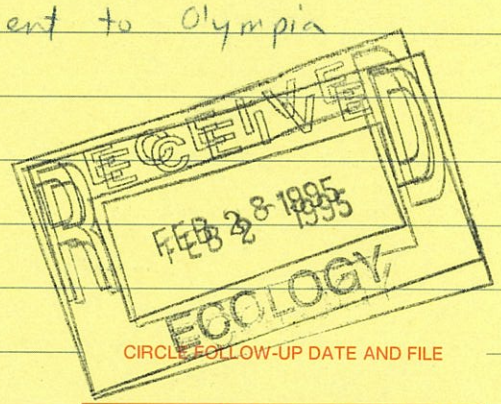
2/27/95

Enclosed are copies of the tank decommissioning and the followup assessment report for the undocumented 3^USTs discovered at Terminal 115. For tracking purposes we have labelled the tank T115m, T115n + T115o. The tanks and accessible contaminated soils have been removed. We are in the process of initiating quarterly ground water sampling. Copies of

REPLY

DATE

these reports have also been sent to Olympia



CIRCLE FOLLOW-UP DATE AND FILE

MONTH	J	F	M	A	M	J	J	A	S	O	N	D
DAY	1	2	3	4	5	6	7					
8	9	10	11	12	13	14	15					
16	17	18	19	20	21	22	23					
24	25	26	27	28	29	30	31					

SIGNED

DETACH AND FILE FOR FOLLOW-UP

NW

U0005542
006275

SOIL AND GROUNDWATER ASSESSMENT REPORT

1/1

Port of Seattle
Terminal 115
Seattle, Washington

SR 8/30/95 EM

DEPARTMENT OF ECOLOGY
NWRO/TCP TANK UNIT
WC# 3011
INTERIM CLEANUP REPORT ☑
SITE CHARACTERIZATION ☑
FINAL CLEANUP REPORT ☐
OTHER ☐
AFFECTED MEDIA: SOIL ☑
OTHER GW ☑
INSPECTOR (INIT.) RV DATE 8/28/95

Prepared for

Ms. Kathy Bahnick

Port of Seattle
2611 Alaskan Way
Seattle, Washington

February 21, 1995

RECEIVED
FEB 28 1995
ECOLOGY

Prepared by

EMCON Northwest, Inc.
18912 North Creek Parkway, Suite 100
Bothell, Washington 98011-8016

Project 0357-013.02

Soil and Groundwater Assessment Report
Port of Seattle
Terminal 115
Seattle, Washington

The material and data in this report were prepared by or under the supervision and direction of the undersigned.

EMCON Northwest, Inc.

Tom R. Bodle
Geologist

John K. Meyer
Project Manager

James Bailey, R.G.
Supervising Hydrogeologist

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TABLES AND ILLUSTRATIONS

Tables

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EXECUTIVE SUMMARY

At the request of the Port of Seattle, EMCON conducted a soil and groundwater site assessment at Terminal 115 in Seattle, Washington. The work was conducted to assess and document subsurface soil and groundwater conditions near three former underground storage tanks discovered and removed in April 1994. Field activities focused on obtaining baseline groundwater quality data and information about subsurface geology and groundwater occurrence.

Field activities completed in October and November 1994 consisted of the following:

- Drilling four hollow-stem auger soil borings approximately 16 feet (ft) below the ground surface (bgs) and installing four groundwater monitoring wells
- Hand augering five soil borings approximately 5 ft bgs
- Collecting soil samples from the soil borings
- Developing and surveying the wells
- Collecting groundwater samples
- Coordinating chemical analyses of selected soil and groundwater samples
- Evaluating hydrogeological and chemical data

The investigation identified the following conditions:

Soils encountered during drilling consisted of approximately 10 to 15 ft of sand and gravel (fill) overlying interbedded silt and sand (alluvium) to the total explored depth of approximately 16 ft bgs.

Laboratory testing indicated soil samples collected from borings MW-10 and MW-11 and hand auger boring HB2 contained concentrations of total petroleum

hydrocarbons as oil (TPH-O) exceeding Model Toxics Control Act (MTCA) Method A Cleanup Levels.[1]

Groundwater was present approximately 9 to 11 ft bgs during the November 4, 1994, sampling event, with a hydraulic gradient of approximately 0.004 ft per ft, generally directed toward the west.

Laboratory testing indicated groundwater samples collected from MW-8 and MW-9 on November 4, 1994, contained concentrations of total petroleum hydrocarbons as diesel (TPH-D) exceeding the MTCA Method A Cleanup Level. The groundwater sample collected from MW-9 also contained benzene exceeding the MTCA Method A Cleanup Level.

Base neutral-acid semivolatile organic compound and volatile organic compound analyses indicated the groundwater sample collected from MW-8 contained a vinyl chloride concentration exceeding the MTCA Method A Cleanup Level; methylene chloride, benzene, ethylbenzene, isopropylbenzene, n-propylbenzene, and naphthalene were also detected.

Total lead concentrations exceeded the MTCA Method A Cleanup Level in all groundwater samples analyzed.

This summary is presented solely for introductory purposes and is intended for use in conjunction with the full text of this report.

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[1] Chapter 173-340 WAC, *The Model Toxics Control Act Cleanup Regulation; Method A Cleanup Levels.* Amended December 1993.

1 INTRODUCTION

EMCON was retained by the Port of Seattle to conduct a subsurface investigation at the Terminal 115 facility located in Seattle, Washington. The investigation was conducted to assess the condition of soil and groundwater adjacent to a former underground storage tank excavation located at the south portion of the site.

The tasks completed under the current scope of work consisted of the following:

- Updating the site-specific health and safety plan
- Conducting a utilities clearance check
- Drilling four hollow stem auger and five hand auger soil borings and logging soil conditions
- Converting the four hollow stem auger borings to 2-inch (in)-diameter PVC groundwater monitoring wells
- Developing and surveying the wells
- Collecting soil and groundwater samples
- Field screening soil samples for petroleum hydrocarbons
- Coordinating chemical analyses of selected soil and groundwater samples
- Evaluating laboratory data
- Preparing a report of the findings

The work was authorized under Supplemental Agreement Number 11 of Professional Services Agreement Number P-047006, dated July 19, 1993, between the Port of Seattle and EMCON. Tasks were completed in general accordance with the October 10, 1994, proposal to the Port of Seattle regarding subsurface assessment activities.

2 BACKGROUND

2.1 Site Description

The Terminal 115 property is owned by the Port of Seattle. The site is located on the Duwamish Waterway in Seattle, Washington (Figure 2-1). The site is bordered on the north by industrial property, on the south by Southwest Michigan Street, on the east by the Duwamish Waterway, and on the west by West Marginal Way Southwest (Figure 2-2). The property is relatively level at an elevation of approximately 20 feet (ft) above mean sea level. The site is currently used as a marine storage, transfer, and loading facility.

2.2 Previous Investigations

Three, approximately 6,000-gallon (gal), underground storage tanks (USTs) were discovered at Terminal 115 during construction activities for the tenant (Seafreeze, Inc.) in April 1994. EMCON was retained by the Port of Seattle to conduct an environmental assessment following tank decommissioning and removal.

Approximately 750 cubic yards (cu yd) of petroleum hydrocarbon impacted soil were removed from the UST excavation following tank decommissioning and removal. A review of laboratory results indicated that soil samples collected from the four excavation sidewalls contained concentrations of total xylenes, total petroleum hydrocarbons as gasoline (TPH-G), diesel (TPH-D), and oil (TPH-O) exceeding MTCA[2] Method A Cleanup Levels. Groundwater was encountered at approximately 9 ft below the ground surface (bgs) during excavation activities. Results of the investigation were presented in draft form to the Port of Seattle in the *Underground Storage Tank Decommissioning and Soil Assessment Report*, dated August 23, 1994.

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[2] Chapter 173-340 WAC, *The Model Toxics Control Act Cleanup Regulation; Method A Cleanup Levels.*

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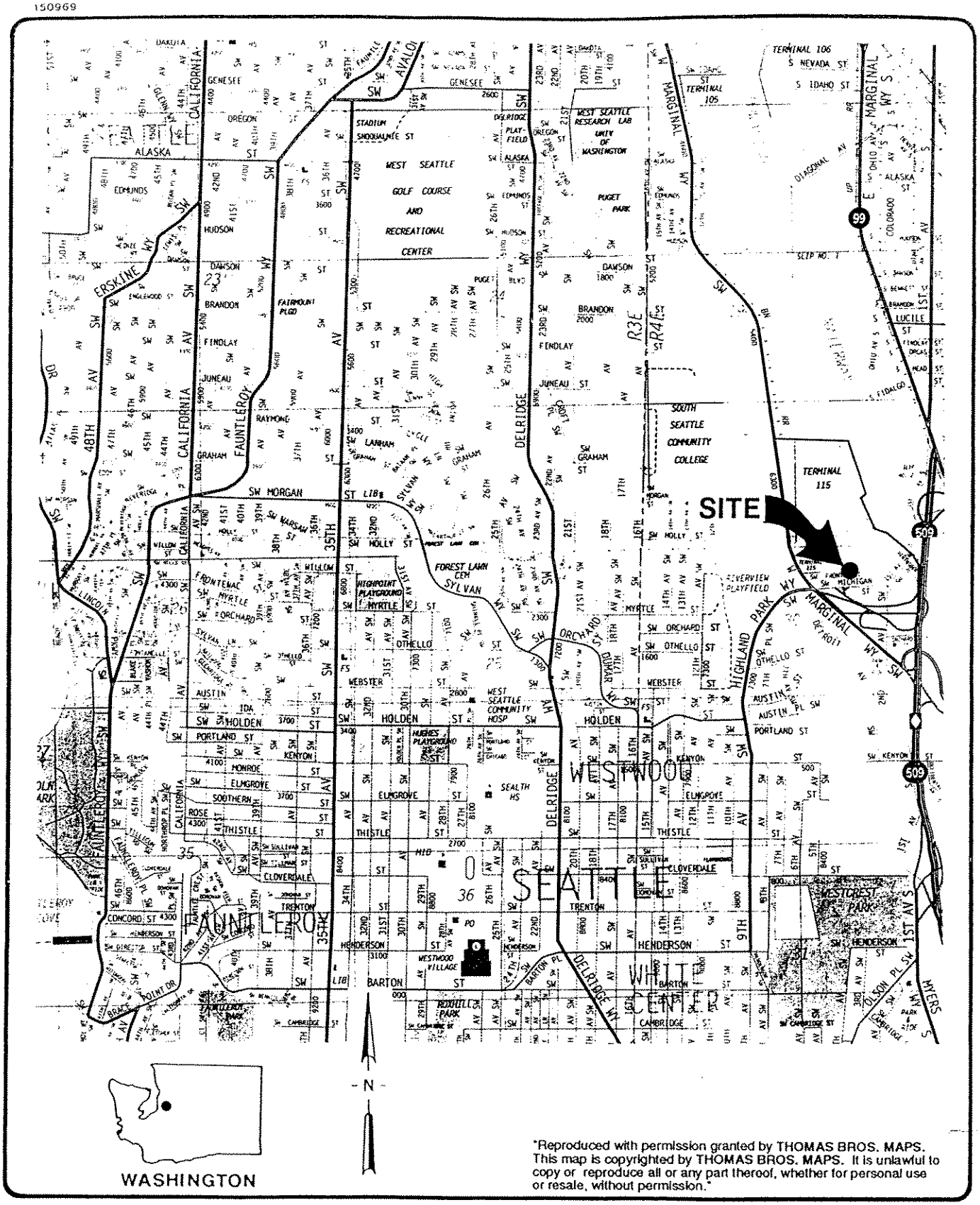
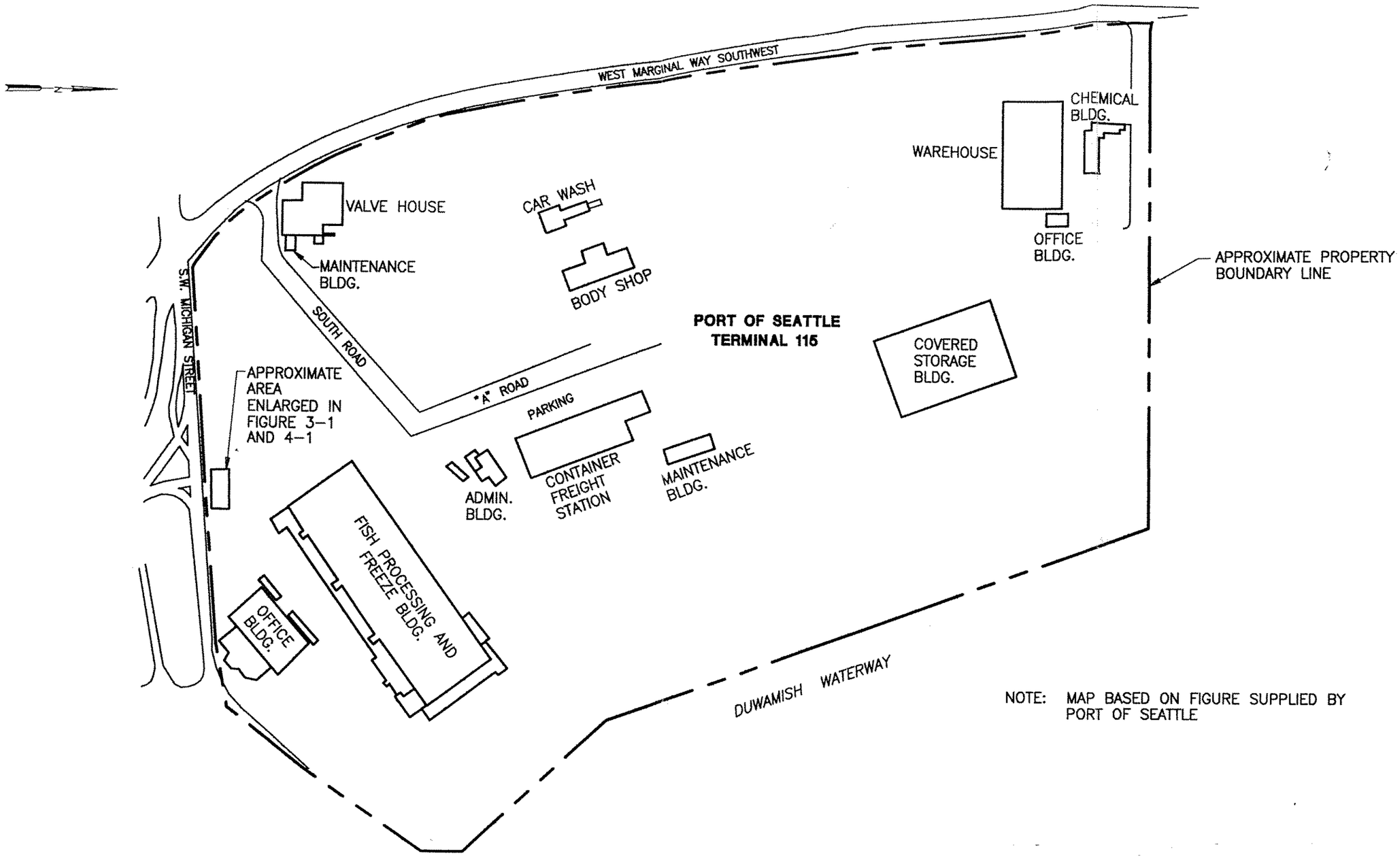


EMCON Northwest, Inc.

DATE 5-94
DWN. MLP
APPR.
REVIS.
PROJECT NO. 0357-013.01

Figure 2-1
PORT OF SEATTLE
TERMINAL 115
SEATTLE, WASHINGTON
SITE LOCATION MAP



NOTE: MAP BASED ON FIGURE SUPPLIED BY PORT OF SEATTLE

0 300 600

SCALE (ft)

EMCON Northwest, Inc.

