



SW JS
100639
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**UNDERGROUND STORAGE TANK
SITE ASSESSMENT / SITE CHARACTERIZATION**

Sea-Land Container Terminal

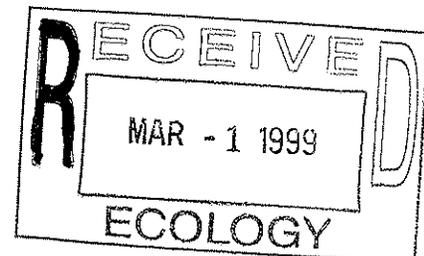
Located at:
1675 Lincoln Avenue
Tacoma, Washington

Revised: February 19, 1999

Submitted to
Tacoma Pierce County Health Department

Prepared By:

Creative Environmental Technologies, Inc.
P.O. Box 1803
Tacoma, Washington 98401-1803
253.627.3347



Sea-Land UST Removal Report-093-1.wpd

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Attachment 4 - Site History

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1.0 Introduction

This UST Decommissioning and Site Assessment report was prepared on behalf of Sea-land Services, Inc and Mr. Guy Buzzoni. The contents represented are specific to the decommissioning and removal of one - 3,000 gallon waste oil underground storage tank (UST) and a limited historical review of the immediate area where the UST was located.

1.1 Purpose

The purpose of this site assessment report is to document closure of a 3,000 gallon underground waste oil storage tank removed on December 7, 1998 at the Sea-Land container Handling terminal in Tacoma. This report was prepared for submission to the Tacoma Pierce County Health Department (TPCHD) in response to the letter dated December 7, 1998 from TPCHD and attached hereto as attachment 1, as well as required by WAC 173-303.

1.2 Background

Creative Environmental Technologies, Inc. (CETI) was hired by NW Tank & Environmental Services to delineate, and characterize one 3,000 gallon waste oil underground storage tank (UST) as well as complete a UST Site Assessment / Site Characterization following the removal of the UST on property located at 1675 Lincoln Avenue, Tacoma, Washington.

The UST was installed October 1984. Washington UST identification number is 10456 and site identification number is 100639. The tank was single wall steel and used for storage of waste oil collected during the servicing of Sea-Land vehicles. The UST was removed to meet new December 22, 1998 Ecology guidelines.

1.3 Underground Storage Tank Decommissioning Notification

Notification for the tank decommissioning was submitted by NW Tank & Environmental Services, Inc., to the Tacoma Fire Department, Tacoma-Pierce County Health Department and Department of Ecology. Copies of permits and notifications are attached.

2.0 Excavation and Removal of UST

NW Tank and Environmental Services utilized a vacuum pump truck to remove all liquid from the UST. The liquid was disposed of by Marine Vacuum Services, Seattle, Washington at 1516 S Graham Street, Seattle, Washington 98108 (1-206-762-0240). A copy of the manifest is attached in Appendix B. Following the product removal, the UST was triple rinsed and inerted by Aspen Environmental Services using dry ice. The top of the UST was 4.0 feet BGS. Excavation total depth was 9.25 feet BGS. The product and vent lines were located on top (approximately 3.0 feet BGS) of and to the east side of the UST (figure 4). The vent lines ran from the UST north to the edge of the adjacent building.

During the excavation of the UST on December 7, 1998, a strong diesel odor was observed from the excavation. As the UST was excavated free diesel product was observed on the surface of ground water at a depth of 8.0 feet BGS (below ground surface). On site analysis using the Petroflag Hydrocarbon Analyzer indicated the presence of hydrocarbons in the excavated soils.

The UST was examined following removal from the excavation and appeared in good condition. There was minimal evidence of scaling, pitting or rusting present on the surface of the UST. The UST was placed on a truck and disposed of through Northwest Tank and Environmental at 12720 4th Avenue W Suite F 406, Everett, Washington, 98204 by Marine Vacuum Services and recycled at a local scrap metal recycling facility.

3.0 Soil Sampling and Testing

Sub-surface soils consisted of medium to fine, dry, silty sand, brown to tan in color. Poorly sorted gravel, .5-1 inches in size, was evenly distributed throughout the subsurface soils. The soil's origin is unknown. Staining of the soils and strong diesel odor, by what appeared to be diesel product, was encountered in the excavation beginning at 3.0 to 4.0 BGS. Soil samples were collected from the excavation bottom under the UST along the north side wall at 8.0 feet BGS.

The sample collected during the UST removal was field screened using a Petroflag Hydrocarbon Analyzer. The sample showed signs of contamination in the field giving a reading exceeding 2,000 ppm. The Petroflag was calibrated for diesel.

The soil sample was collected from the excavation using a backhoe bucket. The samples were carefully removed from the bucket teeth, representing the purest undisturbed sample. Select soil was placed in an EPA approved 4 oz glass sample collection jar with a Teflon™ lined lid. All samples were stored in a cooler at 40° F. to maintain and preserve the integrity of the sample until delivered to the laboratory for analysis.

Due to the condition and use of the UST and the concentrations of contamination observed in the UST excavation, a sample of the sludge inside the UST was collected and analyzed, using the same methods used on the soil sample. The sludge sample was also

Sludge from the inside of the UST was placed in an EPA approved 4 oz glass sample collection jar with a Teflon™ lined lid. All samples were stored in a cooler at 40° F. to maintain and preserve the integrity of the sample until delivered to the laboratory for analysis.

All soil and sludge samples collected were analyzed at Sound Analytical Services, Inc. (SASI) at 4813 Pacific Hwy., Fife, Washington, a state licensed laboratory. Sample location are shown on the site map. SASI analyzed collected soil and UST sludge samples using method WTPH-D Extended (diesel/oil), method 8260 total RCRA 8 metals, method 8260 volatile organic compounds and method 8082 PCB's.

UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT

Sea-Land Container Terminal

1675 Lincoln Avenue

Tacoma, Washington

4.0 Analytical Results

Washington Administrative Code (WAC) 173-340-745 Method A sets an action level (maximum allowable limit) of 200 ppm (mg/kg) diesel and 100 ppm (mg/kg) gasoline for soil.

The results of the sample analysis revealed diesel range hydrocarbons above the state Model Toxics Control Act (MTCA) allowable limit of 200 parts per million (ppm) in the soils below of the excavation that contained the UST.

4.1 Analytical Results Table

Table 1
Soil Analysis
Method TPH-D (Diesel/Oil)

Sample ID	Sample Location	Diesel	Oil	Action Level ppm
S1-12798	Soil Sample Excavation Bottom	6,600 ppm	370 ppm	200
S3-122098	Sludge From Inside UST	260,000 ppm	720,000 ppm	None

Analytical results for samples taken during UST assessment Sea-Land Facility

For all other analytical results please refer to Appendix B.

5.0 Further Investigation

The client requested that CETI investigate the origin of the contaminate. CETI inspected the tank and related piping. The tank did not appear to have any leaks, was minimally pitted and appeared to be in excellent condition. The piping appeared to be tight, and in excellent condition as well. There did not appear to be contamination at or near the vent pipe or the fill pipe. Soil at the location of the pipe was a sandy material which had no odor nor staining. The odor of diesel and the staining by what appeared to be hydrocarbon material, were encountered at a lower portion of the excavation.

Since the tank was installed and used for waste oil, record searches were begun to try to determine if any potential diesel releases could have occurred in the area that may have impacted the site.

An above-ground tank (AGT) evidently had been located on the site at the location of the UST removal some years ago. An undated areal photograph CIRA 1960 to 1980 shows a large above ground storage tank-like structure located where the Sea-Land maintenance building is located now. According to an undated memo from the Port of Tacoma, the 1.25 million gallon tank was apparently used for diesel fuel storage and was owned by the Milwaukee Railroad prior to the purchase of the property by the Port of Tacoma. The tank was demolished and lines pulled by the Port in July 1981, according to the memo.

A subsurface exploration and geotechnical study was accomplished by Hart Crowser & Associates, Inc., a regional engineering and science company, dated November 4, 1983. The document resulting from the study, shows various test pits being advanced near the area of the maintenance shop location. At one site (test pit #20), the Hart Crowser report states that the investigator found "...strong fuel odor" at 6 feet BGS. The report was prepared prior to the construction of the Sea-Land maintenance facility, or the waste oil UST recently removed.

A drawing of the site with an overlay of both the AGT and the maintenance building as well as the location of the waste oil tank is found in Appendix A.

6.0 Conclusions

Analytical and visual evidence indicates that the site is contaminated with diesel product, including free product at the groundwater surface. There does not seem to be contamination at the upper levels (3.0 TO 0 feet BGS) of the waste oil tank excavation.

Sample results for method 6010 - Total RCRA 8 metals, method 8260 - volatile organic compounds and method 8082 - PCB's did not indicate any elevated level of these specific contaminants in the soil sample collected from the waste oil UST excavation..

Based on the results of the laboratory soils analysis and on-site observations, it is CETI's opinion the subsurface soils in the UST excavation are contaminated by diesel and oil range petroleum range hydrocarbons. The amount of oil reported in the analytical results is minimal, however the diesel both observed in the UST excavation and reported through the analytical results indicate the need for further delineation of the site.

The evidence of a 1.25 million gallon diesel fuel tank, along with the previous evidence of fuel releases in the subsurface of the site prior to the installation of the 3,000 gallon waste oil tank, indicates that the release encountered in the excavation of the waste oil tank was from previous activities, not from the UST removed. There is no evidence that the waste oil tank was the source of any releases on the site.

At this time, CETI recommends closure of the waste oil UST matter. Any further investigation should be centered around previous activities and facilities on the site to and including the 1.25 gallon diesel fuel tank and its related piping and facilities.

CETI further recommends that a copy of this report be presented to the Port of Tacoma as owner of the property, and the Washington Department of Ecology so that a decision may be made for further investigation in accordance with the applicable regulations for releases.

UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT

Sea-Land Container Terminal

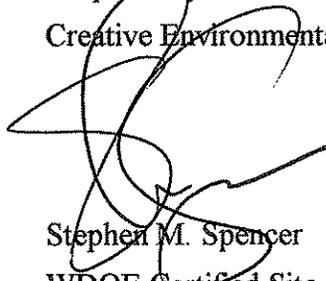
1675 Lincoln Avenue

Tacoma, Washington

Creative Environmental Technologies, Inc. extends its appreciation for the opportunity to provide environmental services on this project. If there are any questions regarding this report please do not hesitate to contact us.

Respectfully Submitted:

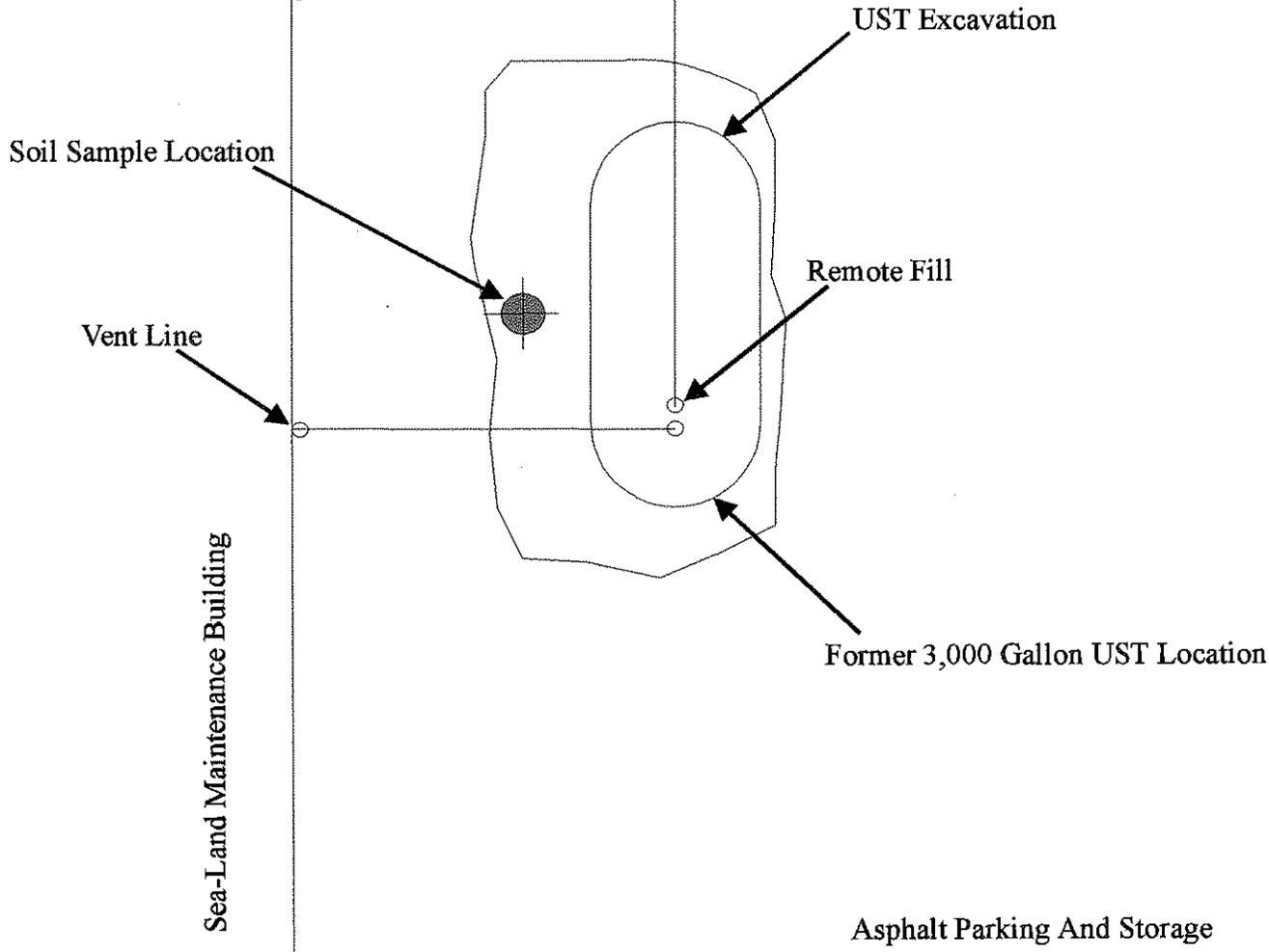
Creative Environmental Technologies, Inc.



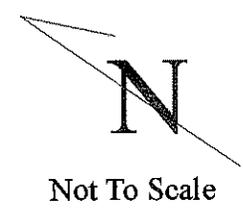
Stephen M. Spencer

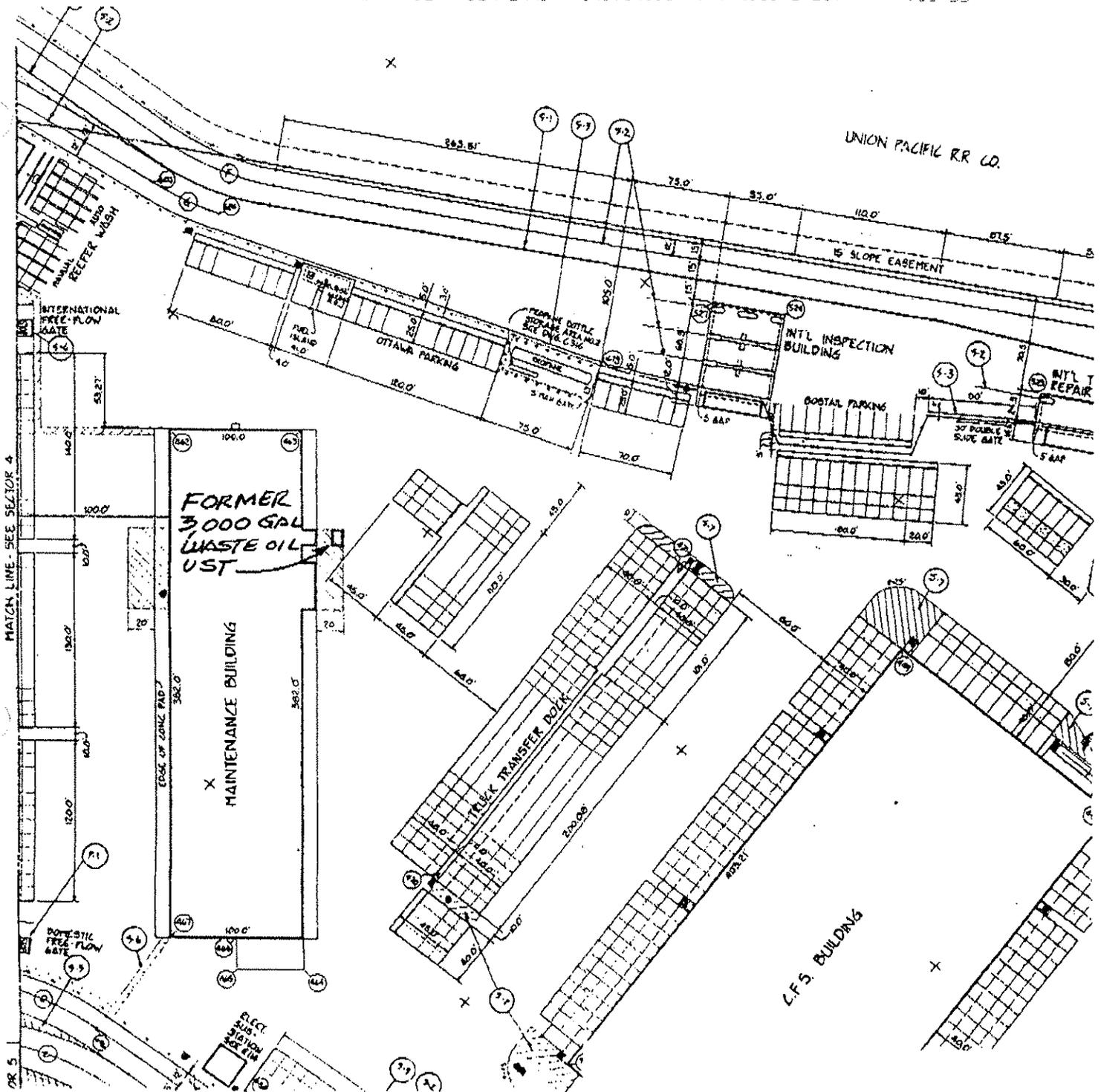
WDOE Certified Site Assessor

Appendix A - Drawings, Photographs and Figures



UST Location Map
Sea-Land Facility
1675 Lincoln Avenue
Tacoma, Washington
Job Number 093-1-1999





MATCH LINE - SEE SECTOR 4

UNION PACIFIC RR CO.