DATE	5-94
DWN.	MLP
REV.	
APPR.	
PROJECT NO.	0357-013.01

Figure 2-2
PORT OF SEATTLE
TERMINAL 115
SEATTLE, WASHINGTON
SITE PLAN

1= 300 12-13-94 G:\DWG\0357\013\01BLC03A

3 FIELD INVESTIGATIONS

3.1 Drilling and Soil Sampling

A site-specific health and safety plan was prepared, and underground utilities clearances were conducted by local utility companies and Locating, Inc., a private utility locating service, before work began.

Four borings (MW-8 through MW-11) were advanced approximately 16 ft bgs by using hollow-stem auger drilling equipment on October 27 and 28, 1994. Boring locations are shown on the site maps in Section 4. Soil samples were collected at approximate 2.5-ft intervals during drilling. Drilling was conducted by Tacoma Pump and Drill, Inc., Tacoma, Washington. In addition to hollow-stem auger borings, five hand-auger soil borings (HB1, HB2, HB3, and HB7) were advanced in the same area. The hand borings were advanced approximately 5 ft bgs. Auger boring logs are presented in Appendix A.

Soil samples were field screened by using a portable photoionization detector (PID). An Environmental Instruments Model 580B OVM, calibrated daily to 100 parts per million (ppm) isobutylene, was used to obtain field measurements. This analysis was performed to assist in sample selection for laboratory testing. Soil samples for laboratory testing were collected in laboratory supplied 4-ounce (oz) jars with Teflon™-lined lids, then placed into an iced cooler and delivered to the laboratory for analysis. An EMCON geologist logged soil types in accordance with the Unified Soil Classification System.

Groundwater was encountered at approximately 9.0 to 10.5 ft bgs during drilling. Drill cuttings were contained in labeled 55-gal drums and temporarily stored on site pending disposal. Following sampling, the hand-auger borings were abandoned with bentonite chips, hydrated with potable water to approximately 1 ft bgs, and completed at the surface with a concrete seal. Additional details regarding drilling and soil sampling procedures are presented in Appendix A.

3.2 Monitoring Well Construction, Development, and Surveying

3.2.1 Well Construction

Borings MW-8 through MW-11 were completed as groundwater monitoring wells. The monitoring wells were constructed using 2-in-diameter, flush-threaded, schedule 40 PVC well casing and 0.010-in. factory slotted well screen. The well screen interval was placed from approximately 5 to 15 ft bgs. A filter pack of washed silica sand was placed around the well screen to 2 ft above the screened interval. A bentonite seal was placed above the filter pack to approximately 1 ft bgs. A flush-mounted, traffic-rated, well cover was set in concrete in accordance with Port of Seattle construction specifications to complete the surface seal of each well. Well construction details are shown on the boring logs in Appendix A.

3.2.2 Well Development

An EMCON geologist developed each monitoring well to remove water introduced into the well during drilling and to reduce the volume of fine-grained soil entering through the filter pack. Monitoring wells MW-8 through MW-11 were developed by surging and purging at least three well casing volumes. Water was purged from each well by using a disposable Teflon bailer. Water accumulated during development was contained in labeled, 55-gal drums and temporarily stored on site pending disposal.

3.2.3 Well Elevation Surveying

EMCON personnel surveyed the top of each monitoring well PVC casing to the nearest 0.01 ft relative to Seattle Tide Lands Grid horizontal data and Mean Low Low Water vertical datum. Survey data are presented in Table 3-1. The well survey data, along with depth-to-water measurements, were used to calculate the relative groundwater elevations. These data were used to evaluate the groundwater gradient and inferred flow direction.

3.3 Groundwater Sampling

Groundwater sampling was conducted on November 4, 1994. Before collecting groundwater samples, depth-to-water measurements were taken by using a Solinst™ electronic well sounding probe. Measurements were recorded to the nearest 0.01 ft and converted to relative groundwater elevations using the well survey data.

Approximately three well casing volumes of water were purged before sample collection. Water was purged from each well by using a disposable Teflon bailer. Groundwater temperature, conductance, and pH were measured and recorded on an EMCON field

Table 3-1

Groundwater Elevation Data
Port of Seattle Terminal 115
Seattle, Washington

Well Number	Screened Interval (ft bgs)	Top of Casing Grid Coordinates[a]		Top of Casing Elevation[b] (ft)	Date	Depth to Water (ft)	Depth to Product (ft)	Groundwater Elevation (ft)
		Northing	Easting					
MW-8	5.0 to 15.0	749.65	31,045.71	21.05	11/04/94	9.81	None	11.24
MW-9	5.0 to 15.0	722.45	30,989.47	21.61	11/04/94	10.56	None	11.05
MW-10	4.3 to 14.3	772.27	31,113.83	20.29	11/04/94	8.82	None	11.47
MW-11	5.0 to 15.0	732.09	31,106.66	20.78	11/04/94	9.32	None	11.46

[a] Grid coordinates relative to Seattle Tide Lands Grid data are located on S.W. Michigan Street.
[b] Elevation relative to Mean Low Low Water vertical datum is located on S.W. Michigan Street.

sampling data sheet after each well casing of water was purged. Purge water accumulated during sampling was contained in labeled, 55-gal drums and temporarily stored on site pending disposal.

Following purging, one groundwater sample was collected from each well by using a disposable Teflon bailer. A duplicate sample, labeled MW-5, was collected from monitoring well MW-10 for quality control and quality assurance purposes. The five samples were placed into an iced cooler and transported to the laboratory for analysis. Additional details regarding groundwater sampling procedures are presented in Appendix A.

3.4 Waste Disposal

Approximately 200 gal of purge water and decontamination rinsate were collected. The purge water was sampled and found to contain 19 ppb total organic halides and 21 ppb total lead. The water was subsequently transported by Spencer Environmental, Inc., for treatment and disposal.

Approximately 4 tons (3 cu yd) of drill cuttings were transported to Roosevelt Regional Landfill in Roosevelt, Washington for disposal.

4 FINDINGS

4.1 Soil Conditions

The subsurface consisted of sand and gravel fill to approximately 10 to 15 ft bgs, underlain by interbedded silt and sand with organic debris to the total explored depth of approximately 16 ft bgs.

4.2 Groundwater Conditions

Shallow groundwater under water table (unconfined) conditions was encountered 9 to 10 ft bgs during drilling. Depth to water measurements collected during groundwater sampling on November 4, 1994, ranged from 8.82 to 10.56 ft bgs. The groundwater gradient was 0.004 ft per ft (ft/ft) to the west. Groundwater elevation data are included in Table 3-1.

4.3 Quantitative Chemical Analyses

4.3.1 Laboratory Procedures

Soil and groundwater sample analyses were performed by Columbia Analytical Services, Inc., in Bothell, Washington. Laboratory reports are contained in Appendix B.

Selected soil samples were analyzed for TPH-G and benzene, toluene, ethylbenzene, and total xylenes (BTEX) using Washington State Department of Ecology (Ecology) Method WTPH-G/EPA Method 5030/8020 and TPH-D and TPH-O using Ecology Method WTPH-D (extended). One soil sample collected from MW-10 was analyzed for base neutral-acid semivolatile organic compounds (SVOCs) using EPA Methods 3550/8270, volatile organic compounds (VOCs) using EPA Method 8260, and total lead using EPA Method 7420.

Groundwater samples were analyzed for TPH-G and BTEX using Ecology Method WTPH-G/EPA Method 5030/8020, TPH-D and TPH-O using Ecology Method WTPH-D, extended, and for total lead using EPA Method 7421. One groundwater sample collected from monitoring well MW-8 was analyzed for SVOCs using EPA

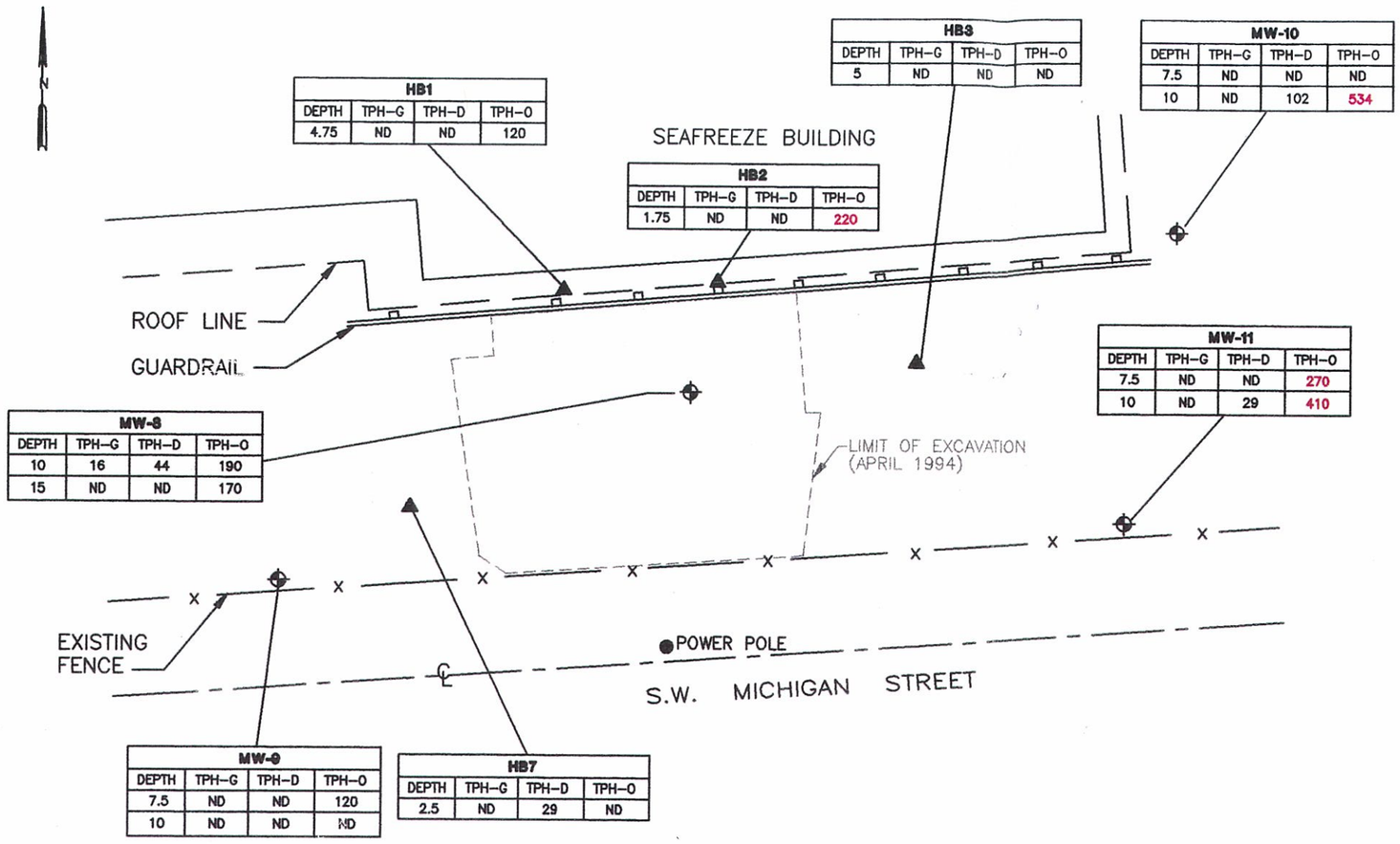
Methods 3550/8270 and VOCs using EPA Method 8260. The collected purge water was analyzed for total organic halides using EPA Method 9020A and total lead using EPA Method 7421.

4.3.2 Laboratory Results

Soil samples collected from monitoring wells MW-10 and MW-11 at 10 ft bgs, and the sample collected from MW-11 at 7.5 ft bgs, contained 534, 410, and 270 ppm TPH-O respectively, exceeding the MTCA Method A Cleanup Level of 200 ppm. The sample collected at 1.75 ft bgs from hand boring HB2 contained 220 ppm TPH-O. No other analyte concentrations exceeded MTCA Method A Cleanup Levels in any soil samples analyzed. Laboratory results for soil samples are shown on Figure 4-1 and are summarized in Table 4-1.

Groundwater samples collected from MW-8 and MW-9 contained 3,170 and 1,420 parts per billion (ppb) TPH-D, respectively, exceeding the MTCA Method A Cleanup Level of 1,000 ppb. The laboratory reported that the samples contained components that eluted in the diesel range; however, the chromatograms did not match the typical diesel fingerprint. The sample collected from MW-9 also contained 10.0 ppb benzene, exceeding the MTCA Method A Cleanup Level of 5 ppb. Total lead concentrations ranging between 12 and 54 ppb were detected in all five groundwater samples analyzed. TPH, BTEX, and total lead results are shown on Figure 4-2, and are summarized in Table 4-2.

Results of SVOC and VOC analyses indicate that the groundwater sample collected from MW-8 contained 0.6 ppb vinyl chloride, exceeding the MTCA Method A Cleanup Level of 0.2 ppb. The groundwater sample collected from MW-8 also contained methylene chloride, benzene, and ethylbenzene concentrations below MTCA Method A Cleanup Levels. Isopropylbenzene, n-propylbenzene, and naphthalene were also reported. These compounds are not included on the list of MTCA Method A Cleanup Levels. A summary of laboratory results of SVOC and VOC analyses for MW-8 is presented in Table 4-3. Copies of the laboratory reports are included in Appendix B.



LEGEND:

MW-1 ⊕ Monitoring Well Location

HB1 ▲ Hand Boring Location

MW-10			
DEPTH	TPH-G	TPH-D	TPH-O
7.5	ND	ND	ND
10	ND	102	534

Laboratory Results in mg/kg

TPH-G = Total Petroleum Hydrocarbons as Gasoline
TPH-D = Total Petroleum Hydrocarbons as Diesel
TPH-O = Total Petroleum Hydrocarbons as Oil

Depths are in Feet Below Ground Surface

Numbers in red exceed MTCA Method A Cleanup Levels

EMCON Northwest, Inc.