FORMER
3000 GAL
WASTE OIL
UST

MAINTENANCE BUILDING

TRUCK TRANSFER DOCK

C.F.S. BUILDING

INTL INSPECTION BUILDING

INTL REPAIR

POSTAL PARKING

OTTAWA PARKING

INTERNATIONAL FREE FLOW GATE

DOMESTIC FREE FLOW GATE

ELECT. CONTROL BUILDING

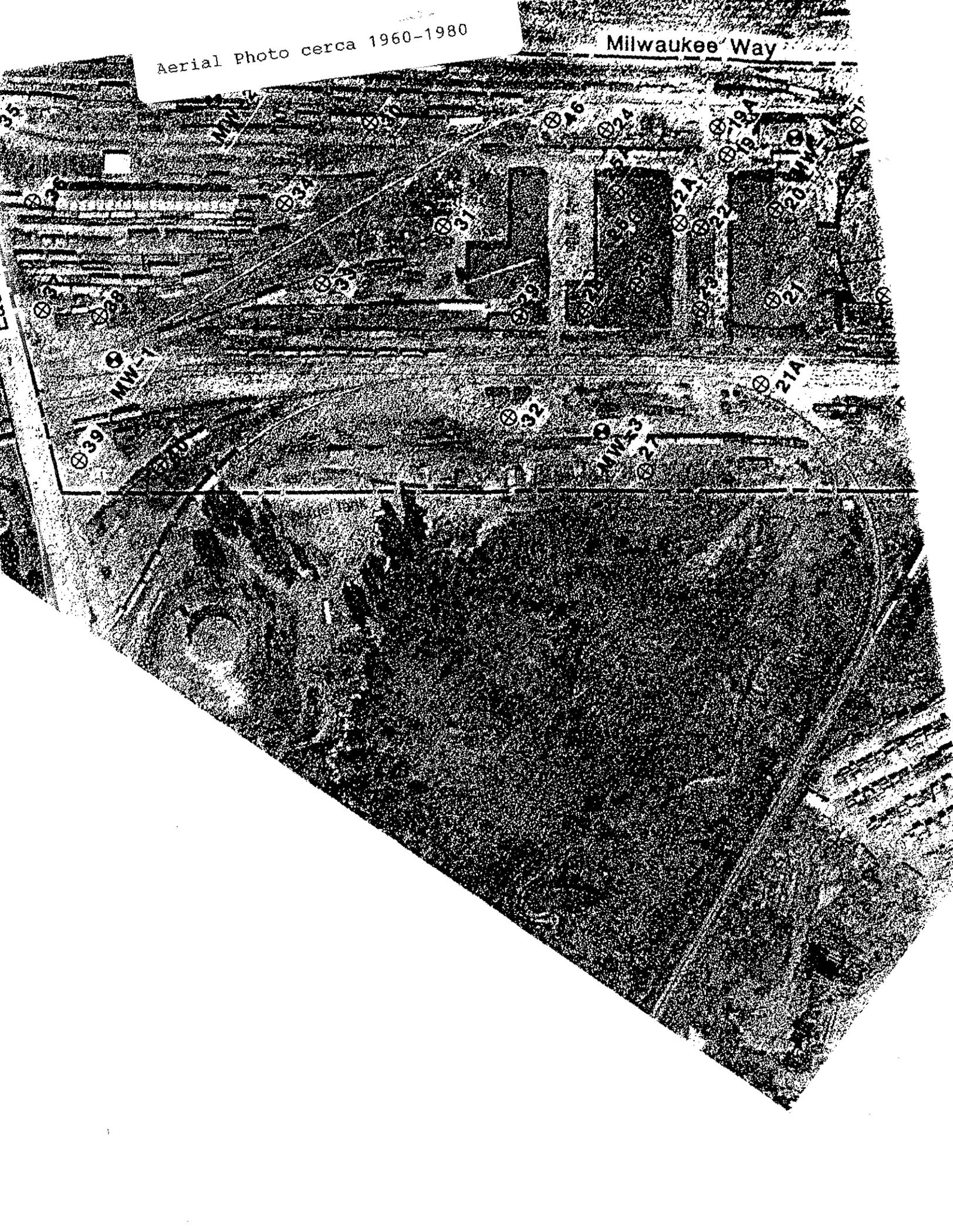
SCALE IN FEET
0 50 100 150

REFERENCE:		PORT OF TACOMA	
TACOMA TERMINALS, INC.		SITE PLAN	
DATE	5-27-04	CHECKED	J. G.
DATE	7-23-04	CHECKED	J. G.
DATE	7-30-04	CHECKED	J. G.
CONTRACT NO.	560		