0 20 40
SCALE (ft)

DATE 12-94
DWN. MLP
REV. ____
APPR. ____
PROJECT NO.
0357-013.02

Figure 4-1
PORT OF SEATTLE
TERMINAL 115
SEATTLE, WASHINGTON
SOIL DATA
OCTOBER 27 AND 28, 1994

1=20 2-01-95 G:\DWG\0357\013\02BLC01

Table 4-1

Laboratory Results for Soil
Port of Seattle Terminal 115
Seattle, Washington

Sample Number	Depth (ft)	Date Collected	Results of Analyses (ppm)							
			Ecology Method WTPH-G	Ecology Method WTPH-D (extended)		EPA Method 5030/8020				Total Lead EPA Method 7420
			TPH-G	TPH-D	TPH-O	Benzene	Toluene	Ethylbenzene	Total Xylenes	
MTCA Method A Cleanup Levels[a]			100	200	200	0.5	40	20	20	
Source Location MW-8										
1-10′	10.0	10/27/94	16	44[b]	190	ND	ND	ND	ND	—
1-15′	15.0	10/27/94	ND	ND	170[c]	ND	ND	ND	ND	—
Source Location MW-9										
2-7.5′	7.5	10/28/94	ND	ND	120	ND	ND	ND	ND	—
2-10′	10.0	10/28/94	ND	ND	ND	ND	ND	ND	ND	—
Source Location MW-10										
3-7.5′	7.5	10/28/94	ND	ND	ND	ND	ND	ND	ND	—
3-10′	10.0	10/28/94	ND	102[b]	534	ND	ND	ND	ND	ND
Source Location MW-11										
4-7.5′	7.5	10/28/94	ND	ND	270	ND	ND	ND	ND	—
4-10′	10.0	10/28/94	ND	29[b]	410	ND	ND	ND	ND	—
Hand Borings										
HB1-4.75′	4.8	10/28/94	ND	ND	120	ND	ND	ND	ND	—
HB2-1.75′	1.8	10/28/94	ND	ND	220	ND	ND	ND	ND	—
HB3-5′	5.0	10/28/94	ND	ND	ND	ND	ND	ND	ND	—
HB7-2.5	2.5	10/28/94	ND	29[b]	ND	ND	ND	ND	ND	—

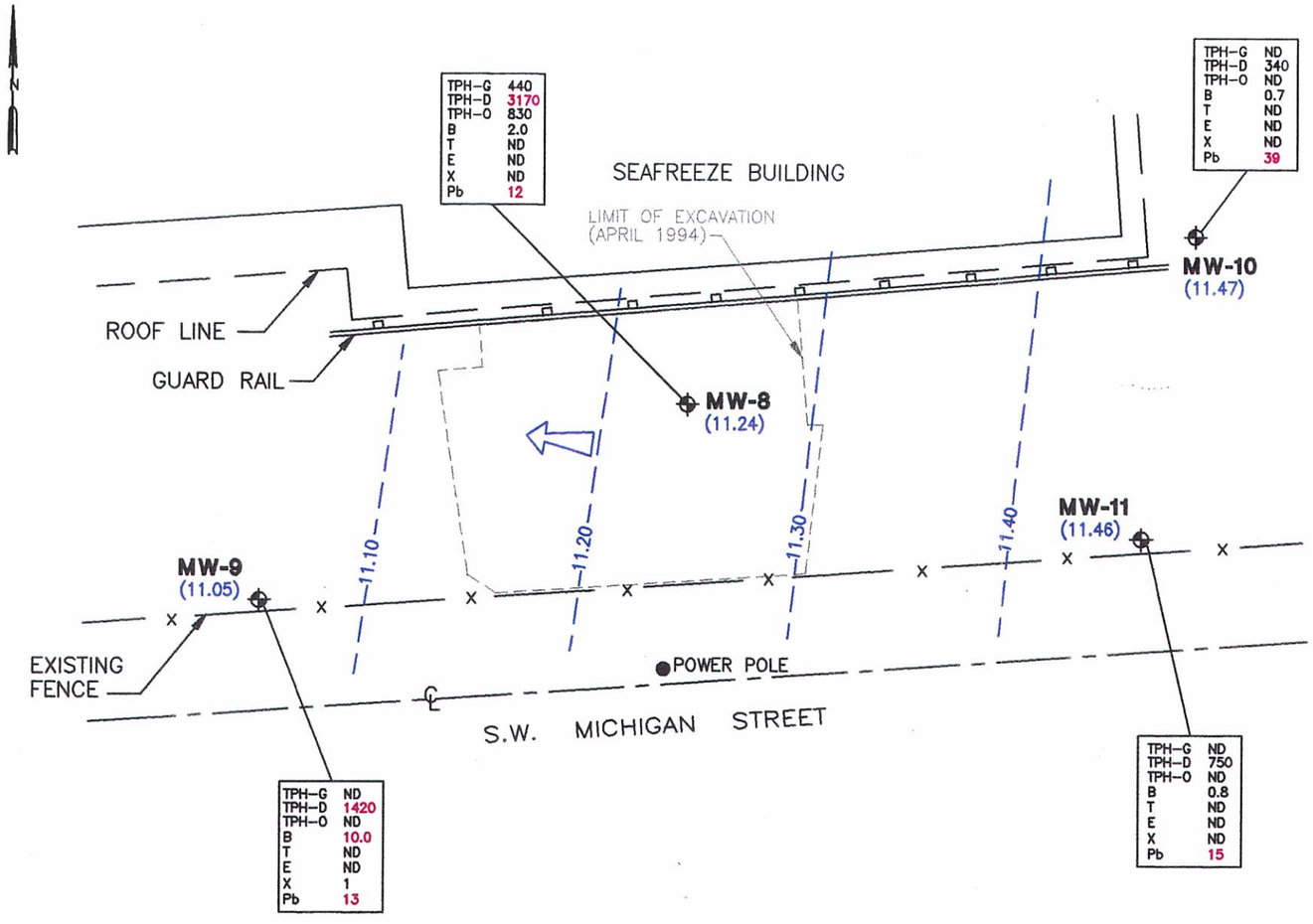
NOTE: Shaded values equal or exceed MTCA Method A Cleanup Levels.

ND = not detected at or above method reporting limit.
TPH-G = total petroleum hydrocarbons as gasoline.
TPH-D = total petroleum hydrocarbons as diesel.
TPH-O = total petroleum hydrocarbons as oil.
ppm = parts per million.
NA = not applicable.
— = not analyzed.

[a] Chapter 173-340 WAC, *The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Levels.* Amended December 1993.

[b] Quantified as diesel. The sample contained components that eluted in the diesel range, but the chromatogram did not match the typical diesel fingerprint.

[c] Quantified as oil. The sample contained components that eluted in the oil range, but the chromatogram did not match the typical oil fingerprint.



LEGEND:

MW-8 ⊕ Monitoring Well Location

TPH-G	ND
TPH-D	340
TPH-O	ND
B	0.7
T	ND
E	ND
X	ND
Pb	54

Laboratory Results in Parts per Billion

TPH-G = Total Petroleum Hydrocarbons as Gasoline
TPH-D = Total Petroleum Hydrocarbons as Diesel
TPH-O = Total Petroleum Hydrocarbons as Oil
B = Benzene
T = Toluene
E = Ethylbenzene
X = Total Xylenes
Pb = Total Lead

ND = Not Detected at or Above the Method Reporting Limit

Numbers in red exceed MTCA Method A Cleanup Levels

(11.24) Groundwater Elevation

--11.10-- Groundwater Elevation Contour

Inferred Groundwater Flow Direction

EMCON Northwest, Inc.

0 20 40
SCALE (ft)

DATE 12-94
DWN. MLP
REV.
APPR.
PROJECT NO.
0357-013.02

Figure 4-2
PORT OF SEATTLE
TERMINAL 115
SEATTLE, WASHINGTON
GROUNDWATER DATA
NOVEMBER 4, 1994

1=20 2-01-94 G:\DWG\0357\013\02BLC02

Table 4-2

Laboratory Results for Groundwater
TPH, BTEX, Lead
Port of Seattle Terminal 115
Seattle, Washington

Monitoring Well		Date	Results of Analyses (µg/L)							
			Ecology Method WTPH-G	Ecology Method WTPH-D (extended)		EPA Method 5030/602				EPA Method 7421
Well Number	Sample Name		TPH-G	TPH-D	TPH-O	Benzene	Toluene	Ethylbenzene	Total Xylenes	Total Lead
MTCA Method A Cleanup Levels[a]			1,000	1,000	1,000	5	40	30	20	5
MW-8	MW-8	11/04/94	440	3,170[b]	830[c]	2.0	ND	ND	ND	12
MW-9	MW-9	11/04/94	ND	1,420[b]	ND	10.0	ND	ND	1	13
MW-10	MW-10	11/04/94	ND	340[b]	ND	0.7	ND	ND	ND	39
MW-10 (Dup)	MW-5	11/04/94	ND	320[b]	ND	0.8	ND	ND	ND	54
MW-11	MW-11	11/04/94	ND	750[b]	ND	0.8	ND	ND	ND	15

NOTE: Shaded values equal or exceed MTCA Method A Cleanup Levels.
ND = not detected at or above method reporting limit.
TPH-G = total petroleum hydrocarbons as gasoline.
TPH-D = total petroleum hydrocarbons as diesel.
TPH-O = total petroleum hydrocarbons as oil.
µg/L = micrograms per liter; approximate parts per billion.
— = not analyzed.

a Chapter 173-340 WAC, *The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Levels.* Amended December 1993.
b Quantified as diesel. The sample contained components that eluted in the diesel range, but the chromatogram did not match the typical diesel fingerprint.
c Quantified as oil. The sample contained components that eluted in the oil range, but the chromatogram did not match the typical oil fingerprint.

Table 4-3

Laboratory Results for Groundwater
SVOCs, VOCs
Port of Seattle Terminal 115
Seattle, Washington

Monitoring Well	Sample Name	Date	Results of Analyses (µg/L)							
			EPA Method 8260							EPA Method 3520/8220
			Vinyl chloride	Methylene chloride	Benzene	Ethylbenzene	Isopropylbenzene	n-propylbenzene	Naphthalene	
MTCA Method A Cleanup Level[a]			0.2	5	5	30	NA	NA	NA	Various
MW-8	MW-1	11/04/94	0.6	2.1	2.0	0.8	2	3	14	ND

NOTE: Shaded values exceed MTCA Method A Cleanup Levels.
Analytes not detected in any sample are not listed.
NA = not applicable.
ND = not detected at or above method reporting limit.
µg/L = micrograms per liter; approximates parts per billion.

[a] Chapter 173-340 WAC, *The Model Toxics Control Act Cleanup Regulations, Method A Cleanup Levels.* Amended December 1993.

5 SUMMARY AND CONCLUSIONS

Subsurface soils consist of 10 to 15 ft of sand and gravel fill, underlain by interbedded silt and sand. Groundwater was present approximately 9 to 11 ft bgs during the November 4, 1994, sampling event, with a gradient of approximately 0.004 ft/ft toward the west.

Soil samples collected from approximately 7.5 ft bgs from MW-10, 7.5 and 10 ft bgs from MW-11, and 1.75 ft bgs from hand boring HB2 contained concentrations of TPH-O exceeding the MTCA Method A Cleanup Level. No other analyte concentrations exceeded MTCA Method A Cleanup Levels in any soil sample analyzed.

Groundwater samples collected from MW-8 and MW-9 on November 4, 1994, contained concentrations of TPH-D exceeding the MTCA Method A Cleanup Level. The groundwater sample collected from MW-9 also contained a benzene concentration exceeding the MTCA Method A Cleanup Level.

SVOC and VOC testing indicated that the groundwater sample collected from MW-8 contained a vinyl chloride concentration exceeding the MTCA Method A Cleanup Level; methylene chloride, benzene, ethylbenzene, isopropylbenzene, n-propylbenzene, and naphthalene were also detected. Total lead concentrations exceeded the MTCA Method A Cleanup Level in all groundwater samples analyzed.

LIMITATIONS

The services described in this report were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, nor the use of segregated portions of this report.

APPENDIX A

BORING LOGS, WELL CONSTRUCTION DETAILS, AND SAMPLING PROCEDURES

FIELD METHODS AND SAMPLING PROCEDURES

A.1 Drilling Methods

Tacoma Pump and Drill Inc., of Tacoma, Washington, drilled and installed the monitoring wells. The borings were advanced by using hollow stem augers. An EMCON geologist observed all soil boring activities. Soil samples were obtained at approximate 2.5-ft-depth intervals by using a 3-in. outer-diameter, split-spoon sampling device and a 140-pound hammer, free-falling 30 ins. The number of blows required to drive the sampler the last 12 in. is shown on the boring logs at the respective sampling depth. Samples were recovered from the split spoon sampler and described according to the classification scheme presented in Figure A-1.

Recovered soil samples were transferred to laboratory prepared glass jars and placed in a chilled cooler for transport to the testing laboratory. Field screening methods and sample jars and sample handling are discussed in subsequent sections of this appendix.

Drill cuttings from the soil borings were placed in 55-gal drums, labeled, and sealed. The drums were stored on site pending disposal. Well installation details are shown on the log of exploratory boring. An explanation of symbols used on the boring logs is described in Figure A-2.

A.2 Field Screening for Organic Vapors

Field tests consisted of portable PID measurements for the presence of volatile organic vapors in each recovered soil sample. An Environmental Instruments Model 580B OVM, calibrated daily to 100 ppm isobutylene, was used to obtain the measurements. Typically, a small hole is poked into the soil with a gloved finger, then the PID is placed directly into the hole and covered with the hand. The maximum reading on the PID indicates the relative concentration of hydrocarbons in that soil sample. This screening equipment was also used for health and safety air quality monitoring in the breathing zone during boring operations.

The field tests were performed to determine the relative magnitude of volatile organic vapors, if any, in the excavations or soil borings. This analysis is performed to compare samples qualitatively and to assist in sample selection for chemical analysis. Field

Sample Descriptions

Classification of soils in this report is based on visual field observations which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless stated. Visual-manual classification methods of ASTM D 2488 were used as an identification guide. Soil density/consistency in borings is related primarily to the Standard Penetration Resistance. Soil density/consistency in test pits is estimated based on visual observation and is presented parenthetically on the test pit logs.

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% retained on No. 200 Sieve.	GRAVEL More than 50% of coarse fraction retained on No. 4 sieve.	CLEAN GRAVEL	GW	Well-graded gravel, fine to coarse gravel
			GP	Poorly-graded gravel
		GRAVEL WITH FINES	GM	Silty gravel
			GC	Clayey gravel
	SAND More than 50% of coarse fraction passes No. 4 sieve.	CLEAN SAND	SW	Well-graded sand, fine to coarse sand
			SP	Poorly-graded sand
		SAND WITH FINES	SM	Silty sand
			SC	Clayey sand
FINE GRAINED SOILS More than 50% passes No. 200 sieve.	SILT AND CLAY Liquid limit less than 50.	INORGANIC	ML	Silt
			CL	Clay
		ORGANIC	OL	Organic silt, organic clay
	SILT AND CLAY Liquid limit 50 or more.	INORGANIC	MH	Silt of high plasticity, elastic silt
			CH	Clay of high plasticity, fat clay
		ORGANIC	OH	Organic clay, organic silt
HIGHLY ORGANIC SOILS			PT	Peat

DENSITY/CONSISTENCY

SAND or GRAVEL		SILT or CLAY	
Density	Standard Penetration Resistance in Blows/Foot	Consistency	Standard Penetration Resistance in Blows/Foot
Very loose	0 - 4	Very soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Medium dense	10 - 30	Medium stiff	4 - 8
Dense	30 - 50	Stiff	8 - 15
Very dense	>50	Very stiff	15 - 30
		Hard	>30

MOISTURE

Modifier	Description
Dry	Little perceptible moisture
Damp	Some perceptible moisture, probably below optimum
Moist	Probably near optimum moisture content
Wet	Much perceptible moisture, probably above optimum

MINOR CONSTITUENTS

Modifier	Estimated Percentage
Trace	< 5
Few	5 - 10
Little	10 - 25
Some	25 - 45

emcon Northwest, Inc.

DATE 3-91
DWN. TB
APPR.
REVIS.
PROJECT NO. 1.00

Figure A-1

SOIL CLASSIFICATION SYSTEM

FIGURE A-2
EXPLANATION OF SYMBOLS ON EXPLORATORY BORING LOGS

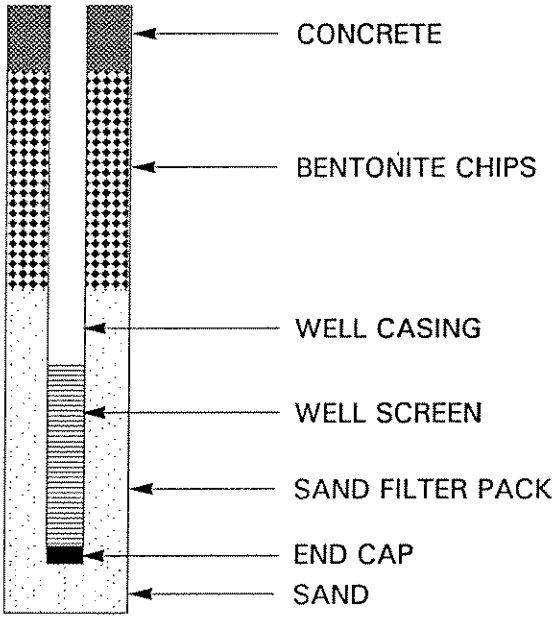
EMCON

SAMPLE COLUMN

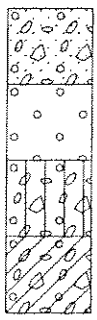
SAMPLE OBTAINED

SAMPLER DRIVEN, NO SAMPLE OBTAINED

WELL DETAILS COLUMN



LITHOLOGIC COLUMN

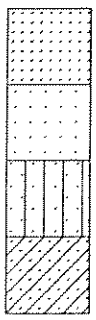


GW

GP

GM

GC

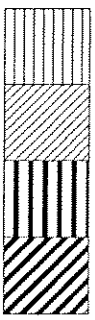


SW

SP

SM

SC



ML

CL

MH

CH

screening with a PID is a subjective analysis influenced by, among other things, climate (e.g., temperature and humidity), soil type and conditions, instrument calibration, and operation.