MARK	REVISION	BY	APP	DATE	AS NOTED

Aerial Photo circa 1960-1980

Milwaukee Way



LIMIT OF CONTRACT

16

REEFER WASH FACILITY

6A

FUELING FACILITIES

NTL INSPECTION BUILDING

NTL TIRE REPAIR

7A

NTL EQ CONTROL & SCALE

Hart Crowser test pit #20

REEFER STALLS

MAINTENANCE BUILDING

3

6

3

LFS BUILDING

EMPLOYEE PARKING

CAR BLOCK STORAGE

SCALES

4

YARD ON

LUMBER STORAGE

5

3

1

ELECTRICAL SUB-STATION

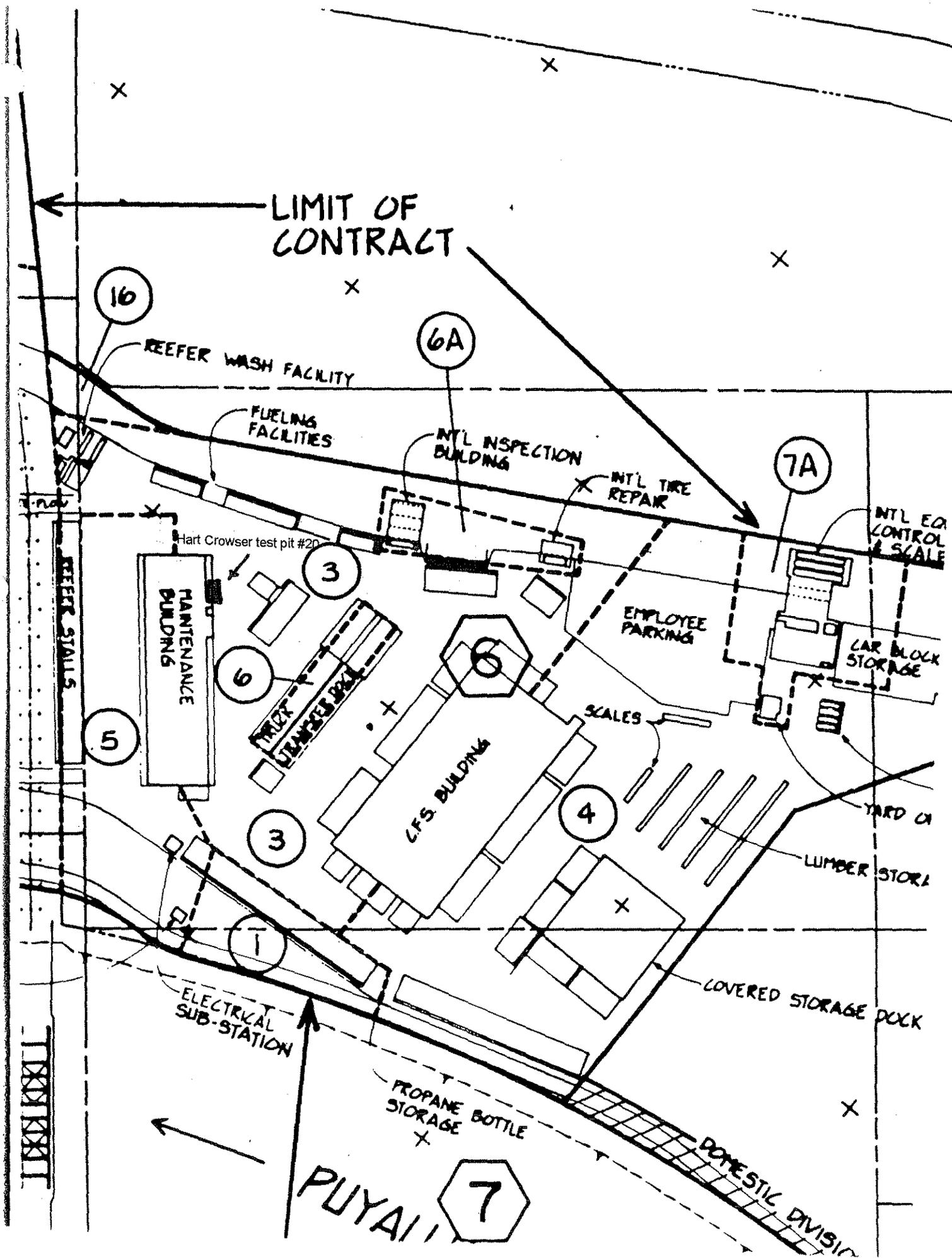
COVERED STORAGE DOCK

PROPANE BOTTLE STORAGE

PUYAI

7

DOMESTIC DIVISION





UST excavation with UST exposed and oil observed floating
on the groundwater

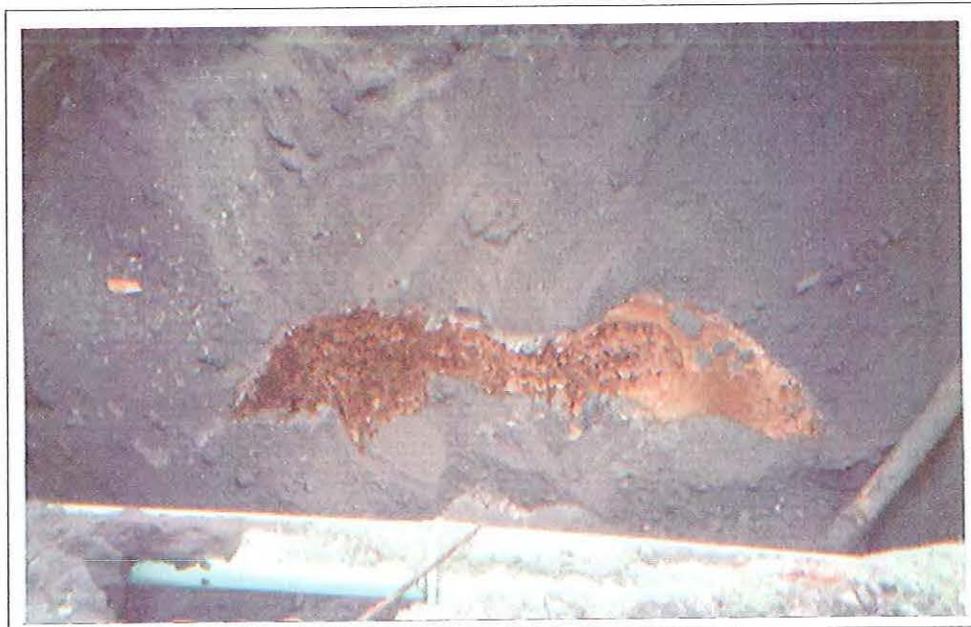


3000 gallon UST following removal from excavation

Site Photographs
Sea-Land Facility
1675 Lincoln Avenue
Tacoma, Washington
Job Number 093-1-1999



3000 gallon UST following removal from excavation. Inspection of the UST showed had no visual evidence of pitting, scaling or holes in the UST.



Diesel oil observed floating on groundwater in UST Excavation

Site Photographs
Sea-Land Facility
1675 Lincoln Avenue
Tacoma, Washington
Job Number 093-1-1999

UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT

Sea-Land Container Terminal

1675 Lincoln Avenue

Tacoma, Washington

Appendix B - Analytical Results, Permits and Notifications

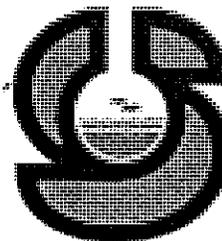
Sound Analytical Services, Inc.

ANALYTICAL & ENVIRONMENTAL CHEMISTS

4813 Pacific Hwy East • Tacoma, WA 98424

(253) 922-2310 • FAX (253) 922-5047

e-mail: SoundL@aol.com



TRANSMITTAL MEMORANDUM

DATE: December 17, 1998

TO: Steve Spencer
Creative Environmental Technology, Inc.
P. O. Box 1803
Tacoma, WA 98401

PROJECT: Aspen - Sealand

REPORT NUMBER: 77614

Enclosed are the test results for two samples received at Sound Analytical Services on December 8, 1998.

The report consists of this transmittal memo, analytical results, quality control reports, a copy of the chain-of-custody, a list of data qualifiers and analytical narrative when applicable, and a copy of any requested raw data.

Should there be any questions regarding this report, please contact me at (253) 922-2310.

Sincerely,

A handwritten signature in cursive script that reads "Katie Downie". The signature is written in black ink and is positioned above the typed name and title.

Katie Downie
Project Manager

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S1-12798
Lab ID:	77614-01
Date Received:	12/8/98
Date Prepared:	12/10/98
Date Analyzed:	12/10/98
% Solids	77.58
Dilution Factor	1

Volatile Organics by USEPA Method 5030/8260B Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
Dibromofluoromethane	91		79	122
Fluorobenzene	94		80	120
Toluene-d8	103		87	109
Ethylbenzene-d10	95		80	120
Bromofluorobenzene	111		74	131

Sample results are on a dry weight basis.

Analyte	Result (ug/kg)	PQL	MDL	Flags
Dichlorodifluoromethane	ND	480	310	
Chloromethane	ND	480	360	
Bromomethane	ND	480	260	
Vinyl Chloride	ND	480	260	
Chloroethane	ND	480	290	
Trichlorofluoromethane	ND	480	86	
1,1-Dichloroethene	ND	480	140	
Methylene Chloride	ND	480	43	
trans-1,2-Dichloroethene	ND	480	61	
1,1-Dichloroethane	ND	480	76	
2,2-Dichloropropane	ND	480	64	
cis-1,2-Dichloroethene	ND	480	50	
Bromochloromethane	ND	480	24	
Chloroform	ND	480	49	
1,1,1-Trichloroethane	ND	480	39	
Carbon Tetrachloride	ND	480	34	
1,1-Dichloropropene	ND	480	57	
Benzene	ND	480	52	
1,2-Dichloroethane	ND	480	75	
Trichloroethene	ND	480	25	
1,2-Dichloropropane	ND	480	35	
Dibromomethane	ND	480	49	
Bromodichloromethane	ND	480	39	
cis-1,3-Dichloropropene	ND	480	46	
Toluene	ND	480	33	
trans-1,3-Dichloropropene	ND	480	33	

SOUND ANALYTICAL SERVICES, INC.

Volatile Organics by USEPA Method 5030/8260B Modified data for 77614-01 continued...

Analyte	Result (ug/kg)	PQL	MDL	
1,1,2-Trichloroethane	ND	480	21	
Tetrachloroethene	ND	480	27	
1,3-Dichloropropane	ND	480	43	
Dibromochloromethane	ND	480	12	
1,2-Dibromoethane	ND	480	24	
Chlorobenzene	1100	480	25	
1,1,1,2-Tetrachloroethane	ND	480	23	
Ethylbenzene	810	480	24	
m,p-Xylene	290	960	72	J
o-Xylene	ND	480	40	
Styrene	ND	480	27	
Bromoform	ND	480	30	
Isopropylbenzene	610	480	42	
Bromobenzene	ND	480	35	
1,1,2,2-Tetrachloroethane	ND	480	50	
1,2,3-Trichloropropane	ND	480	52	
n-Propylbenzene	1900	480	43	
2-Chlorotoluene	ND	480	40	
4-Chlorotoluene	ND	480	45	
1,3,5-Trimethylbenzene	1200	480	47	
t-Butylbenzene	ND	480	41	
1,2,4-Trimethylbenzene	3100	480	99	
sec-Butylbenzene	2800	480	52	
1,3-Dichlorobenzene	270	480	46	J
1,4-Dichlorobenzene	250	480	40	J
4-Isopropyltoluene	1900	480	68	
1,2-Dichlorobenzene	380	480	47	J
n-Butylbenzene	ND	480	69	
1,2-Dibromo-3-chloropropane	ND	480	90	
1,2,4-Trichlorobenzene	ND	480	79	
Hexachlorobutadiene	ND	480	55	
Naphthalene	4000	480	61	
1,2,3-Trichlorobenzene	ND	480	75	

SOUND ANALYTICAL SERVICES, INC.

Client Name Creative Environmental Technology, Inc.
Client ID: S1-12798
Lab ID: 77614-01
Date Received: 12/8/98
Date Prepared: 12/10/98
Date Analyzed: 12/11/98
% Solids 77.58

*Compost
Two Sides*

Extended Diesel Range by WTPH-D Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
o-terphenyl	139		50	150

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Diesel (>nC12-nC24)	6600	130	
Motor Oil (>nC24-nC32)	370	260	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S4-12798
Lab ID:	77614-02
Date Received:	12/8/98
Date Prepared:	12/10/98
Date Analyzed:	12/10/98
% Solids	99.46

Extended Diesel Range by WTPH-D Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
o-terphenyl	98		50	150

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Diesel (>nC12-nC24)	190	19	X1
Motor Oil (>nC24-nC32)	140	38	

X1 - Chromatogram suggests this might be aged or degraded diesel

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S4-12798
Lab ID:	77614-02
Date Received:	12/8/98
Date Prepared:	12/10/98
Date Analyzed:	12/13/98
% Solids	99.46

Total Petroleum Hydrocarbons as Gasoline by WSDOE Method WTPH-G Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
Bromofluorobenzene	97		50	150

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Gasoline Range Organics	2.3	1.8	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S1-12798
Lab ID:	77614-01
Date Received:	12/8/98
Date Prepared:	12/14/98
Date Analyzed:	12/14/98
Dilution Factor	1
% Solids	77.58

Metals by ICP - USEPA Method 6010

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Arsenic	ND	88	
Barium	29	1.1	
Cadmium	ND	18	
Chromium	21	2.2	
Lead	ND	33	
Selenium	ND	180	
Silver	ND	2.2	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S1-12798
Lab ID:	77614-01
Date Received:	12/8/98
Date Prepared:	12/14/98
Date Analyzed:	12/14/98
Dilution Factor	1
% Solids	77.58

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Mercury	ND	0.12	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S1-12798
Lab ID:	77614-01
Date Received:	12/8/98
Date Prepared:	12/14/98
Date Analyzed:	12/15/98
% Solids	77.58

PCBs by USEPA Method 8082

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
TCMX	94		44	145
Decachlorobiphenyl	107		52	125

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Aroclor 1016	ND	0.12	
Aroclor 1221	ND	0.12	
Aroclor 1232	ND	0.12	
Aroclor 1242	ND	0.12	
Aroclor 1248	ND	0.12	
Aroclor 1254	ND	0.12	
Aroclor 1260	ND	0.12	
Aroclor 1262	ND	0.12	
Aroclor 1268	ND	0.12	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - VOL975
Date Received:	-
Date Prepared:	12/10/98
Date Analyzed:	12/10/98
% Solids	
Dilution Factor	1

Volatile Organics by USEPA Method 5030/8260B Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
Dibromofluoromethane	96		79	122
Fluorobenzene	96		80	120
Toluene-d8	103		87	109
Ethylbenzene-d10	97		80	120
Bromofluorobenzene	102		74	131

Sample results are on an as received basis.

Analyte	Result (ug/kg)	PQL	MDL	Flags
Dichlorodifluoromethane	ND	400	250	
Chloromethane	ND	400	300	
Bromomethane	ND	400	220	
Vinyl Chloride	ND	400	210	
Chloroethane	ND	400	240	
Trichlorofluoromethane	ND	400	71	
1,1-Dichloroethene	ND	400	120	
Methylene Chloride	ND	400	36	
trans-1,2-Dichloroethene	ND	400	50	
1,1-Dichloroethane	ND	400	63	
2,2-Dichloropropane	ND	400	53	
cis-1,2-Dichloroethene	ND	400	42	
Bromochloromethane	ND	400	20	
Chloroform	ND	400	41	
1,1,1-Trichloroethane	ND	400	33	
Carbon Tetrachloride	ND	400	28	
1,1-Dichloropropene	ND	400	48	
Benzene	ND	400	44	
1,2-Dichloroethane	ND	400	62	
Trichloroethene	ND	400	21	
1,2-Dichloropropane	ND	400	29	
Dibromomethane	ND	400	41	
Bromodichloromethane	ND	400	32	
cis-1,3-Dichloropropene	ND	400	38	
Toluene	ND	400	27	
trans-1,3-Dichloropropene	ND	400	27	

SOUND ANALYTICAL SERVICES, INC.

Volatile Organics by USEPA Method 5030/8260B Modified data for VOL975 continued...

Analyte	Result (ug/kg)	PQL	MDL
1,1,2-Trichloroethane	ND	400	18
Tetrachloroethene	ND	400	23
1,3-Dichloropropane	ND	400	36
Dibromochloromethane	ND	400	9.6
1,2-Dibromoethane	ND	400	20
Chlorobenzene	ND	400	21
1,1,1,2-Tetrachloroethane	ND	400	19
Ethylbenzene	ND	400	20
m,p-Xylene	ND	800	60
o-Xylene	ND	400	34
Styrene	ND	400	23
Bromoform	ND	400	25
Isopropylbenzene	ND	400	35
Bromobenzene	ND	400	29
1,1,2,2-Tetrachloroethane	ND	400	41
1,2,3-Trichloropropane	ND	400	43
n-Propylbenzene	ND	400	35
2-Chlorotoluene	ND	400	33
4-Chlorotoluene	ND	400	37
1,3,5-Trimethylbenzene	ND	400	39
t-Butylbenzene	ND	400	34
1,2,4-Trimethylbenzene	ND	400	82
sec-Butylbenzene	ND	400	43
1,3-Dichlorobenzene	ND	400	38
1,4-Dichlorobenzene	ND	400	33
4-Isopropyltoluene	ND	400	56
1,2-Dichlorobenzene	ND	400	39
n-Butylbenzene	ND	400	58
1,2-Dibromo-3-chloropropane	ND	400	75
1,2,4-Trichlorobenzene	ND	400	66
Hexachlorobutadiene	ND	400	45
Naphthalene	ND	400	50
1,2,3-Trichlorobenzene	ND	400	62

SOUND ANALYTICAL SERVICES, INC.

Blank Spike/Blank Spike Duplicate Report

Lab ID: VOL975
Date Prepared: 12/10/98
Date Analyzed: 12/10/98
QC Batch ID: VOL975

Volatile Organics by USEPA Method 5030/8260B Modified

Compound Name	Blank Result (ug/kg)	Spike Amount (ug/kg)	BS Result (ug/kg)	BS % Rec.	BSD Result (ug/kg)	BSD % Rec.	RPD	Flag
1,1-Dichloroethene	0	2000	2120	106	2080	104	-1.9	
Benzene	0	2000	1940	96.9	1930	96.6	-0.31	
Trichloroethene	0	2000	1910	95.7	1840	91.8	-4.2	
Toluene	0	2000	1990	99.3	1970	98.7	-0.61	
Chlorobenzene	0	2000	1970	98.7	1990	99.7	1	

SOUND ANALYTICAL SERVICES, INC.

Lab ID: Method Blank - DI1843
Date Received: -
Date Prepared: 12/10/98
Date Analyzed: 12/10/98
% Solids

Extended Diesel Range by WTPH-D Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
o-terphenyl	96		50	150

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Diesel (>nC12-nC24)	ND	20	
Motor Oil (>nC24-nC32)	ND	40	

SOUND ANALYTICAL SERVICES, INC.

Blank Spike/Blank Spike Duplicate Report

Lab ID: DI1843
Date Prepared: 12/10/98
Date Analyzed: 12/10/98
QC Batch ID: DI1843

Extended Diesel Range by WTPH-D Modified

Compound Name	Blank Result (mg/kg)	Spike Amount (mg/kg)	BS Result (mg/kg)	BS % Rec.	BSD Result (mg/kg)	BSD % Rec.	RPD	Flag
Diesel (>nC12-nC24)	0	502	457	91	454	90.4	-0.66	
Motor Oil (>nC24-nC32)	0	500	452	90.5	478	95.5	5.4	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: 98C 13461
Lab ID: 77618-01
Date Prepared: 12/10/98
Date Analyzed: 12/11/98
QC Batch ID: DI1843

W. J. ...

Extended Diesel Range by WTPH-D Modified

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Diesel (>nC12-nC24)	64000	74000	-14.0	
Motor Oil (>nC24-nC32)	16000	18000	-12.0	

SOUND ANALYTICAL SERVICES, INC.

Lab ID: Method Blank - GB1638
Date Received: -
Date Prepared: 12/10/98
Date Analyzed: 12/13/98
% Solids

Total Petroleum Hydrocarbons as Gasoline by WSDOE Method WTPH-G Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
Bromofluorobenzene	97		50	150

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Gasoline Range Organics	ND	2	

SOUND ANALYTICAL SERVICES, INC.

Blank Spike Report

Lab ID: GB1638
Date Prepared: 12/10/98
Date Analyzed: 12/13/98
QC Batch ID: GB1638

Total Petroleum Hydrocarbons as Gasoline by WSDOE Method WTPH-G Modified

Parameter Name	Blank Result (mg/kg)	Spike Amount (mg/kg)	BS Result (mg/kg)	BS % Rec.	Flag
Gasoline Range Organics	0	40	34	84	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: 99-02731
Lab ID: 77607-01
Date Prepared: 12/10/98
Date Analyzed: 12/13/98
QC Batch ID: GB1638

Total Petroleum Hydrocarbons as Gasoline by WSDOE Method WTPH-G Modified

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Gasoline Range Organics	0	0	NC	

SOUND ANALYTICAL SERVICES, INC.

Lab ID: Method Blank - PCBC72
Date Received: -
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
% Solids 100

PCBs by USEPA Method 8082

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
TCMX	103		44	145
Decachlorobiphenyl	93		52	125

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Aroclor 1016	ND	0.098	
Aroclor 1221	ND	0.098	
Aroclor 1232	ND	0.098	
Aroclor 1242	ND	0.098	
Aroclor 1248	ND	0.098	
Aroclor 1254	ND	0.098	
Aroclor 1260	ND	0.098	
Aroclor 1262	ND	0.098	
Aroclor 1268	ND	0.098	

SOUND ANALYTICAL SERVICES, INC.

Blank Spike/Blank Spike Duplicate Report

Lab ID: PCBC72
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
QC Batch ID: PCBC72

PCBs by USEPA Method 8082

Compound Name	Blank Result (mg/kg)	Spike Amount (mg/kg)	BS Result (mg/kg)	BS % Rec.	BSD Result (mg/kg)	BSD % Rec.	RPD	Flag
Aroclor 1260	0	0.988	0.978	99	0.981	100	1	

SOUND ANALYTICAL SERVICES, INC.

Lab ID: Method Blank - S259
Date Received: -
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
Dilution Factor: 1

Metals by ICP - USEPA Method 6010

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Arsenic	ND	80	
Barium	ND	1	
Cadmium	ND	16	
Chromium	ND	2	
Lead	ND	30	
Selenium	ND	160	
Silver	ND	2	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: S1-12798
Lab ID: 77614-01
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
QC Batch ID: S259

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Arsenic	0	0	NC	
Barium	29	29	0.0	
Cadmium	0	0	NC	
Chromium	21	38	-58.0	X4a
Lead	0	0	NC	
Selenium	0	0	NC	
Silver	0	0	NC	

SOUND ANALYTICAL SERVICES, INC.