A.3 Groundwater Sampling Procedures

After calculating the volume of water in each well, a disposable Teflon bailer was used to remove a minimum of three casing volumes of water from each well. Field parameters (pH, temperature, and conductivity) were measured after each well volume was removed. Purging continued until field parameter measurements stabilized to within 10 percent of the previous measurement, or until the well was purged "dry." Groundwater samples were collected by using a disposable Teflon bailer when water levels had recovered sufficiently.

A.4 Sample Jars, Sample Handling, and Chain-of-Custody

Each discrete soil or groundwater sample and each composite soil sample were submitted in a laboratory-prepared glass container. Sample jars obtained specifically for use on this project consisted of glass jars with Teflon lid inserts. Samples were collected, labeled, and placed immediately into a chilled cooler for transport to the testing laboratory. Chain-of-custody records were maintained recording the sample number, the location, the depth, the type of preservative (if any), and the handling procedures.

A.5 Field Equipment Decontamination Procedures

All sampling equipment (e.g., spoons, bailers, etc.) was routinely decontaminated after each use and between sample locations. All sampling equipment was decontaminated with a nonphosphatic soap in a tap water solution, a stiff-bristle brush, a 1:1 (methanol:deionized water) rinse, and a thorough deionized water rinse. A new disposable Teflon bailer was used to collect a single sample set at each monitoring well. The bailers were disposed after each use.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Port of Seattle, Terminal 115**	BORING NO.	**MW- 8**
LOCATION	**Seattle, Washington**	PAGE	**1 OF 2**
DRILLED BY	**Tacoma Pump and Drilling Co., Inc.**	GROUND ELEV.	**21.05'**
DRILL METHOD	**Hollow-Stem Auger**	TOTAL DEPTH	**16.50'**
LOGGED BY	**T. Bodle**	DATE COMPLETED	**10/27/94**

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
	0							**0 to 0.33 foot: ASPHALT**
								0.33 to 2.5 feet: SAND WITH GRAVEL (SP), brown, coarse to medium, some fine gravel, damp. (FILL)
1-2.5' SS	0	50-50/3						**2.5 to 15.0 feet: SAND (SP),** brown, medium, few fine gravel, very dense, damp.
1-5' SS	0	38-40-45		5				
1-7.5' SS	0	60/5						
1-10' SS	325	36-35-35	▽ ATD	10				@ 10.5 feet to 10.66 feet: SILT. @ 10.66 feet: gray and black colored sand, wet.
1-15' SS	12	10-9-10		15				**15.0 to 16.5 feet: SILT (ML),** brown, trace fine sand, trace organic debris, very stiff, damp. (ALLUVIUM)
								Total depth drilled = 15.0 feet. Total depth sampled = 16.5 feet.
				20				See Page 2 for Well Completion Details.

REMARKS

(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

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LOG OF EXPLORATORY BORING

PROJECT NAME	**Port of Seattle, Terminal 115**	BORING NO.	**MW- 8**
LOCATION	**Seattle, Washington**	PAGE	**2 OF 2**
DRILLED BY	**Tacoma Pump and Drilling Co., Inc.**	GROUND ELEV.	**21.05'**
DRILL METHOD	**Hollow-Stem Auger**	TOTAL DEPTH	**16.50'**
LOGGED BY	**T. Bodle**	DATE COMPLETED	**10/27/94**

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
				25				**WELL COMPLETION DETAILS:** 0 to 5.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe. 5.0 to 15.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots and a 2-inch-diameter threaded end cap. 0 to 1.5 feet: Concrete. 1.5 to 3.0 feet: Bentonite chips hydrated with potable water. 3.0 to 16.5 feet: 10 - 20 Colorado Silica Sand.
				30				
				35				
				40				

REMARKS

(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

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LOG OF EXPLORATORY BORING

PROJECT NAME	**Port of Seattle, Terminal 115**	BORING NO.	**MW- 9**
LOCATION	**Seattle, Washington**	PAGE	**1 OF 2**
DRILLED BY	**Tacoma Pump and Drilling Co., Inc.**	GROUND ELEV.	**21.61'**
DRILL METHOD	**Hollow-Stem Auger**	TOTAL DEPTH	**16.50'**
LOGGED BY	**T. Bodle**	DATE COMPLETED	**10/28/94**

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
								0 to 0.33 foot: ASPHALT
	6							**0.33 to 3.0 feet: SILTY SAND WITH GRAVEL (SM)**, brown, coarse to fine, some subangular to subround, fine to coarse gravel, some silt, compact, wet. (FILL)
2-2.5' SS	10 15	26-19-16						**3.0 to 5.0 feet: SAND WITH GRAVEL (SP)**, brown, medium to fine, little subrounded gravel and cobbles, very dense, damp.
2-5' SS	25	60/6		5				**5.0 to 8.0 feet: GRAVELLY SILT (ML)**, brown, some gravel, hard, damp.
2-7.5' SS	25 25	5-7-6						**8.0 to 10.0 feet: SAND WITH SILT (SP-SM)**, gray and black, medium to fine, few silt, few wood and organic debris, loose, damp.
2-10' SS	25 25	7-7-10		10				**10.0 to 10.5 feet: GRAVELLY SILT (ML)**
								10.5 to 12.5 feet: SAND (SP), gray and black, medium to fine, trace organic and wood debris, medium dense, wet.
2-12.5' SS	2 0	9-10-10	▽ ATD					**12.5 to 16.5 feet: SILT (ML)**, brown, trace organic and wood debris, very stiff, moist. (ALLUVIUM) @ 12.5 to 13.0 feet: few sand, wet.
2-15' SS	2	8-5-7		15				
								Total depth drilled = 15.0 feet. Total depth sampled = 16.5 feet.
				20				See Page 2 for Well Completion Details.

REMARKS

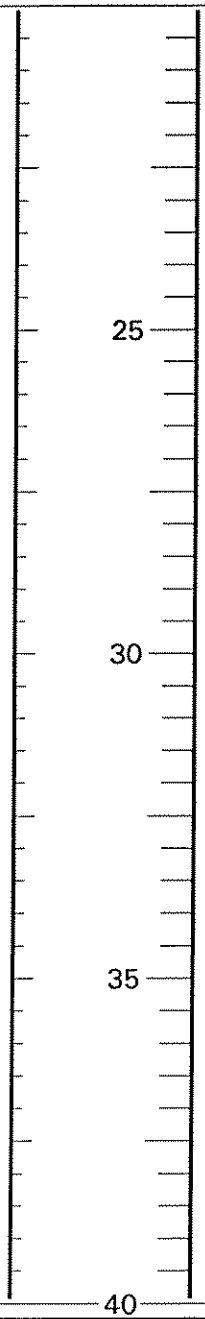
(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	**Port of Seattle, Terminal 115**	BORING NO.	**MW- 9**
LOCATION	**Seattle, Washington**	PAGE	**2 OF 2**
DRILLED BY	**Tacoma Pump and Drilling Co., Inc.**	GROUND ELEV.	**21.61'**
DRILL METHOD	**Hollow-Stem Auger**	TOTAL DEPTH	**16.50'**
LOGGED BY	**T. Bodle**	DATE COMPLETED	**10/28/94**

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION



WELL COMPLETION DETAILS:

0 to 5.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.

5.0 to 15.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots and a 2-inch-diameter threaded end cap.

0 to 1.5 feet: Concrete.

1.5 to 3.0 feet: Bentonite chips hydrated with potable water.

3.0 to 16.5 feet: 10 - 20 Colorado Silica Sand.

REMARKS

(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

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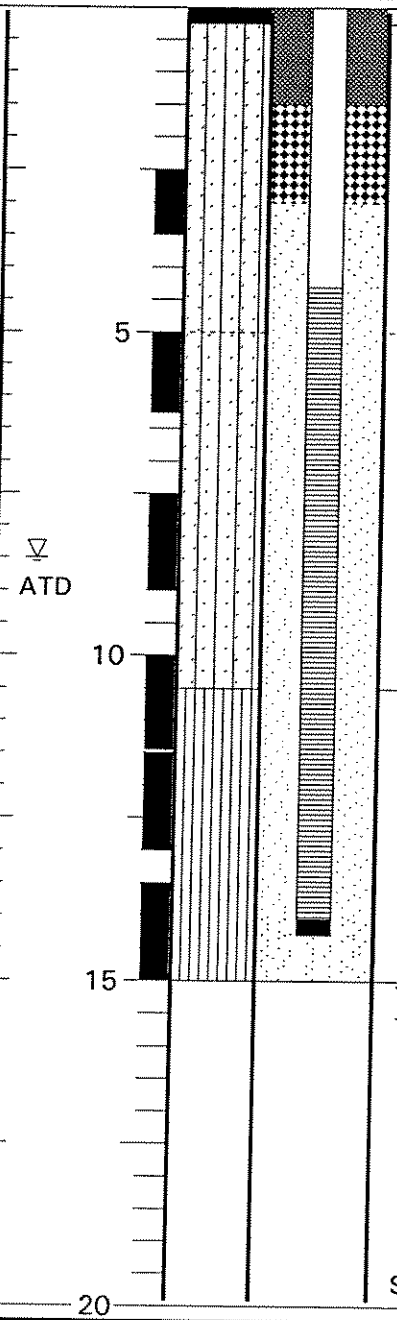
LOG OF EXPLORATORY BORING

PROJECT NAME	Port of Seattle, Terminal 115	BORING NO.	MW-10
LOCATION	Seattle, Washington	PAGE	1 OF 2
DRILLED BY	Tacoma Pump and Drilling Co., Inc.	GROUND ELEV.	20.29'
DRILL METHOD	Hollow-Stem Auger	TOTAL DEPTH	15.00'
LOGGED BY	T. Bodle	DATE COMPLETED	10/28/94

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES
3-2.5' SS	13	16-26-30
3-5' SS	14	16-19-25
3-7.5' SS	75	13-15-19
3-10' SS	103 100	9-9-10
3-11.5' SS	14.5 20	6-5-6
3-13.5' SS	14 20	8-10-12



0 to 0.25 foot: ASPHALT

0.25 to 5.0 feet: SILTY SAND WITH GRAVEL (SM), brown, coarse to fine, some subangular to subround, fine to coarse gravel, some silt, compact, moist.

5.0 to 10.5 feet: SAND WITH SILT (SP-SM), brown, fine to coarse, few subround gravel, few silt, dense, moist.

@ 7.5 to 8.5 feet: medium to coarse sand, moist.

@ 8.5 to 9.0 feet: fine to medium sand, wet.

10.5 to 15.0 feet: SILT (ML), brown, trace organic and wood debris, very stiff, moist. (ALLUVIUM)

@ 11.5 to 12.0 feet: SAND (SP).

@ 13.5 to 13.9 feet: SILTY SAND (SM).

Total depth drilled = 13.5 feet.
Total depth sampled = 15.0 feet.

See Page 2 for Well Completion Details.

REMARKS

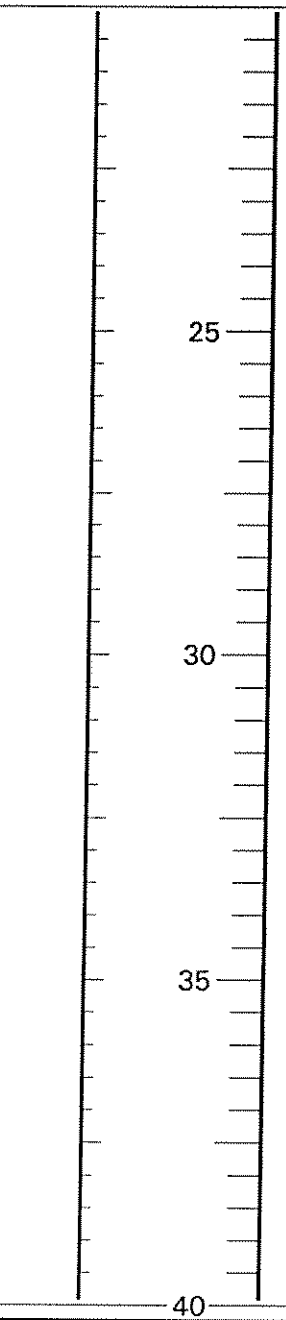
(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	**Port of Seattle, Terminal 115**	BORING NO.	**MW-10**
LOCATION	**Seattle, Washington**	PAGE	**2 OF 2**
DRILLED BY	**Tacoma Pump and Drilling Co., Inc.**	GROUND ELEV.	**20.29'**
DRILL METHOD	**Hollow-Stem Auger**	TOTAL DEPTH	**15.00'**
LOGGED BY	**T. Bodle**	DATE COMPLETED	**10/28/94**

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION



WELL COMPLETION DETAILS:

0 to 4.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.

4.3 to 14.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots and a 2-inch-diameter threaded end cap.

0 to 1.5 feet: Concrete.

1.5 to 3.0 feet: Bentonite chips hydrated with potable water.

3.0 to 15.0 feet: 10 - 20 Colorado Silica Sand.

REMARKS

(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

EMCON

LOG OF EXPLORATORY BORING

PROJECT NAME	**Port of Seattle, Terminal 115**	BORING NO.	**MW-11**
LOCATION	**Seattle, Washington**	PAGE	**1 OF 2**
DRILLED BY	**Tacoma Pump and Drilling Co., Inc.**	GROUND ELEV.	**20.78'**
DRILL METHOD	**Hollow-Stem Auger**	TOTAL DEPTH	**16.50'**
LOGGED BY	**T. Bodle**	DATE COMPLETED	**10/28/94**

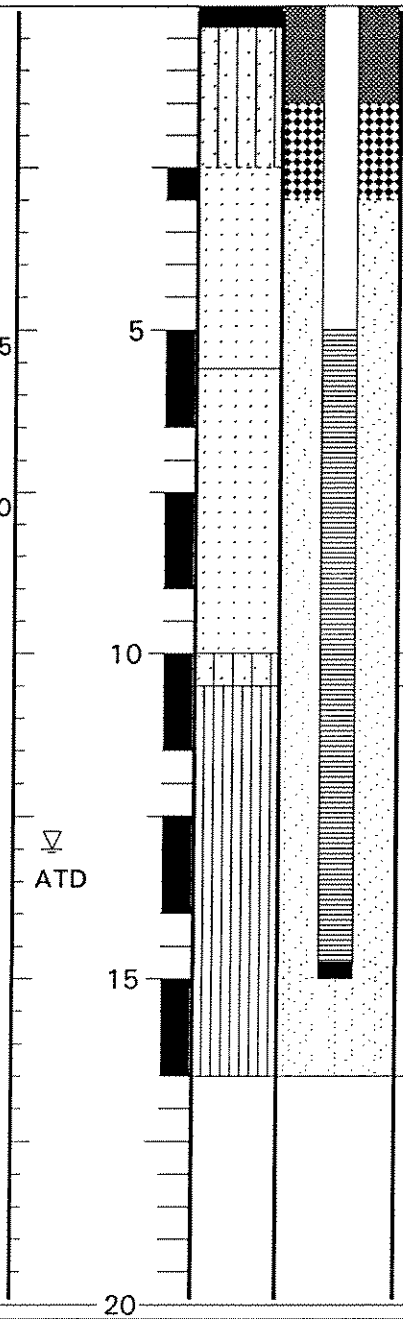
SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	LITHOLOGIC DESCRIPTION
	0		**0 to 0.33 foot: ASPHALT** **0.33 to 2.5 feet: SILTY SAND WITH GRAVEL (SM),** brown, coarse to fine, some subangular to subround, fine to coarse gravel, some silt, compact, damp and moist. (FILL)
4-2.5' SS		60/5	**2.5 to 5.6 feet: SAND WITH GRAVEL (SP),** brown (some black), coarse to fine, some fine gravel, very dense, damp. (FILL) @ 4.5 feet: reduction in drilling resistance.
4-5' SS	0 0 4	11-11-15	@ 5.0 to 5.5 feet: trace to few silt. @ 5.5 to 5.6 feet: SILT
4-7.5' SS	12	17-12-10	**5.6 to 10.0 feet: SAND (SP),** gray and black, medium to fine, trace wood and organic debris, medium dense, damp. @ 7.5 to 10.5 feet: no organic or wood debris.
4-10' SS	0 3	8-6-6	**10.0 to 10.5 feet: SILTY SAND (SM),** gray and black, medium to fine, few silt, medium dense, moist.
4-12.5' SS	4 2	5-8-13	**10.5 to 16.5 feet: SILT (ML),** brown, trace organic debris, stiff, moist. (ALLUVIUM) @ 12.5 to 13.0 feet: SILTY SAND (SM). @ 13.0 feet: wet.
4-15' SS	1	5-6-7	@ 15.0 to 15.5 feet: SILTY SAND (SM). @ 15.5 feet: moist.
			Total depth drilled = 15.0 feet. Total depth sampled = 16.5 feet.
			See Page 2 for Well Completion Details.

GROUND WATER LEVELS: ▽ ATD

DEPTH IN FEET: 5, 10, 15, 20

SAMPLES

LITHOLOGIC COLUMN



WELL DETAILS

REMARKS

(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

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LOG OF EXPLORATORY BORING

PROJECT NAME	Port of Seattle, Terminal 115	BORING NO.	MW-11
LOCATION	Seattle, Washington	PAGE	2 OF 2
DRILLED BY	Tacoma Pump and Drilling Co., Inc.	GROUND ELEV.	20.78'
DRILL METHOD	Hollow-Stem Auger	TOTAL DEPTH	16.50'
LOGGED BY	T. Bodle	DATE COMPLETED	10/28/94

SAMPLE NUMBER AND METHOD	PID (in ppm)	BLOWS PER 6 INCHES	GROUND WATER LEVELS	DEPTH IN FEET	SAMPLES	LITHOLOGIC COLUMN	WELL DETAILS	LITHOLOGIC DESCRIPTION
				25				
				30				
				35				
				40				

WELL COMPLETION DETAILS:

0 to 5.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.

5.0 to 15.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.010-inch machined slots and a 2-inch-diameter threaded end cap.

0 to 1.5 feet: Concrete.

1.5 to 3.0 feet: Bentonite chips hydrated with potable water.

3.0 to 16.5 feet: 10 - 20 Colorado Silica Sand.

REMARKS

(1) PID = Photoionization detector readings in parts per million. (2) ATD = Approximate depth to groundwater At the Time of Drilling. (3) Samples collected with a 3-inch O.D. split-barrel sampler with a 140-pound hammer. (4) NM = Not measured. (5) Ground Elev. = ground elevation of top of casing relative to Seattle tide mean low low water vertical datum.

EMCON

APPENDIX B

LABORATORY REPORTS

Columbia Analytical Services, Inc.

November 28, 1994

Service Request No.: B940825

John Meyer
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: **Port of Seattle Terminal 115/Project #0357-013.02**

Dear John:

Attached are the results of the sample(s) submitted to our laboratory on October 31, 1994. Preliminary results were given on November 14, 1994. For your reference, these analyses have been assigned our service request number B940825.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results only apply to samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Laboratory Manager

CBE/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Work Order No.:	B940825

BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		1-10'	1-15'	2-7.5'
Lab Code:		B0825-4	B0825-5	B0825-8
Date Analyzed:		11/08/94	11/08/94	11/07/94
Analyte	**MRL**			
Benzene	0.05	ND	ND	ND
Toluene	0.1	ND	ND	ND
Ethylbenzene	0.1	ND	ND	ND
Total Xylenes	0.1	ND	ND	ND
TPH as Gasoline	5	16	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Chris Elliott Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Work Order No.:	B940825

BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		2-10'	3-7.5'	4-7.5'
Lab Code:		B0825-9	B0825-14	B0825-21
Date Analyzed:		11/07/94	11/07/94	11/07/94
Analyte	**MRL**			
Benzene	0.05	ND	ND	ND
Toluene	0.1	ND	ND	ND
Ethylbenzene	0.1	ND	ND	ND
Total Xylenes	0.1	ND	ND	ND
TPH as Gasoline	5	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by C. Elliott Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Work Order No.:	B940825

BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G
mg/Kg (ppm)
Dry Weight Basis

Sample Name:		4-10'	hb1-4.75'	hb3-5'
Lab Code:		B0825-22	B0825-26	B0825-28
Date Analyzed:		11/07/94	11/07/94	11/07/94
Analyte	**MRL**			
Benzene	0.05	ND	ND	ND
Toluene	0.1	ND	ND	ND
Ethylbenzene	0.1	ND	ND	ND
Total Xylenes	0.1	ND	ND	ND
TPH as Gasoline	5	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Ann. Ellen Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Work Order No.:	B940825

BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G
mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	**hb7-2.5'**	**hb2-1.75'**	**Method Blank**
		Lab Code:	**B0825-29**	**B0825-30**	**B0825-MB**
		Date Analyzed:	**11/07/94**	**11/07/94**	**11/07/94**
Analyte	**MRL**				
Benzene	0.05		ND	ND	ND
Toluene	0.1		ND	ND	ND
Ethylbenzene	0.1		ND	ND	ND
Total Xylenes	0.1		ND	ND	ND
TPH as Gasoline	5		ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by *[signature]* Date *11/28/94*

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/08/94
		Date Analyzed:	11/10/94
		Work Order No.:	B940825

Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D
mg/Kg (ppm)
Dry Weight Basis

		Diesel		Oil♦	
Sample Name	**Lab Code**	**MRL**	**Result**	**MRL**	**Result**
1-10'	B0825-4	25	[a]44	100	190
1-15'	B0825-5	25	ND	100	[b]170
2-7.5'	B0825-8[c]	25	ND	100	120
2-10'	B0825-9	25	ND	100	ND
3-7.5'	B0825-14	25	ND	100	ND
4-7.5'	B0825-21	25	ND	100	270
4-10'	B0825-22	25	[a]29	100	410
hb1-4.75'	B0825-26	25	ND	100	120
hb3-5'	B0825-28	25	ND	100	ND
hb7-2.5'	B0825-29	25	[a]29	100	ND
hb2-1.75'	B0825-30	25	ND	100	220
Method Blank	B0825-MB	25	ND	100	ND

♦ Quantified using 30-weight motor oil as a standard.
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
[a] Quantified as diesel. The sample contained components that eluted in the diesel range, but the chromatogram did not match the typical diesel fingerprint.
[b] Quantified as oil. The sample contained components that eluted in the oil range, but the chromatogram did not match the typical oil fingerprint.
[c] Result is from an analysis performed on November 22, 1994.

Approved by C. Elliott Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Date Analyzed:	11/07,08/94
		Work Order No.:	B940825

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G

Sample Name	Lab Code	Spike Level (mg/Kg)	Percent Recovery 4-Bromofluorobenzene
1-10'	B0825-4	8.8	93
1-15'	B0825-5	8.8	90
2-7.5'	B0825-8	8.8	90
2-10'	B0825-9	8.8	93
3-7.5'	B0825-14	8.8	92
4-7.5'	B0825-21	8.8	98
4-7.5'	B0825-21Dup	8.8	97
4-10'	B0825-22	8.8	95
4-10'	B0825-22MS	8.8	101
hb1-4.75'	B0825-26	8.8	97
hb3-5'	B0825-28	8.8	100
hb7-2.5'	B0825-29	8.8	95
hb2-1.75'	B0825-30	8.8	93
Method Blank	B0825-MB	8.8	99
Laboratory Control Sample	B0825-LCS	8.8	101
Laboratory Control Sample	B0825-GLCS	8.8	105
	CAS Acceptance Criteria		71-108

TPH Total Petroleum Hydrocarbons

Approved by J. Elliott Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	11/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Date Analyzed:	11/07/94
		Work Order No.:	B940825

Duplicate Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G
mg/Kg (ppm)
Dry Weight Basis

Sample Name: 4-7.5'
Lab Code: B0825-21

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.05	ND	ND	--	--
Toluene	0.1	ND	ND	--	--
Ethylbenzene	0.1	ND	ND	--	--
Total Xylenes	0.1	ND	ND	--	--
TPH as Gasoline	5	ND	ND	--	--

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by C. Elliott Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	10/27,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/07/94
		Date Analyzed:	11/08/94
		Work Order No.:	B940825

Matrix Spike Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G
mg/Kg (ppm)
Dry Weight Basis

Sample Name: 4-10'
Lab Code: B0825-22

Analyte	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	1.05	ND	0.92	88	54-114
Toluene	1.05	ND	0.98	93	52-119
Ethylbenzene	1.05	ND	0.99	94	59-115

ND None Detected at or above the method reporting limit

Approved by _____ Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	Date Extracted:	11/07/94
Project:	Port of Seattle Terminal 115	Date Analyzed:	11/07/94
LCS Matrix:	Soil	Work Order No.:	B940825

Laboratory Control Sample Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Washington DOE Method WTPH-G
mg/Kg (ppm)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	1.00	0.95	95	54-114
Toluene	1.00	0.97	97	52-119
Ethylbenzene	1.00	0.98	98	59-115
TPH as Gasoline	50	60	120	44-154

TPH Total Petroleum Hydrocarbons

Approved by A. Elliott Date 11/28/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	10/28,28/94
Project:	Port of Seattle Terminal 115	**Date Received:**	10/31/94
Sample Matrix:	Soil	**Date Extracted:**	11/08/94
		Date Analyzed:	11/10/94
		Work Order No.:	B940825

Surrogate Recovery Summary
Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D

Sample Name	**Lab Code**	**Percent Recovery** *p*-Terphenyl
1-10'	B0825-4	92
1-15'	B0825-5	85
2-7.5'	B0825-8	*113
2-10'	B0825-9	98
3-7.5'	B0825-14	100
4-7.5'	B0825-21	119
4-10'	B0825-22	106
hb1-4.75'	B0825-26	107
hb3-5'	B0825-28	105
hb7-2.5'	B0825-29	92
hb2-1.75'	B0825-30	105
Method Blank	B0825-MB	81
	CAS Acceptance Criteria	76-122

* Result is from an analysis performed on November 22, 1994.

Approved by Cole. Elliott Date 11/28/94

Northwest, Inc.

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

DATE 10-31-94 PAGE 1 OF 4

PROJECT NAME Port of Seattle Terminal 115 0357-013.02

PROJECT Meyer

COMPANY/ADDRESS EMCON

PHONE 485-5000

SAMPLERS SIGNATURE T. Bodle

ANALYSIS REQUEST: PETROLEUM HCS / ORGANIC / ORGANIC METALS/INORGANICS

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	TPH - HCID State:	TPH - G State: WA ✓ BTEX ✓	TPH - D State: WA ✓ OIL ✓	TPH - 418.1 State:	TPH - Other	Halogenated or Aromatic Volatiles 601/8010 602/8020	Volatile Organics GC/MS 624-8240 8260	Base/Neu/Acid Organics GC/MS 625/8270	Pesticides/PCBS 8080 PCB ONLY 3550/8080	PAH 8310 8100 GC HPCL	TCLP Metals Semi VOA VOA Pest/Herb	Metals Total DISS List Below	Cyanide	pH, Cond Cl, SO4, PO4 F, Br NO2 NO3 (Circle)	NH3 - N, COD, Total-P TKN, TOC TOX (Circle)			REMARKS
1-2.5'	10-27-94		825-1	soil	1																		
1-5'	↓		-2	↓	1																		
1-7.5'	↓		-3	↓	1		~~✓~~	~~✓~~															
1-10'	↓		-4	↓	1		✓	✓					~~X~~ TB	~~X~~									11-2-94 HOLD T Bodle
1-15'	↓		-5	↓	1		✓	✓	11-2-94 T Bodle														
2-2.5'	10-28-94		-6	↓	1																		
2-5'	↓		-7	↓	1																		
2-7.5'	↓		-8	↓	1		✓	✓															
2-10'	↓		-9	↓	1		✓	✓															
2-12.5'	↓		-10	↓	1																		

RELINQUISHED BY:
Signature: T. Bodle
Printed Name: Bodle
Firm: EMCON
Date/Time: 10-31-94 1030

RECEIVED BY:
Signature: C. Elliott
Printed Name: Coh Elliott
Firm: CAS
Date/Time: 10/31/94 10:30

TURNAROUND REQUIREMENTS
~~24 hr~~ ___ 48 hr. ___ 5 day
✓ Standard (10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX preliminary Results
Requested Report Date ______

REPORT REQUIREMENTS
___ I. Routine Report
___ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:
P.O.# ______
Bill To ______

SAMPLE RECEIPT:
Shipping VIA: ______
Shipping to: ______
Condition: ______
Lab No: ______

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

container 1-10' broken

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

EMCON Northwest, Inc.

DATE 10-31-94 PAGE 2 OF 4

PROJECT NAME Port of Seattle T115 # 0357-013.02

PROJECT Meyer

COMPANY/ADDRESS EMCON

PHONE

SAMPLERS SIGNATURE Bodle

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	ANALYSIS REQUEST: PETROLEUM HCS: TPH - HCID State:	TPH - G State: ✓ BTEX ✓	TPH - D State: WA ✓ OIL ✓	TPH - 418.1 State: WA	TPH - Other	Halogenated or Aromatic Volatiles 601/8010 602/8020	Volatile Organics GC/MS ~~624-8240~~ 8240	Base/Neu/Acid Organics GC/MS ~~625/8270~~ 8270	Pesticides/PCBS 8080 PCB ONLY	PAH 8310 8100 GC HPCL	TCLP Metals Semi VOA VOA Pest/Herb	Metals Total ✓ DISS ✓ List Below Lead	Cyanide 3550/8270	pH, Cond Cl, SO_4, PO_4 F, Br NO_2 NO_3 (Circle)	NH_3 - N, COD, Total-P TKN, TOC, TOX (Circle)	REMARKS
2-1.5'	10-28		825-11	soil	1																
3-2.5'			-12		1																
3-5'			-13		1																
3-7.5'			-14		1		✓	✓													
3-10'			-15		1		✓	✓				✓	~~✓~~				✓	✓			
3-10a'			-16		1																
3-11.5'			-17		1																
3-13.5'			-18		1																
4-2.5'			-19		1																
4-5'			-20		1																

RELINQUISHED BY:

Signature: Bodle

Printed Name: Bodle

Firm: EMCON

Date/Time: 10-31-94 10:30

RECEIVED BY:

Signature: Cathy Elliott

Printed Name: Cathy Elliott

Firm: CAS

Date/Time: 10/31/94 10:30

RELINQUISHED BY:

Signature

Printed Name

Firm

Date/Time

RECEIVED BY:

Signature

Printed Name

Firm

Date/Time

TURNAROUND REQUIREMENTS

___ 24 hr ___ 48 hr. ___ 5 day

✓ Standard (10-15 working days)

___ Provide Verbal Preliminary Results

___ Provide FAX preliminary Results

Requested Report Date ___

REPORT REQUIREMENTS

___ I. Routine Report

___ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)

___ III. Data Validation Report (includes All Raw Data)

___ IV. CLP Deliverable Report

INVOICE INFORMATION:

P.O.# ___

Bill To ___

SAMPLE RECEIPT:

Shipping VIA: ___

Shipping to: ___

Condition: ___

Lab No: ___

SPECIAL INSTRUCTIONS/COMMENTS:

Sample 3-10' has only one 4oz jar. use will Cave!!

EMCON Northwest, Inc.