Matrix Spike Report

Client Sample ID: S1-12798
Lab ID: 77614-01
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
QC Batch ID: S259

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Arsenic	0	908	962	106	
Barium	29	908	965	103	
Cadmium	0	22.7	25.9	114	
Chromium	21	90.8	112	99	
Lead	0	227	228	101	
Selenium	0	908	868	96	
Silver	0	136	143	105	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - S153
Date Received:	-
Date Prepared:	12/14/98
Date Analyzed:	12/14/98
Dilution Factor	1

Mercury by CVAA - USEPA Method 7471

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Mercury	ND	0.1	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: S1-12798
Lab ID: 77614-01
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
QC Batch ID: S153

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Mercury	0	0	NC	

SOUND ANALYTICAL SERVICES, INC.

Matrix Spike Report

Client Sample ID: S1-12798
Lab ID: 77614-01
Date Prepared: 12/14/98
Date Analyzed: 12/14/98
QC Batch ID: S153

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Mercury	0	1.01	1.26	124	

SOUND ANALYTICAL SERVICES, INC.

ANALYTICAL & ENVIRONMENTAL CHEMISTS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE: (253) 922-2310 - FAX: (253) 922-5047

DATA QUALIFIERS AND ABBREVIATIONS

- B1: This analyte was detected in the associated method blank. The analyte concentration was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).
- B2: This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than ten times the concentration reported in the blank).
- C1: Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be $\leq 40\%$.
- C2: Second column confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be $> 40\%$. The higher result was reported unless anomalies were noted.
- M: GC/MS confirmation was performed. The result derived from the original analysis was reported.
- D: The reported result for this analyte was calculated based on a secondary dilution factor.
- E: The concentration of this analyte exceeded the instrument calibration range and should be considered an estimated quantity.
- J: The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.
- MCL: Maximum Contaminant Level
- MDL: Method Detection Limit
- N: See analytical narrative.
- ND: Not Detected
- PQL: Practical Quantitation Limit
- X1: Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____.
- X2: Contaminant does not appear to be "typical" product.
- X3: Identification and quantitation of the analyte or surrogate was complicated by matrix interference.
- X4: RPD for duplicates was outside advisory QC limits. The sample was re-analyzed with similar results. The sample matrix may be nonhomogeneous.
- X4a: RPD for duplicates outside advisory QC limits due to analyte concentration near the method practical quantitation limit/detection limit.
- X5: Matrix spike recovery was not determined due to the required dilution.
- X6: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Sample was re-analyzed with similar results.
- X7: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Matrix interference may be indicated based on acceptable blank spike recovery and/or RPD.
- X7a: Recovery and/or RPD values for this spiked analyte outside advisory QC limits due to high concentration of the analyte in the original sample.
- X8: Surrogate recovery was not determined due to the required dilution.
- X9: Surrogate recovery outside advisory QC limits due to matrix interference.



SOUND ANALYTICAL SERVICES, INC.

ANALYTICAL & ENVIRONMENTAL CHEMISTS

Creative Env.

4813 Pacific Hwy. East
Tacoma, Washington 98424

(253) 922-2310 • FAX (253) 922-5047

77614

CHAIN OF CUSTODY / REQUEST FOR LABORATORY ANALYSIS

CLIENT: <u>Aspen - Sealand</u>					ANALYSIS REQUESTED:																		
PROJECT NAME: <u>Aspen - Sealand</u>					# of Containers	Halogenated Volatiles EPA 601/8010	Aromatic Volatiles EPA 602/8020	Chlorinated Pest., PCB's EPA 608/8080	PAH's	Volatile Organics EPA 624/8240 (GC/MS)	Semi-volatiles EPA 625/8270 (GC/MS)	TPH 418.1	Oil & Grease	Total Metals (Specify below)	TCLP Extraction				WTPH-D Ext.	WTPH-G	VOA 8260	PCB 8082	TOTAL METALS ICP/DCP
CONTACT: <u>Steve Spencer</u>															8 Metals	Volatiles	Semi-volatiles	Pesticides & Herbicides					
PHONE NO: <u>(253)-627-3347</u>																							
LAB #	SAMPLE I.D.	DATE	TIME	MATRIX																			
1	S1-12798	12/7		soil	1											X		X	X	X			
2	S4-12798	12/7		soil	1											X	X						

CECA (P)

Signature	Printed Name	Firm	Time / Date	SPECIAL INSTRUCTIONS/COMMENTS: These samples will be disposed of 45 days after receipt . Check this box to have samples returned <input type="checkbox"/> . S1-12798 - excavation bottom S4-12798 - stockpile Normal turnaround
Retinquired By <u>[Signature]</u>	Fritz Carmine	CETI	12/8/98	
Received By <u>[Signature]</u>	Giceng	SAS	12/8/98	
Retinquired By				
Received By				
Received By				

51301

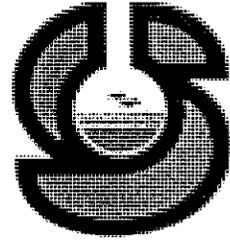
Sound Analytical Services, Inc.

ANALYTICAL & ENVIRONMENTAL CHEMISTS

4813 Pacific Hwy East • Tacoma, WA 98424

(253) 922-2310 • FAX (253) 922-5047

e-mail: SoundL@aol.com



TRANSMITTAL MEMORANDUM

DATE: January 8, 1999

TO: Steve Spencer
Creative Environmental Technology, Inc.
P. O. Box 1803
Tacoma, WA 98401

PROJECT: Sealand/Aspen

REPORT NUMBER: 77953

Enclosed are the test results for one sample received at Sound Analytical Services on December 22, 1998.

The report consists of this transmittal memo, analytical results, quality control reports, a copy of the chain-of-custody, a list of data qualifiers and analytical narrative when applicable, and a copy of any requested raw data.

Should there be any questions regarding this report, please contact me at (253) 922-2310.

Sincerely,

A handwritten signature in cursive script that reads "Katie Downie".

Katie Downie
Project Manager

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S3-122098
Lab ID:	77953-01
Date Received:	12/22/98
Date Prepared:	12/31/98
Date Analyzed:	1/1/99
% Solids	82.2
Dilution Factor	1

Volatile Organics by USEPA Method 5030/8260B Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
Dibromofluoromethane	111		79	122
Fluorobenzene	98		80	120
Toluene-d8	88		87	109
Ethylbenzene-d10	87		80	120
Bromofluorobenzene	104		74	131

Sample results are on a dry weight basis.

Analyte	Result (ug/kg)	PQL	MDL	Flags
Dichlorodifluoromethane	2200	470	13	
Chloromethane	ND	470	18	
Bromomethane	ND	470	12	
Vinyl Chloride	ND	470	14	
Chloroethane	ND	470	5.2	
Trichlorofluoromethane	ND	470	3.3	
1,1-Dichloroethene	1600	470	6.9	
Methylene Chloride	ND	470	13	
trans-1,2-Dichloroethene	ND	470	9.9	
1,1-Dichloroethane	9000	470	28	
2,2-Dichloropropane	ND	470	13	
cis-1,2-Dichloroethene	ND	470	16	
Bromochloromethane	ND	470	90	
Chloroform	ND	470	15	
1,1,1-Trichloroethane	470000	470	100	D
Carbon Tetrachloride	ND	470	69	
1,1-Dichloropropene	ND	470	9.8	
Benzene	1600	470	1500	
1,2-Dichloroethane	ND	470	23	
Trichloroethene	32000	470	1600	D
1,2-Dichloropropane	ND	470	18	
Dibromomethane	ND	470	12000	
Bromodichloromethane	ND	470	180	
cis-1,3-Dichloropropene	ND	470	12	
Toluene	16000	470	13	D
trans-1,3-Dichloropropene	ND	470	9	

SOUND ANALYTICAL SERVICES, INC.

Volatile Organics by USEPA Method 5030/8260B Modified data for 77953-01 continued...

Analyte	Result (ug/kg)	PQL	MDL	
1,1,2-Trichloroethane	ND	470	16	
Tetrachloroethene	ND	470	12	
1,3-Dichloropropane	ND	470	11	
Dibromochloromethane	ND	470	11	
1,2-Dibromoethane	ND	470	9.4	
Chlorobenzene	ND	470	11	
1,1,1,2-Tetrachloroethane	ND	470	14	
Ethylbenzene	7600	470	43	
m,p-Xylene	27000	940	15	D
o-Xylene	13000	470	12	D
Styrene	ND	470	8.9	
Bromoform	ND	470	14	
Isopropylbenzene	1500	470	5.7	
Bromobenzene	ND	470	12	
1,1,2,2-Tetrachloroethane	ND	470	12	
1,2,3-Trichloropropane	ND	470	23	
n-Propylbenzene	4500	470	7.4	
2-Chlorotoluene	ND	470	9.8	
4-Chlorotoluene	ND	470	7.8	
1,3,5-Trimethylbenzene	ND	470	6.5	
t-Butylbenzene	ND	470	9.4	
1,2,4-Trimethylbenzene	32000	470	8.8	D
sec-Butylbenzene	2300	470	8.7	
1,3-Dichlorobenzene	ND	470	8.4	
1,4-Dichlorobenzene	ND	470	9	
4-Isopropyltoluene	3500	470	22	
1,2-Dichlorobenzene	ND	470	15	
n-Butylbenzene	ND	470	11	
1,2-Dibromo-3-chloropropane	ND	470	17	
1,2,4-Trichlorobenzene	ND	470	21	
Hexachlorobutadiene	ND	470	13	
Naphthalene	30000	470	8.4	D
1,2,3-Trichlorobenzene	ND	470	130	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S3-122098
Lab ID:	77953-01
Date Received:	12/22/98
Date Prepared:	12/29/98
Date Analyzed:	12/29/98
% Solids	