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

DATE 10-31-94 PAGE 3 OF 4

PROJECT NAME Port of Seattle T115 #0357-013.02

PROJECT Meyer

COMPANY/ADDRESS EMCON

PHONE

SAMPLERS SIGNATURE Bodle

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	ANALYSIS REQUEST: PETROLEUM HCS: TPH - HCID State:	TPH - G State: WA ✓ BTEX ✓	TPH - D State: WA ✓ OIL ✓	TPH - 418.1 State:	TPH - Other	Halogenated or Aromatic Volatiles 601/8010 ___ 602/8020 ___	Volatile Organics GC/MS 624-8240	ORGANIC: Base/Neu/Acid Organics GC/MS 625/8270	Pesticides/PCBS 8080 PCB ONLY ___	PAH 8310 8100 GC ___ HPCL ___	TCLP Metals ___ Semi VOA ___ Pest/Herb ___	Metals Total ___ DISS ___ List Below	Cyanide	ORGANIC METALS/INORGANICS: pH, Cond Cl, SO_4, PO_4 F, Br NO_2 NO_3 (Circle)	NH_3 - N, COD, Total-P TKN, TOC TOX (Circle)			REMARKS
4-7.5'	10-28-94		825-21	soil	1		✓	✓															
4-10'			-22		1		✓	✓															
4-12.5'			-23		1																		
4-15'			-24		1																		
hb1-2.5'			-25		1																		
hb1-4.75'			-26		1		✓	✓															
hb3-2.5'			-27		1																		
hb3-5'			-28		1		✓	✓															
hb7-2.5'			-29		1		✓	✓															
hb2-1.75'	↓		-30	↓	1		✓	✓															

RELINQUISHED BY:

Signature: Bodle
Printed Name: Bodle
Firm: EMCON
Date/Time: 10-31-94 10:30

RECEIVED BY:

Signature: Colin Elliott
Printed Name: Colin-Elliott
Firm: CAS
Date/Time: 10/31/94 10:30

RELINQUISHED BY:

Signature
Printed Name
Firm
Date/Time

RECEIVED BY:

Signature
Printed Name
Firm
Date/Time

TURNAROUND REQUIREMENTS

___ 24 hr ___ 48 hr. ___ 5 day
___ Standard (10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS

___ I. Routine Report
___ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:

P.O.# ___
Bill To ___

SAMPLE RECEIPT:

Shipping VIA: ___
Shipping to: ___
Condition: ___
Lab No: ___

SPECIAL INSTRUCTIONS/COMMENTS:

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

EMCON Northwest, Inc.

DATE 10-31-94 PAGE 4 OF 4

PROJECT NAME Port of Seattle TMS # 0357-013.02

PROJECT Meyer

COMPANY/ADDRESS EMCON

PHONE

SAMPLERS SIGNATURE Bodle

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	ANALYSIS REQUEST: PETROLEUM HCS: TPH - HCID State:	TPH - G BTEX State:	TPH - D OIL State:	TPH - 418.1 State:	TPH - Other	ORGANIC: Halogenated or Aromatic Volatiles 601/8010 602/8020	Volatile Organics GC/MS 624-8240	Base/Neu/Acid Organics GC/MS 625/8270	Pesticides/PCBS 8080 PCB ONLY	PAH 8100 GC 8310 HPCL	TCLP Semi VOA Metals VOA Pest/Herb	Metals Total DISS List Below	ORGANIC METALS/INORGANICS: Cyanide	pH, Cond Cl, SO_4, PO_4 F, Br NO_2 NO_3 (Circle)	NH_3 - N, COD, Total-P TKN, TOC, TOX (Circle)			REMARKS
hb1-3'	10-28-94		825-31	soil	1																		

RELINQUISHED BY:

Signature: Tom Bodle

Printed Name: Bodle

Firm: EMCON 10-31-94 1030

Date/Time

RECEIVED BY:

Signature: Colm Elliott

Printed Name: Colm Elliott

Firm: CAS 10/31/94 10:30

Date/Time

TURNAROUND REQUIREMENTS

- ✓ 24 hr ____ 48 hr. ____ 5 day
- ____ Standard (10-15 working days)
- ____ Provide Verbal Preliminary Results
- ____ Provide FAX preliminary Results

Requested Report Date ____

REPORT REQUIREMENTS

- ____ I. Routine Report
- ____ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)
- ____ III. Data Validation Report (includes All Raw Data)
- ____ IV. CLP Deliverable Report

INVOICE INFORMATION:

P.O.# ____

Bill To ____

SAMPLE RECEIPT:

Shipping VIA: ____

Shipping to: ____

Condition: ____

Lab No: ____

RELINQUISHED BY:

Signature

Printed Name

Firm

Date/Time

RECEIVED BY:

Signature

Printed Name

Firm

Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:

Columbia Analytical Services inc.

November 17, 1994

Service Request No.: K946855B

John Meyer
EMCON Northwest, Inc.
18912 North Creek Parkway, Suite 210
Bothell, WA 98011

Re: **Port of Seattle/Terminal 115/Project #0357-013.02/B94-0825**

Dear John:

Enclosed are the results of the sample(s) submitted to our laboratory on October 31, 1994. Preliminary results were transmitted via facsimile on November 14 and 17, 1994. For your reference, these analyses have been assigned our service request number K946855B.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 260.

Respectfully submitted,
Columbia Analytical Services, Inc.

Janice M. Sedlak

Janice M. Sedlak
Project Chemist

JMS/rr

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal 115/#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: NA
Date Analyzed: 11/8/94

Solids, Total
Volatile Organic Compounds
EPA Method 160.3 Modified
Units: Percent (%)

Sample Name	Lab Code	Result
3-10'	K946855-001	89.2

Approved By: Jeff C. Crocker Date: 11-14-94

00003

1A/102094
6855BVOA.CL1 - TSolids 11/14/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal / #0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: NA
Date Analyzed: 11/7/94

Total Lead
EPA Method 7420
Units: mg/kg (ppm)
Dry Weight Basis

Sample Name	Lab Code	MRL	Result
3-10'	K685501	5	ND
Method Blank]	K6855MB	5	ND

Approved By: _____ Date: 11/14/94

00004

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K946855B
Project:	Port of Seattle/Terminal 115/#0357-013.02	**Date Collected:**	10/28/94
Sample Matrix:	Soil	**Date Received:**	10/31/94
		Date Extracted:	11/9/94
		Date Analyzed:	11/10/94

BTEX and Total Petroleum Hydrocarbons as Gasoline
EPA Methods 5030/8020 and Washington DOE Method WTPH-G
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte:	Benzene	Toluene	Ethylbenzene	Total Xylenes	TPH as Gasoline
Method Reporting Limit:	0.05	0.1	0.1	0.1	5
Sample Name	**Lab Code**				
3-10'	K946855-001	ND	ND	ND	ND	ND
Method Blank	K941109-SB	ND	ND	ND	ND	ND

Approved By: _____ Date: 11/15/94

00005

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Service Request:**	K946855B
Project:	Port of Seattle/Terminal 115/#0357-013.02	**Date Collected:**	10/28/94
Sample Matrix:	Soil	**Date Received:**	10/31/94
		Date Extracted:	11/7/94
		Date Analyzed:	11/10,11/94

Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D
Units: mg/Kg (ppm)
Dry Weight Basis

Analyte:	**Diesel**	**Oil**
Method Reporting Limit:	25	100

Sample Name	**Lab Code**		
3-10'	K946855-001	102(a)	534
Method Blank	K941107-SB1	ND	ND

a Quantified as diesel. The sample contained an oil component that partially eluted in the diesel range.

Approved By: Walter R. Gotham Date: 11/14/94

00006

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal 115/#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: NA

Volatile Organic Compounds
EPA Method 8260
Units: µg/Kg (ppb)
Dry Weight Basis

	Sample Name:	3-10'	Method Blank
	Lab Code:	K946855-001	K946855-MB
	Date Analyzed:	11/7/94	11/7/94
Analyte	**MRL**		
Dichlorodifluoromethane (CFC 12)	5	ND	ND
Chloromethane	5	ND	ND
Vinyl Chloride	5	ND	ND
Bromomethane	5	ND	ND
Chloroethane	5	ND	ND
Trichlorofluoromethane (CFC 11)	5	ND	ND
Acetone	50	ND	ND
1,1-Dichloroethene	5	ND	ND
Carbon Disulfide	5	ND	ND
Methylene Chloride	10	ND	ND
trans-1,2-Dichloroethene	5	ND	ND
1,1-Dichloroethane	5	ND	ND
2-Butanone (MEK)	20	ND	ND
2,2-Dichloropropane	5	ND	ND
cis-1,2-Dichloroethene	5	ND	ND
Chloroform	5	ND	ND
Bromochloromethane	5	ND	ND
1,1,1-Trichloroethane (TCA)	5	ND	ND
1,1-Dichloropropene	5	ND	ND
Carbon Tetrachloride	5	ND	ND
1,2-Dichloroethane	5	ND	ND
Benzene	5	ND	ND
Trichloroethene (TCE)	5	ND	ND
1,2-Dichloropropane	5	ND	ND
Bromodichloromethane	5	ND	ND
Dibromomethane	5	ND	ND
2-Hexanone	20	ND	ND
cis-1,3-Dichloropropene	5	ND	ND
Toluene	5	ND	ND
trans-1,3-Dichloropropene	5	ND	ND
1,1,2-Trichloroethane	5	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND
1,3-Dichloropropane	5	ND	ND

Approved By: Jeff C. Crocker Date: 11-14-94

00007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal 115/#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: NA

Volatile Organic Compounds
EPA Method 8260
Units: µg/Kg (ppb)
Dry Weight Basis

		Sample Name:	3-10'	Method Blank
		Lab Code:	K946855-001	K946855-MB
		Date Analyzed:	11/7/94	11/7/94
Analyte	**MRL**			
Tetrachloroethene (PCE)	5		ND	ND
Dibromochloromethane	5		ND	ND
1,2-Dibromoethane (EDB)	20		ND	ND
Chlorobenzene	5		ND	ND
1,1,1,2-Tetrachloroethane	5		ND	ND
Ethylbenzene	5		ND	ND
Total Xylenes	5		ND	ND
Styrene	5		ND	ND
Bromoform	5		ND	ND
Isopropylbenzene	20		ND	ND
1,1,2,2-Tetrachloroethane	5		ND	ND
1,2,3-Trichloropropane	5		ND	ND
Bromobenzene	5		ND	ND
n -Propylbenzene	20		ND	ND
2-Chlorotoluene	20		ND	ND
4-Chlorotoluene	20		ND	ND
1,3,5-Trimethylbenzene	20		ND	ND
tert -Butylbenzene	20		ND	ND
1,2,4-Trimethylbenzene	20		ND	ND
sec -Butylbenzene	20		ND	ND
1,3-Dichlorobenzene	5		ND	ND
4-Isopropyltoluene	20		ND	ND
1,4-Dichlorobenzene	5		ND	ND
n -Butylbenzene	20		ND	ND
1,2-Dichlorobenzene	5		ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	20		ND	ND
1,2,4-Trichlorobenzene	20		ND	ND
1,2,3-Trichlorobenzene	20		ND	ND
Naphthalene	20		ND	ND
Hexachlorobutadiene	20		ND	ND

Approved By: Jeff C. Crocker Date: 11-14-94

00008

3S2P/101894

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON NORTHWEST
Project: Port of Seattle/Terminal 115\#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: 11/8/94

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
Units: mg/Kg (ppm)
Dry Weight Basis

	Sample Name:	3-10'	Method Blank
	Lab Code:	K946855-001	K941108-SB1
	Date Analyzed:	11/16/94	11/11/94
Base Neutral Analyte	**MRL**		
N-Nitrosodimethylamine	2	ND	ND
Aniline	1	ND	ND
Bis(2-chloroethyl) Ether	0.3	ND	ND
1,2-Dichlorobenzene	0.3	ND	ND
1,3-Dichlorobenzene	0.3	ND	ND
1,4-Dichlorobenzene	0.3	ND	ND
Bis(2-chloroisopropyl) Ether	0.3	ND	ND
N-Nitrosodi-*n*-propylamine	0.3	ND	ND
Hexachloroethane	0.3	ND	ND
Nitrobenzene	0.3	ND	ND
Isophorone	0.3	ND	ND
Bis(2-chloroethoxy)methane	0.3	ND	ND
1,2,4-Trichlorobenzene	0.3	ND	ND
Naphthalene	0.3	ND	ND
4-Chloroaniline	0.3	ND	ND
Hexachlorobutadiene	0.3	ND	ND
2-Methylnaphthalene	0.3	ND	ND
Hexachlorocyclopentadiene	0.3	ND	ND
2-Chloronaphthalene	0.3	ND	ND
2-Nitroaniline	2	ND	ND
Dimethyl Phthalate	0.3	ND	ND
Acenaphthylene	0.3	ND	ND
3-Nitroaniline	2	ND	ND
Acenaphthene	0.3	ND	ND
Dibenzofuran	0.3	ND	ND
2,4-Dinitrotoluene	0.3	ND	ND

Approved By: _____ Date: 11/17/94

00009

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON NORTHWEST	**Service Request:**	K946855B
Project:	Port of Seattle/Terminal 115\#0357-013.02	**Date Collected:**	10/28/94
Sample Matrix:	Soil	**Date Received:**	10/31/94
		Date Extracted:	11/8/94

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
Units: mg/Kg (ppm)
Dry Weight Basis

		Sample Name:	**3-10'**	**Method Blank**
		Lab Code:	K946855-001	K941108-SB1
		Date Analyzed:	11/16/94	11/11/94
Base Neutral Analyte	**MRL**			
2,6-Dinitrotoluene	0.3		ND	ND
Diethyl Phthalate	0.3		ND	ND
4-Chlorophenyl Phenyl Ether	0.3		ND	ND
Fluorene	0.3		ND	ND
4-Nitroaniline	2		ND	ND
N-Nitrosodiphenylamine	0.3		ND	ND
4-Bromophenyl Phenyl Ether	0.3		ND	ND
Hexachlorobenzene	0.3		ND	ND
Phenanthrene	0.3		ND	ND
Anthracene	0.3		ND	ND
Di-*n*-butyl Phthalate	0.3		ND	ND
Fluoranthene	0.3		ND	ND
Pyrene	0.3		ND	ND
Butylbenzyl Phthalate	0.3		ND	ND
3,3'-Dichlorobenzidine	2		ND	ND
Benz(a)anthracene	0.3		ND	ND
Bis(2-ethylhexyl) Phthalate	0.3		ND	ND
Chrysene	0.3		ND	ND
Di-*n*-octyl Phthalate	0.3		ND	ND
Benzo(b)fluoranthene	0.3		ND	ND
Benzo(k)fluoranthene	0.3		ND	ND
Benzo(a)pyrene	0.3		ND	ND
Indeno(1,2,3-cd)pyrene	0.3		ND	ND
Dibenz(a,h)anthracene	0.3		ND	ND
Benzo(g,h,i)perylene	0.3		ND	ND

Approved By: _____ Date: 11/17/94

00010

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON NORTHWEST
Project: Port of Seattle/Terminal 115\#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: 11/8/94

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270
Units: mg/Kg (ppm)
Dry Weight Basis

	Sample Name:	3-10'	Method Blank
	Lab Code:	K946855-001	K941108-SB1
	Date Analyzed:	11/16/94	11/11/94
Acid Analyte	**MRL**		
Phenol	0.3	ND	ND
2-Chlorophenol	0.3	ND	ND
Benzyl Alcohol	0.3	ND	ND
2-Methylphenol	0.3	ND	ND
3- and 4-Methylphenol*	0.3	ND	ND
2-Nitrophenol	0.3	ND	ND
2,4-Dimethylphenol	0.3	ND	ND
Benzoic Acid	2	ND	ND
2,4-Dichlorophenol	0.3	ND	ND
4-Chloro-3-methylphenol	0.3	ND	ND
2,4,6-Trichlorophenol	0.3	ND	ND
2,4,5-Trichlorophenol	0.3	ND	ND
2,4-Dinitrophenol	2	ND	ND
4-Nitrophenol	2	ND	ND
2-Methyl-4,6-dinitrophenol	2	ND	ND
Pentachlorophenol	2	ND	ND

* Quantified as 4-methylphenol.