PCBs by USEPA Method 8082

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
TCMX	82		39	138
Decachlorobiphenyl	88		49	125

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Aroclor 1016	ND	0.83	
Aroclor 1221	ND	0.83	
Aroclor 1232	ND	0.83	
Aroclor 1242	ND	0.83	
Aroclor 1248	ND	0.83	
Aroclor 1254	ND	0.83	
Aroclor 1260	ND	0.83	
Aroclor 1262	ND	0.83	
Aroclor 1268	ND	0.83	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S3-122098
Lab ID:	77953-01
Date Received:	12/22/98
Date Prepared:	12/28/98
Date Analyzed:	12/30/98
% Solids	100

Extended Diesel Range by WTPH-D Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
o-terphenyl	139		50	150

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Diesel (>nC12-nC24)	260000	21000	
Motor Oil (>nC24-nC32)	720000	42000	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S3-122098
Lab ID:	77953-01
Date Received:	12/22/98
Date Prepared:	12/28/98
Date Analyzed:	1/7/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Barium	700	1.5	
Chromium	130	3	
Lead	460	45	
Selenium	ND	240	
Silver	ND	3	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S3-122098
Lab ID:	77953-01
Date Received:	12/22/98
Date Prepared:	12/28/98
Date Analyzed:	12/30/98
Dilution Factor	5
% Solids	100

ICP-MS Metals by USEPA Method 6020

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	MDL	Flags
Arsenic	12	1.5	
Cadmium	31	0.74	

SOUND ANALYTICAL SERVICES, INC.

Client Name	Creative Environmental Technology, Inc.
Client ID:	S3-122098
Lab ID:	77953-01
Date Received:	12/22/98
Date Prepared:	12/29/98
Date Analyzed:	12/29/98
Dilution Factor	1
% Solids	100

Mercury by CVAA - USEPA Method 7471

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Mercury	ND	0.088	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - VOL992
Date Received:	-
Date Prepared:	12/31/98
Date Analyzed:	12/31/98
% Solids	
Dilution Factor	1

Volatile Organics by USEPA Method 5030/8260B Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
Dibromofluoromethane	105		79	122
Fluorobenzene	99		80	120
Toluene-d8	89		87	109
Ethylbenzene-d10	86		80	120
Bromofluorobenzene	97		74	131

Sample results are on an as received basis.

Analyte	Result (ug/kg)	PQL	MDL	Flags
Dichlorodifluoromethane	ND	400	11	
Chloromethane	ND	400	15	
Bromomethane	ND	400	10	
Vinyl Chloride	ND	400	12	
Chloroethane	ND	400	4.4	
Trichlorofluoromethane	ND	400	2.8	
1,1-Dichloroethene	ND	400	5.9	
Methylene Chloride	ND	400	11	
trans-1,2-Dichloroethene	ND	400	8.4	
1,1-Dichloroethane	ND	400	23	
2,2-Dichloropropane	ND	400	11	
cis-1,2-Dichloroethene	ND	400	14	
Bromochloromethane	ND	400	76	
Chloroform	ND	400	13	
1,1,1-Trichloroethane	ND	400	88	
Carbon Tetrachloride	ND	400	59	
1,1-Dichloropropene	ND	400	8.3	
Benzene	ND	400	1300	
1,2-Dichloroethane	ND	400	19	
Trichloroethene	ND	400	1300	
1,2-Dichloropropane	ND	400	16	
Dibromomethane	ND	400	10000	
Bromodichloromethane	ND	400	150	
cis-1,3-Dichloropropene	ND	400	10	
Toluene	ND	400	11	
trans-1,3-Dichloropropene	ND	400	7.6	

SOUND ANALYTICAL SERVICES, INC.

Blank Spike/Blank Spike Duplicate Report

Lab ID: VOL992
Date Prepared: 12/31/98
Date Analyzed: 12/31/98
QC Batch ID: VOL992

Volatile Organics by USEPA Method 5030/8260B Modified

Compound Name	Blank Result (ug/kg)	Spike Amount (ug/kg)	BS Result (ug/kg)	BS % Rec.	BSD Result (ug/kg)	BSD % Rec.	RPD	Flag
1,1-Dichloroethene	0	2000	2000	100	2130	106	5.8	
Benzene	0	2000	2030	102	2050	102	0	
Trichloroethene	0	2000	1830	91.5	1900	95	3.8	
Toluene	0	2000	1730	86.4	1630	81.3	-6.1	
Chlorobenzene	0	2000	1630	81.4	1620	81.1	-0.37	

SOUND ANALYTICAL SERVICES, INC.

Matrix Spike/Matrix Spike Duplicate Report

Client Sample ID: SS-1
Lab ID: 78031-01
Date Prepared: 12/31/98
Date Analyzed: 12/31/98
QC Batch ID: VOL992

Volatile Organics by USEPA Method 5030/8260B Modified

Compound Name	Sample Result (ug/kg)	Spike Amount (ug/kg)	MS Result (ug/kg)	MS % Rec.	MSD Result (ug/kg)	MSD % Rec.	RPD	Flag
1,1-Dichloroethene	0	3340	2240	67.1	2150	64.4	-4.1	
Benzene	0	3340	2140	64	2140	64.3	0.47	
Trichloroethene	0	3340	1830	54.7	1840	55.4	1.3	X7
Toluene	810	3340	2120	39.3	2460	49.5	23	X7
Chlorobenzene	0	3340	1480	44.4	1600	48.1	8	X7

SOUND ANALYTICAL SERVICES, INC.

Lab ID: Method Blank - PCBC80
Date Received: -
Date Prepared: 12/29/98
Date Analyzed: 12/29/98
% Solids

PCBs by USEPA Method 8082

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
TCMX	83		39	138
Decachlorobiphenyl	100		49	125

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Aroclor 1016	ND	0.88	
Aroclor 1221	ND	0.88	
Aroclor 1232	ND	0.88	
Aroclor 1242	ND	0.88	
Aroclor 1248	ND	0.88	
Aroclor 1254	ND	0.88	
Aroclor 1260	ND	0.88	
Aroclor 1262	ND	0.88	
Aroclor 1268	ND	0.88	

SOUND ANALYTICAL SERVICES, INC.

Blank Spike/Blank Spike Duplicate Report

Lab ID: PCBC80
Date Prepared: 12/29/98
Date Analyzed: 12/29/98
QC Batch ID: PCBC80

PCBs by USEPA Method 8082

Compound Name	Blank Result (mg/kg)	Spike Amount (mg/kg)	BS Result (mg/kg)	BS % Rec.	BSD Result (mg/kg)	BSD % Rec.	RPD	Flag
Aroclor 1260	0	9.92	7.64	77	7.44	78	1.3	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - DI1862
Date Received:	-
Date Prepared:	12/28/98
Date Analyzed:	12/29/98
% Solids	100

Extended Diesel Range by WTPH-D Modified

Surrogate	% Recovery	Flags	Recovery Limits	
			Low	High
o-terphenyl	126		50	150

Sample results are on a dry weight basis.

Analyte	Result (mg/kg)	PQL	Flags
Diesel (>nC12-nC24)	ND	5000	
Motor Oil (>nC24-nC32)	ND	10000	

SOUND ANALYTICAL SERVICES, INC.

Blank Spike/Blank Spike Duplicate Report

Lab ID: DI1862
Date Prepared: 12/28/98
Date Analyzed: 12/29/98
QC Batch ID: DI1862

Extended Diesel Range by WTPH-D Modified

Compound Name	Blank Result (mg/kg)	Spike Amount (mg/kg)	BS Result (mg/kg)	BS % Rec.	BSD Result (mg/kg)	BSD % Rec.	RPD	Flag
Diesel (>nC12-nC24)	0	50200	53600	107	56800	113	5.5	
Motor Oil (>nC24-nC32)	0	50000	53000	106	54200	108	1.9	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/28/98
Date Analyzed: 12/30/98
QC Batch ID: DI1862

Extended Diesel Range by WTPH-D Modified

Parameter Name	Sample	Duplicate	RPD	Flag
	Result	Result		
Diesel (>nC12-nC24)	(mg/kg) 260000	(mg/kg) 290000	% -11.0	
Motor Oil (>nC24-nC32)	(mg/kg) 720000	(mg/kg) 810000	% -12.0	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - M299
Date Received:	-
Date Prepared:	12/28/98
Date Analyzed:	1/7/99
Dilution Factor	1

Metals by ICP - USEPA Method 6010

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Barium	ND	1	
Chromium	ND	2	
Lead	ND	30	
Selenium	ND	160	
Silver	ND	2	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/28/98
Date Analyzed: 1/7/99
QC Batch ID: M299

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Barium	700	510	31.0	
Chromium	130	92	34.0	
Lead	460	400	14.0	
Selenium	0	0	NC	
Silver	0	0	NC	

SOUND ANALYTICAL SERVICES, INC.