Approved By: _____ Date: 11/17/94

00011

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal 115/#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: 11/9/94
Date Analyzed: 11/10/94

Surrogate Recovery Summary
BTEX and Total Petroleum Hydrocarbons as Gasoline
EPA Methods 5030/8020 and Washington DOE Method WTPH-G

Sample Name	Lab Code	Percent Recovery 1,4-DFB (PID - BTEX)	Percent Recovery 1,4-DFB (FID - GAS)
3-10'	K946855-001	80	81
Method Blank	K941109-SB	93	96
CAS Acceptance Limits:		51-133	51-133

Approved By: _____ Date: 11/15/94

00012

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal 115/#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: 11/7/94
Date Analyzed: 11/10,11/94

Surrogate Recovery Summary
Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D

Sample Name	Lab Code	Percent Recovery o-Terphenyl
3-10'	K946855-001	102
Method Blank	K941107-SB1	96

CAS Acceptance Limits: 55-119

Approved By: Walter R. Cotham Date: 11/14/94

00013

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Northwest
Project: Port of Seattle/Terminal 115/#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: NA
Date Analyzed: 11/7/94

Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8260

		Percent Recovery		
Sample Name	**Lab Code**	Dibromofluoromethane	Toluene-d_8	4-Bromofluorobenzene
3-10'	K946855-001	103	81	77
Method Blank	K946855-MB	91	101	103
CAS Acceptance Limits:		80-120	81-117	74-121

Approved By: Jeff C. Crocker Date: 11-14-94

SUR3/060194
6855BVOA.CL1 - SUR3 11/14/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON NORTHWEST
Project: Port of Seattle/Terminal 115\#0357-013.02
Sample Matrix: Soil

Service Request: K946855B
Date Collected: 10/28/94
Date Received: 10/31/94
Date Extracted: 11/8/94
Date Analyzed: 11/11,16/94

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3550/8270

		Percent Recovery					
Sample Name	**Lab Code**	2FP	PHL	TBP	NBZ	FBP	TPH
3-10'	K946855-001	50	67	40	74	74	93
Method Blank	K941108-SB1	62	62	61	65	69	63
Lab. Control Sample	K941108-SL1	61	59	59	64	64	52
CAS Acceptance Limits:		25-121	24-113	19-122	23-120	30-115	18-137

2FP	2-Fluorophenol
PHL	Phenol-d_6
TBP	2,4,6-Tribromophenol
NBZ	Nitrobenzene-d_5
FBP	2-Fluorobiphenyl
TPH	Terphenyl-d_{14}

Approved By: _____ Date: 11/17/94

00015

EMCON Northwest, Inc.

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

DATE 10-31-94 PAGE 2 OF 4

PROJECT NAME Port of Seattle T115 # 0357-013.02
PROJECT Meyer
COMPANY/ADDRESS EMCON
PHONE
SAMPLERS SIGNATURE Bodle

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	ANALYSIS REQUEST: PETROLEUM HCS: TPH - HCID State:	TPH - G ✓ BTEX ✓ State: WA	TPH - D ✓ OIL ✓ State: WA	TPH - 418.1 State:	TPH - Other	ORGANIC: Halogenated or Aromatic Volatiles 601/8010 ___ 602/8020 ___	Volatile Organics GC/MS ___	Base/Neu/Acid Organics GC/MS ~~625~~ 8270	Pesticides/PCBS 8080 ~~625/8270~~ 8250/8270	PCB ONLY ___	PAH 8100 GC ___ 8310 HPCL ___	TCLP Metals ___ Semi VOA ___ VOA ___ Pest/Herb ___	Metals Total ✓ DISS ___ List Below Lead	ORGANIC METALS/INORGANICS: ~~Cyanide~~ 3550/8270	pH, Cond Cl, SO_4, PO_4 F, Br	NO_2 NO_3 (Circle)	NH_3 - N, COD, Total-P TKN, TOC	TOX (Circle)		REMARKS
2-15'	10-28-94		825-11	soil	1																				
3-2.5'	↓		-12	↓	1																				
3-5'			-13		1																				
3-7.5'			-14		1		✓	✓																	
3-10'			-15		1		✓	✓				✓	~~✓~~ TB					✓	✓						
3-10a'			-16		1																				
3-11.5'			-17		1																				
3-13.5'			-18		1																				
4-2.5'			-19		1																				
4-5'	↓		-20	↓	1																				

RELINQUISHED BY:
Signature: Bodle
Printed Name: Bodle
Firm: EMCON
Date/Time: 10-31-94 10:30

RECEIVED BY:
Signature: Colin Elliott
Printed Name: Colin Elliott
Firm: CAS
Date/Time: 10/31/94 10:30

TURNAROUND REQUIREMENTS
___ 24 hr ___ 48 hr. ___ 5 day
✓ Standard (10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
___ I. Routine Report
___ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:
P.O.#
Bill To

SAMPLE RECEIPT:
Shipping VIA:
Shipping to:
Condition:
Lab No:

RELINQUISHED BY:
Signature: Colin Elliott
Printed Name: Colin Elliott
Firm: CAS
Date/Time: 11/1/94 16:00

RECEIVED BY:
Signature: Lori K. Hanh
Printed Name: Lori K. Hanh
Firm: CAS-IC
Date/Time: 11-2-94 1000

SPECIAL INSTRUCTIONS/COMMENTS:

Sample 3-10' has only one 4oz jar. use will Care!!

Columbia Analytical Services inc.

November 21, 1994 Service Request No.: B940848

John Meyer
EMCON Northwest
18912 N Creek Parkway
Suite 210
Bothell, WA 98011

Re: **Port of Seattle Terminal 115/Project #0357-013.02**

Dear John:

Attached are the results of the sample(s) submitted to our laboratory on November 4, 1994. For your reference, these analyses have been assigned our service request number B940848.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and CAS is not responsible for use of less than the complete report. Results only apply to samples analyzed.

Please call if you have any questions.

Respectfully submitted,

Columbia Analytical Services, Inc.

Colin B. Elliott
Laboratory Manager

CBE/bdr

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Received:**	11/04/94
Project:	Port of Seattle Terminal 115	**Work Order No.:**	B940848
Sample Matrix:	Water		

CASE NARRATIVE SUMMARY

All analyses were performed consistent with the quality assurance program of Columbia Analytical Services, Inc.

Samples MW-3 and MW-5 analyzed by Method WTPH-D showed low surrogate recovery due to matrix interferences. The samples showed responses in the diesel range that did not match a typical diesel chromatogram.

Approved by Ann Ellis Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	11/04/94
Project:	Port of Seattle Terminal 115	**Date Received:**	11/04/94
Sample Matrix:	Water	**Work Order No.:**	B940848

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Washington DOE Method WTPH-G
µg/L (ppb)

Sample Name:		MW-1	MW-2	MW-3
Lab Code:		B0848-1	B0848-2	B0848-3
Date Analyzed:		11/12/94	11/12/94	11/12/94
Analyte	MRL			
Benzene	0.5	2.0	10.0	0.7
Toluene	1	ND	ND	ND
Ethylbenzene	1	ND	ND	ND
Total Xylenes	1	ND	1	ND
TPH as Gasoline	50	440	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by John Elliott Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	Date Collected:	11/04/94
Project:	Port of Seattle Terminal 115	Date Received:	11/04/94
Sample Matrix:	Water	Work Order No.:	B940848

BTEX and TPH as Gasoline
EPA Methods 5030/8020/Washington DOE Method WTPH-G
µg/L (ppb)

Sample Name:		MW-4	MW-5	Method Blank
Lab Code:		B0848-4	B0848-5	B0848-MB
Date Analyzed:		11/12/94	11/12/94	11/11/94
Analyte	**MRL**			
Benzene	0.5	0.8	0.8	ND
Toluene	1	ND	ND	ND
Ethylbenzene	1	ND	ND	ND
Total Xylenes	1	ND	ND	ND
TPH as Gasoline	50	ND	ND	ND

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by John Elliott Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	EMCON Northwest	**Date Collected:**	11/04/94
Project:	Port of Seattle Terminal 115	**Date Received:**	11/04/94
Sample Matrix:	Water	**Date Extracted:**	11/08/94
		Date Analyzed:	11/09,10/94
		Work Order No.:	B940848

Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D
µg/L (ppb)

		Diesel		Oil♦	
Sample Name	**Lab Code**	**MRL**	**Result**	**MRL**	**Result**
MW-1	B0848-1	250	[a]3,170	750	[b]830
MW-2	B0848-2	250	[a]1,420	750	ND
MW-3	B0848-3	250	[a]340	750	ND
MW-4	B0848-4	250	[a]750	750	ND
MW-5	B0848-5	250	[a]320	750	ND
Method Blank	B0848-MB	250	ND	750	ND

♦ Quantified using 30-weight motor oil as a standard.
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit
[a] Quantified as diesel. The sample contained components that eluted in the diesel range, but the chromatogram did not match the typical diesel fingerprint.
[b] Quantified as oil. The sample contained components that eluted in the oil range, but the chromatogram did not match the typical oil fingerprint.

Approved by C. Elliott Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	11/04/94
Project:	Port of Seattle Terminal 115	**Date Received:**	11/04/94
Sample Matrix:	Water	**Date Analyzed:**	11/11,12/94
		Work Order No.:	B940848

Surrogate Recovery Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020
Washington DOE Method WTPH-G

Sample Name	Lab Code	Spike Level (µg/L)	Percent Recovery 4-Bromofluorobenzene
MW-1	B0848-1	100	95
MW-2	B0848-2	100	103
MW-3	B0848-3	100	112
MW-3	B0848-3Dup	100	98
MW-4	B0848-4	100	109
MW-5	B0848-5	100	104
Method Blank	B0848-MB	100	111
Laboratory Control Sample	B0848-LCS	100	110
Laboratory Control Sample	B0848-GLCS	100	111
	CAS Acceptance Criteria		86-116

TPH Total Petroleum Hydrocarbons

Approved by C. Elliott Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	11/04/94
Project:	Port of Seattle Terminal 115	**Date Received:**	11/04/94
Sample Matrix:	Water	**Date Analyzed:**	11/12/94
		Work Order No.:	B940848

Duplicate Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Washington DOE Method WTPH-G
µg/L (ppb)

Sample Name: MW-3
Lab Code: B0848-3

Analyte	MRL	Sample Result	Duplicate Sample Result	Average	Relative Percent Difference
Benzene	0.5	0.7	0.7	0.7	<1
Toluene	1	ND	ND	--	--
Ethylbenzene	1	ND	ND	--	--
Total Xylenes	1	ND	ND	--	--
TPH as Gasoline	50	ND	ND	--	--

TPH Total Petroleum Hydrocarbons
MRL Method Reporting Limit
ND None Detected at or above the method reporting limit

Approved by Cle-Elliott Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	----/----/----
Project:	Port of Seattle Terminal 115	**Date Received:**	----/----/----
Sample Matrix:	Water	**Date Analyzed:**	11/12/94
		Work Order No.:	B940848

Matrix Spike Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Washington DOE Method WTPH-G
µg/L (ppb)

Sample Name: Batch QC
Lab Code: B0870-4

Analyte	Spike Level	Sample Result	Spiked Sample Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	100	2.2	112	110	77-127
Toluene	100	ND	107	107	78-127
Ethylbenzene	100	ND	113	113	74-128

TPH Total Petroleum Hydrocarbons
ND None Detected at or above the method reporting limit

Approved by Cole Elliott Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Extracted:**	11/11/94
Project:	Port of Seattle Terminal 115	**Date Analyzed:**	11/12/94
LCS Matrix:	Water	**Work Order No.:**	B940848

Laboratory Control Sample Summary
BTEX and TPH as Gasoline
EPA Methods 5030/8020/Washington DOE Method WTPH-G
µg/L (ppb)

Analyte	True Value	Result	Percent Recovery	CAS Percent Recovery Acceptance Criteria
Benzene	100	102	102	77-127
Toluene	100	106	106	78-127
Ethylbenzene	100	109	109	74-128
TPH as Gasoline	5,500	6,500	118	70-140

TPH Total Petroleum Hydrocarbons

Approved by C. Ellis Date 11/21/94

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client:	EMCON Northwest	**Date Collected:**	11/04/94
Project:	Port of Seattle Terminal 115	**Date Received:**	11/04/94
Sample Matrix:	Water	**Date Extracted:**	11/08/94
		Date Analyzed:	11/09,10/94
		Work Order No.:	B940848

Surrogate Recovery Summary
Total Petroleum Hydrocarbons as Diesel and Oil
Washington DOE Method WTPH-D

Sample Name	Lab Code	Percent Recovery *p*-Terphenyl
MW-1	B0848-1	90
MW-2	B0848-2	78
MW-3	B0848-3	*25
MW-4	B0848-4	87
MW-5	B0848-5	*16
Method Blank	B0848-MB	88
	CAS Acceptance Criteria	59-124

* Outside of acceptance limits because of matrix effects. The sample produced an emulsion during the preparation steps.

Approved by A. Elliott Date 11/21/94

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

Columbia Analytical Services, Inc. 18912 North Creek Pkwy, Suite 118 • Bothell, WA 98011 • (206) 486-6983 • FAX (206) 486-7695

DATE 11-4-94 PAGE 1 OF 1

PROJECT NAME Port of Seattle Terminal 115 # 0357-013.02

PROJECT Meyer

COMPANY/ADDRESS EMCON

PHONE

SAMPLERS SIGNATURE Tom Bodle

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	TPH - HCID State:	TPH - G ✓ BTEX ✓ State: WA	TPH - D ✓ Oil ✓ State: WA	TPH - 418.1 State:	TPH - Other	Halogenated or Aromatic Volatiles 601/8010 602/8020	Volatile Organics GC/MS 624 8240 8260	Base/Neu/Acid Organics GC/MS 625/8270	Pesticides/PCBS 8080 PCB ONLY	PAH 8310 8100 GC HPCL	TCLP Metals Semi VOA VOA	Metals Total ✓ Pest/Herb List Below DISS	Cyanide	pH, Cond Cl, SO_4, PO_4 F, Br NO_2 NO_3 (Circle)	Alk - N, COD, Total-P TKN, TOC, TOX (Circle)			REMARKS
MW-1	11-4-94		B4Y-842-1	water	8		✓	✓				✓	✓				✓						
MW-2			-2		5		✓	✓									✓						
MW-3			-3		4		✓	✓									✓						
MW-4			-4				✓	✓									✓						
MW-5			-5		4		✓	✓									✓						
purge water			-6		2												✓			✓			

ANALYSIS REQUEST

PETROLEUM HCS | ORGANIC | ORGANIC METALS/INORGANICS

RELINQUISHED BY:
Signature: Tom Bodle
Printed Name: Tom Bodle
Firm: EMCON
Date/Time: 11-4-94 1604

RECEIVED BY:
Signature: Chris Elliott
Printed Name: Chris Elliott
Firm: CAS
Date/Time: 11/4/94 16:04

TURNAROUND REQUIREMENTS
___ 24 hr ___ 48 hr. ___ 5 day
✓ Standard (10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX preliminary Results
Requested Report Date ___

REPORT REQUIREMENTS
___ I. Routine Report
___ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:
P.O.# ___
Bill To ___

SAMPLE RECEIPT:
Shipping VIA: ___
Shipping to: ___
Condition: ___
Lab No: B4Y0848

RELINQUISHED BY:
Signature
Printed Name
Firm
Date/Time

RECEIVED BY:
Signature
Printed Name
Firm
Date/Time

SPECIAL INSTRUCTIONS/COMMENTS:
* Metals = Pb

ORIGINAL IS IN PROJECT FILING

Columbia Analytical Services inc.

November 22, 1994 Service Request No.: K946932B

John Meyer
EMCON Northwest, Inc.
18912 North Creek Parkway, Suite 210
Bothell, WA 98011

Re: **Port of Seattle Terminal 115/Project #0357-013.02/B94-0848**

Dear John:

Enclosed are the results of the sample(s) submitted to our laboratory on November 7, 1994. Preliminary results were transmitted via facsimile on November 21, 1994. For your reference, these analyses have been assigned our service request number K946932B.

All analyses were performed consistent with our laboratory's quality assurance program. All results are intended to be considered in their entirety, and Columbia Analytical Services, Inc. (CAS) is not responsible for use of less than the complete report. Results apply only to the samples analyzed.

Please call if you have any questions. My extension is 260.

Respectfully submitted,

Columbia Analytical Services, Inc.

Richard A Cramer for JMS

Janice M. Sedlak
Project Chemist

JMS/sam

COLUMBIA ANALYTICAL SERVICES, Inc.

Acronyms

ASTM	American Society for Testing and Materials
CARB	California Air Resources Board
CAS Number	Chemical Abstract Service registry Number
CFC	Chlorofluorocarbon
CFU	Colony-Forming Unit
DEC	Department of Environmental Conservation
DEQ	Department of Environmental Quality
DHS	Department of Health Services
DOE	Department of Ecology
DOH	Department of Health
EPA	U. S. Environmental Protection Agency
GC	Gas Chromatography
GC/MS	Gas Chromatography/Mass Spectrometry
LUFT	Leaking Underground Fuel Tank
MCL	Maximum Contaminant Level is the highest permissible concentration of a substance allowed in drinking water as established by the USEPA.
MDL	Method Detection Limit
MPN	Most Probable Number
MRL	Method Reporting Limit
NA	Not Applicable
NAN	Not Analyzed
NC	Not Calculated
NCASI	National Council of the Paper Industry for Air and Stream Improvement
ND	Not Detected at or above the MRL
NIOSH	National Institute for Occupational Safety and Health
PQL	Practical Quantitation Limit
RCRA	Resource Conservation and Recovery Act
SIM	Selected Ion Monitoring
TPH	Total Petroleum Hydrocarbons

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115 / #0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: NA
Date Analyzed: 11/15/94

Total Lead
EPA Method 7421
Units: µg/L (ppb)

Sample Name	Lab Code	MRL	Result
MW-1	K693201	2	12
MW-2	K693202	2	13
MW-3	K693203	2	39
MW-4	K693204	2	15
MW-5	K693205	2	54
Purge Water	K693206	2	21
Method Blank	K6932MB	2	ND

Approved By: _____ Date: 11/16/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115 / #0357-013.02
Sample Matrix: Water

Date Collected: 11/4/94
Date Received: 11/7/94
Service Request: K946932B

Total Organic Halides (TOX)
EPA Method 9020A
Units: µg/L (ppb)

Sample Name	Lab Code	MRL	Result	Date Analyzed
Purge Water	K946932-006	10	19	11/18/94
Method Blank	K946932-MB	10	ND	11/18/94

Approved By: Tracy L. Kinney Date: 11/21/94

00004

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115/ #0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: NA

Volatile Organic Compounds
EPA Method 8260
Units: µg/L (ppb)

	Sample Name:	MW-1	Method Blank
	Lab Code:	K946932-001	K946932-MB
	Date Analyzed:	11/16/94	11/16/94
Analyte	**MRL**		
Dichlorodifluoromethane (CFC 12)	0.5	ND	ND
Chloromethane	0.5	ND	ND
Vinyl Chloride	0.5	0.6	ND
Bromomethane	0.5	ND	ND
Chloroethane	0.5	ND	ND
Trichlorofluoromethane (CFC 11)	0.5	ND	ND
Acetone	20	ND	ND
1,1-Dichloroethene	0.5	ND	ND
Carbon Disulfide	0.5	ND	ND
Methylene Chloride	1	2.1	ND
trans-1,2-Dichloroethene	0.5	ND	ND
1,1-Dichloroethane	0.5	ND	ND
2-Butanone (MEK)	20	ND	ND
2,2-Dichloropropane	0.5	ND	ND
cis-1,2-Dichloroethene	0.5	ND	ND
Chloroform	0.5	ND	ND
Bromochloromethane	0.5	ND	ND
1,1,1-Trichloroethane (TCA)	0.5	ND	ND
1,1-Dichloropropene	0.5	ND	ND
Carbon Tetrachloride	0.5	ND	ND
1,2-Dichloroethane	0.5	ND	ND
Benzene	0.5	2.0	ND
Trichloroethene (TCE)	0.5	ND	ND
1,2-Dichloropropane	0.5	ND	ND
Bromodichloromethane	0.5	ND	ND
Dibromomethane	0.5	ND	ND
2-Hexanone	20	ND	ND
cis-1,3-Dichloropropene	0.5	ND	ND
Toluene	0.5	ND	ND
trans-1,3-Dichloropropene	0.5	ND	ND
1,1,2-Trichloroethane	0.5	ND	ND
4-Methyl-2-pentanone (MIBK)	20	ND	ND
1,3-Dichloropropane	0.5	ND	ND

Approved By: _____ Date: 11/21/94

00005

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115/ #0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: NA

Volatile Organic Compounds
EPA Method 8260
Units: µg/L (ppb)

	Sample Name:	MW-1	Method Blank
	Lab Code:	K946932-001	K946932-MB
	Date Analyzed:	11/16/94	11/16/94
Analyte	**MRL**		
Tetrachloroethene (PCE)	0.5	ND	ND
Dibromochloromethane	0.5	ND	ND
1,2-Dibromoethane (EDB)	2	ND	ND
Chlorobenzene	0.5	ND	ND
1,1,1,2-Tetrachloroethane	0.5	ND	ND
Ethylbenzene	0.5	0.8	ND
Total Xylenes	0.5	ND	ND
Styrene	0.5	ND	ND
Bromoform	0.5	ND	ND
Isopropylbenzene	2	2	ND
1,1,2,2-Tetrachloroethane	0.5	ND	ND
1,2,3-Trichloropropane	0.5	ND	ND
Bromobenzene	0.5	ND	ND
n -Propylbenzene	2	3	ND
2-Chlorotoluene	2	ND	ND
4-Chlorotoluene	2	ND	ND
1,3,5-Trimethylbenzene	2	ND	ND
tert -Butylbenzene	2	ND	ND
1,2,4-Trimethylbenzene	2	ND	ND
sec -Butylbenzene	2	ND	ND
1,3-Dichlorobenzene	0.5	ND	ND
4-Isopropyltoluene	2	ND	ND
1,4-Dichlorobenzene	0.5	ND	ND
n -Butylbenzene	2	ND	ND
1,2-Dichlorobenzene	0.5	ND	ND
1,2-Dibromo-3-chloropropane (DBCP)	2	ND	ND
1,2,4-Trichlorobenzene	2	ND	ND
1,2,3-Trichlorobenzene	2	ND	ND
Naphthalene	2	14	ND
Hexachlorobutadiene	2	ND	ND

Approved By: _____ Date: 11/21/94

00006

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115\#0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: 11/9/94

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520/8270
Units: µg/L (ppb)

	Sample Name:	MW-1	Method Blank
	Lab Code:	K946932-001(a)	K941109-WB1
	Date Analyzed:	11/15/94	11/15/94
Base Neutral Analyte	**MRL**		
N-Nitrosodimethylamine	25	<50	ND
Aniline	25	<50	ND
Bis(2-chloroethyl) Ether	10	<20	ND
1,2-Dichlorobenzene	10	<20	ND
1,3-Dichlorobenzene	10	<20	ND
1,4-Dichlorobenzene	10	<20	ND
Bis(2-chloroisopropyl) Ether	10	<20	ND
N-Nitrosodi-*n*-propylamine	10	<20	ND
Hexachloroethane	10	<20	ND
Nitrobenzene	10	<20	ND
Isophorone	10	<20	ND
Bis(2-chloroethoxy)methane	10	<20	ND
1,2,4-Trichlorobenzene	10	<20	ND
Naphthalene	10	<20	ND
4-Chloroaniline	10	<20	ND
Hexachlorobutadiene	10	<20	ND
2-Methylnaphthalene	10	<20	ND
Hexachlorocyclopentadiene	10	<20	ND
2-Chloronaphthalene	10	<20	ND
2-Nitroaniline	25	<50	ND
Dimethyl Phthalate	10	<20	ND
Acenaphthylene	10	<20	ND
3-Nitroaniline	25	<50	ND
Acenaphthene	10	<20	ND
Dibenzofuran	10	<20	ND
2,4-Dinitrotoluene	10	<20	ND

a MRL is elevated because the sample required diluting. Dilution factor: 2

Approved By: _____ Date: 11/17/94

00007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115\#0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: 11/9/94

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520/8270
Units: µg/L (ppb)

	Sample Name:	MW-1	Method Blank
	Lab Code:	K946932-001(a)	K941109-WB1
	Date Analyzed:	11/15/94	11/15/94
Base Neutral Analyte	**MRL**		
2,6-Dinitrotoluene	10	<20	ND
Diethyl Phthalate	10	<20	ND
4-Chlorophenyl Phenyl Ether	10	<20	ND
Fluorene	10	<20	ND
4-Nitroaniline	25	<50	ND
N-Nitrosodiphenylamine	10	<20	ND
4-Bromophenyl Phenyl Ether	10	<20	ND
Hexachlorobenzene	10	<20	ND
Phenanthrene	10	<20	ND
Anthracene	10	<20	ND
Di-*n*-butyl Phthalate	10	<20	ND
Fluoranthene	10	<20	ND
Pyrene	10	<20	ND
Butylbenzyl Phthalate	10	<20	ND
3,3'-Dichlorobenzidine	25	<50	ND
Benz(a)anthracene	10	<20	ND
Bis(2-ethylhexyl) Phthalate	10	<20	20
Chrysene	10	<20	ND
Di-*n*-octyl Phthalate	10	<20	ND
Benzo(b)fluoranthene	10	<20	ND
Benzo(k)fluoranthene	10	<20	ND
Benzo(a)pyrene	10	<20	ND
Indeno(1,2,3-cd)pyrene	10	<20	ND
Dibenz(a,h)anthracene	10	<20	ND
Benzo(g,h,i)perylene	10	<20	ND

a MRL is elevated because the sample required diluting. Dilution factor: 2

Approved By: _____ Date: 11/17/94

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115\#0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: 11/9/94

Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520/8270
Units: µg/L (ppb)

	Sample Name:	MW-1	Method Blank
	Lab Code:	K946932-001(a)	K941109-WB1
	Date Analyzed:	11/15/94	11/15/94
Acid Analyte	**MRL**		
Phenol	10	<20	ND
2-Chlorophenol	10	<20	ND
Benzyl Alcohol	10	<20	ND
2-Methylphenol	10	<20	ND
3- and 4-Methylphenol*	10	<20	ND
2-Nitrophenol	10	<20	ND
2,4-Dimethylphenol	10	<20	ND
Benzoic Acid	25	<50	ND
2,4-Dichlorophenol	10	<20	ND
4-Chloro-3-methylphenol	10	<20	ND
2,4,6-Trichlorophenol	10	<20	ND
2,4,5-Trichlorophenol	10	<20	ND
2,4-Dinitrophenol	25	<50	ND
4-Nitrophenol	25	<50	ND
2-Methyl-4,6-dinitrophenol	25	<50	ND
Pentachlorophenol	25	<50	ND

* Quantified as 4-methylphenol.
a MRL is elevated because the sample required diluting. Dilution factor: 2

Approved By: _____ Date: 11/17/94

00009

3S3PBNA/102094

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115/ #0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: NA
Date Analyzed: 11/16/94

Surrogate Recovery Summary
Volatile Organic Compounds
EPA Method 8260

		Percent Recovery		
Sample Name	**Lab Code**	Dibromofluoromethane	Toluene-d_8	4-Bromofluorobenzene
MW-1	K946932-001	108	100	103
Method Blank	K946932-MB	103	99	94
CAS Acceptance Limits:		86-118	88-110	86-115

Approved By: _____ Date: 11/21/94

00010

COLUMBIA ANALYTICAL SERVICES, INC.

QA/QC Report

Client: EMCON Northwest
Project: Port of Seattle Terminal 115\#0357-013.02
Sample Matrix: Water

Service Request: K946932B
Date Collected: 11/4/94
Date Received: 11/7/94
Date Extracted: 11/9/94
Date Analyzed: 11/15/94

Surrogate Recovery Summary
Base Neutral/Acid Semivolatile Organic Compounds
EPA Methods 3520/8270

		Percent Recovery					
Sample Name	**Lab Code**	2FP	PHL	TBP	NBZ	FBP	TPH
MW-1	K946932-001(a)	71	87	74	74	89	56
Method Blank	K941109-WB1	63	75	74	77	76	70
Lab Control Sample	K941109-WL1	66	80	83	83	80	74
CAS Acceptance Limits:		21-100	10-94	10-123	35-114	43-116	33-141

2FP	2-Fluorophenol
PHL	Phenol-d_6
TBP	2,4,6-Tribromophenol
NBZ	Nitrobenzene-d_5
FBP	2-Fluorobiphenyl
TPH	Terphenyl-d_{14}

a Result is from the analysis of a diluted sample. Dilution factor: 2

Approved By: _____ Date: 11/17/94

00011

CHAIN OF CUSTODY/LABORATORY ANALYSIS REPORT FORM

Columbia Analytical Services, Inc. 18912 North Creek Pkwy, Suite 118 • Bothell, WA 98011 • (206) 486-6983 • FAX (206) 486-7695

DATE 11-4-94 PAGE 1 OF 1

PROJECT NAME Port of Seattle Terminal 115 # 0357-013.02

PROJECT Meyer

COMPANY/ADDRESS EMCON

PHONE

SAMPLERS SIGNATURE Tom Bodle

ANALYSIS REQUEST

SAMPLE I.D.	DATE	TIME	LAB I.D.	SAMPLE MATRIX	NUMBER OF CONTAINERS	PETROLEUM HCS: TPH - HCID State:	TPH - G State: WA ✓ BTEX ✓	TPH - D State: WA ✓ OIL ✓	TPH - 418.1 State:	TPH - Other	ORGANIC: Halogenated or Aromatic Volatiles 601/8010 602/8020	Volatile Organics GC/MS 624 8240 8260	Base/Neu/Acid Organics GC/MS 625 8270	Pesticides/PCBS 8080 PCB ONLY	PAH 8310 HPCL 8100 GC	TCLP Metals	Semi VOA VOA	Metals List Below ✓ Pest/Herb ✓ Total ✓ DISS	Cyanide	ORGANIC METALS/INORGANICS: pH, Cond Cl, SO_4, PO_4 F, Br NO_2 NO_3 (Circle)	NH_3 - N, COD, Total-P TKN, TOC, (TOX) (Circle)	REMARKS
MW-1	11-4-94		BSY-848-1	water	8		✓	✓				✓	✓				✓	✓				
MW-2			-2		5		✓	✓									✓					
MW-3			-3		4		✓	✓									✓					
MW-4			-4				✓	✓									✓					
MW-5			-5		4		✓	✓									✓					
purge water			-6		2												✓			✓		

RELINQUISHED BY:
Signature: Tom Bodle
Printed Name: Tom Bodle
Firm: EMCON
Date/Time: 11-4-94 1604

RECEIVED BY:
Signature: Cola Elliott
Printed Name: Cola Elliott
Firm: CAS
Date/Time: 11/4/94 16:04

TURNAROUND REQUIREMENTS
___ 24 hr ___ 48 hr. ___ 5 day
✓ Standard (10-15 working days)
___ Provide Verbal Preliminary Results
___ Provide FAX preliminary Results
Requested Report Date

REPORT REQUIREMENTS
___ I. Routine Report
___ II. Report (includes DUP.MAS. MSD, as required, may be charged as samples)
___ III. Data Validation Report (includes All Raw Data)
___ IV. CLP Deliverable Report

INVOICE INFORMATION:
P.O.#
Bill To

SAMPLE RECEIPT:
Shipping VIA:
Shipping to:
Condition:
Lab No: K9411932.B

RELINQUISHED BY:
Signature: Cola Elliott
Printed Name: Cola Elliott
Firm: CAS
Date/Time: 11/5/94 11:00 to Fed Ex

RECEIVED BY:
Signature: D Storms
Printed Name: D Storms
Firm: CAS
Date/Time: 11/7/94 1000

SPECIAL INSTRUCTIONS/COMMENTS:
* Metals = Pb