Matrix Spike Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/28/98
Date Analyzed: 1/7/99
QC Batch ID: M299

Metals by ICP - USEPA Method 6010

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Barium	700	1120	1740	93	
Chromium	130	112	223	83	
Lead	460	280	677	78	
Selenium	0	1120	1030	92	
Silver	0	559	502	90	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - M299
Date Received:	-
Date Prepared:	12/28/98
Date Analyzed:	12/30/98
Dilution Factor:	1

ICP-MS Metals by USEPA Method 6020

Sample results are on an as received basis.

Analyte	Result (mg/kg)	MDL	Flags
Arsenic	ND	0.33	
Cadmium	ND	0.17	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/28/98
Date Analyzed: 12/30/98
QC Batch ID: M299

ICP-MS Metals by USEPA Method 6020

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Arsenic	12	9.4	24.0	
Cadmium	31	22	34.0	X4

SOUND ANALYTICAL SERVICES, INC.

Matrix Spike Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/28/98
Date Analyzed: 12/30/98
QC Batch ID: M299

ICP-MS Metals by USEPA Method 6020

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Arsenic	11.8	67	67.7	83	
Cadmium	31	67	84.1	80	

SOUND ANALYTICAL SERVICES, INC.

Lab ID:	Method Blank - S169
Date Received:	-
Date Prepared:	12/29/98
Date Analyzed:	12/29/98
Dilution Factor:	1

Mercury by CVAA - USEPA Method 7471

Sample results are on an as received basis.

Analyte	Result (mg/kg)	PQL	Flags
Mercury	ND	0.1	

SOUND ANALYTICAL SERVICES, INC.

Duplicate Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/29/98
Date Analyzed: 12/29/98
QC Batch ID: S169

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	Duplicate Result (mg/kg)	RPD %	Flag
Mercury	0	0	NC	

SOUND ANALYTICAL SERVICES, INC.

Matrix Spike Report

Client Sample ID: S3-122098
Lab ID: 77953-01
Date Prepared: 12/29/98
Date Analyzed: 12/29/98
QC Batch ID: S169

Mercury by CVAA - USEPA Method 7471

Parameter Name	Sample Result (mg/kg)	Spike Amount (mg/kg)	MS Result (mg/kg)	MS % Rec.	Flag
Mercury	0	0.885	0.973	110	

SOUND ANALYTICAL SERVICES, INC.

ANALYTICAL & ENVIRONMENTAL CHEMISTS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE: (253) 922-2310 - FAX: (253) 922-5047

DATA QUALIFIERS AND ABBREVIATIONS

- B1: This analyte was detected in the associated method blank. The analyte concentration was determined not to be significantly higher than the associated method blank (less than ten times the concentration reported in the blank).
- B2: This analyte was detected in the associated method blank. The analyte concentration in the sample was determined to be significantly higher than the method blank (greater than ten times the concentration reported in the blank).
- C1: Second column confirmation was performed. The relative percent difference value (RPD) between the results on the two columns was evaluated and determined to be $\leq 40\%$.
- C2: Second column confirmation was performed. The RPD between the results on the two columns was evaluated and determined to be $> 40\%$. The higher result was reported unless anomalies were noted.
- M: GC/MS confirmation was performed. The result derived from the original analysis was reported.
- D: The reported result for this analyte was calculated based on a secondary dilution factor.
- E: The concentration of this analyte exceeded the instrument calibration range and should be considered an estimated quantity.
- J: The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.
- MCL: Maximum Contaminant Level
- L: Method Detection Limit
- N: See analytical narrative.
- ND: Not Detected
- PQL: Practical Quantitation Limit
- X1: Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____.
- X2: Contaminant does not appear to be "typical" product.
- X3: Identification and quantitation of the analyte or surrogate was complicated by matrix interference.
- X4: RPD for duplicates was outside advisory QC limits. The sample was re-analyzed with similar results. The sample matrix may be nonhomogeneous.
- X4a: RPD for duplicates outside advisory QC limits due to analyte concentration near the method practical quantitation limit/detection limit.
- X5: Matrix spike recovery was not determined due to the required dilution.
- X6: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Sample was re-analyzed with similar results.
- X7: Recovery and/or RPD values for matrix spike(/matrix spike duplicate) outside advisory QC limits. Matrix interference may be indicated based on acceptable blank spike recovery and/or RPD.
- X7a: Recovery and/or RPD values for this spiked analyte outside advisory QC limits due to high concentration of the analyte in the original sample.
- Surrogate recovery was not determined due to the required dilution.
- X9: Surrogate recovery outside advisory QC limits due to matrix interference.



UNDERGROUND STORAGE TANK Closure and Site Assessment Notice

See back of form for instructions

SW 100639
U11276

FOR OFFICE USE ONLY

Site ID # _____

Owner ID # 620-381-910

Please the appropriate box(es)

Temporary Tank Closure Change-In-Service Permanent Tank Closure Site Check/Site Assessment

Site Information

Owner Information

(This form will be returned to this address)

Site ID Number T-17 (Available from Ecology if the tanks are registered) UST Owner/Operator Sea-Land Service Inc

Site/Business Name Sea-Land Service Inc Mailing Address 3600 Port of Tacoma Rd
Street

Site Address 1675 LINCOLN AVE P.O. Box _____
Street

City/State Tacoma, WA City/State Tacoma WA

Zip Code 98421 Telephone (253) 593 1457 Zip Code 98424 Telephone (253) 593 1457

Owner's Signature _____

Tank Closure/Change-In-Service Company

Service Company NORTHWEST TANK & ENVIRONMENTAL SERVICES

Certified Supervisor Remy CANO Decommissioning Certification No. 1062880-26

Supervisor's Signature Ry Co

Address 1720 100th Pl SE, SUITE 101
Street

EVERETT WA P.O. Box 9020B Telephone (425) 742-9622
City State Zip Code

Site Check/Site Assessor

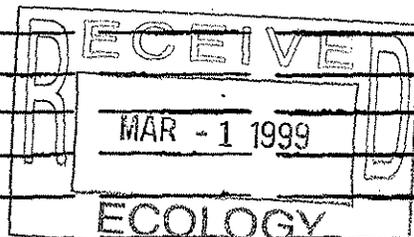
Certified Site Assessor CREATIVE ENVIRO. TECH., INC., STEPHEN M. SPENCER

Address Street _____ P.O. Box 1803

City TACOMA State WA Zip Code 98401 Telephone (253) 627-3347

Tank Information

Tank ID	Closure Date	Closure Method	Tank Capacity	Substance Stored
<u>T-17</u>	<u>12/4/98</u>	<u>REMOVE</u>	<u>3000</u>	<u>Waste oil</u>



Contamination Present at the Time of Closure

Yes No Unknown

Check unknown if no obvious contamination was observed and sample results have not yet been received from analytical lab.

Yes No

If contamination is present, has the release been reported to the appropriate regional office?



UNDERGROUND STORAGE TANK Site Check / Site Assessment Checklist

SW FOR OFFICE USE ONLY JS	
Site #:	100639
Owner #:	U11276

INSTRUCTIONS

When a release has not been confirmed and reported, this Site Check/Site Assessment Checklist must be completed and signed by a person certified by IFCI or a Washington registered professional engineer who is competent, by means of examination, experience, or education, to perform site assessments. **The results of the site check or site assessment must be included with this checklist.** This form must be submitted to Ecology at the address shown below within 30 days after completion of the site check/site assessment.

SITE INFORMATION: Include the Ecology site ID number if the tanks are registered with Ecology. This number may be found on the tank owner's invoice or tank permit.

TANK INFORMATION: Please list all tanks for which the site check or site assessment is being conducted. Use the owner's tank ID numbers if available, and indicate tank capacity and substance stored.

REASON FOR CONDUCTING SITE CHECK/SITE ASSESSEMENT: Please check the appropriate item.

CHECKLIST: Please initial each item in the appropriate box.

SITE ASSESSOR INFORMATION: This form must be signed by the registered site assessor who is responsible for conducting the site check/site assessment.

Underground Storage Tank Section
Department of Ecology
PO Box 47655
Olympia WA 98504-7655

SITE INFORMATION

Site ID Number (Available from Ecology if the tanks are registered): T-17

Site/Business Name: SEA-LAND SERVICES, INC

Site Address: 1675 LINCOLN AVENUE Telephone: (253) 593-1457

Taloma WA 98421

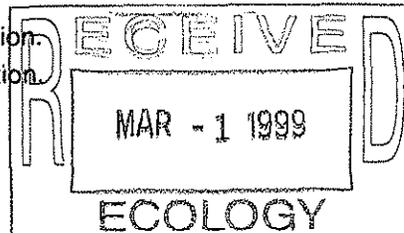
City Street State Zip Code

TANK INFORMATION

Tank ID No.	Tank Capacity	Substance Stored
<u>T-17</u>	<u>3,000</u>	<u>WASTE OIL</u>

REASON FOR CONDUCTING SITE CHECK / SITE ASSESSEMENT

- Check one:
- Investigate suspected release due to on-site environmental contamination.
 - Investigate suspected release due to off-site environmental contamination.
 - Extend temporary closure of UST system for more than 12 months.
 - UST system undergoing change-in-service.
 - UST system permanently closed-in service.
 - UST system permanently closed with tank removed.
 - Abandoned tank containing product.
 - Required by Ecology or delegated agency for UST system closed before 12/22/88.
 - Other (describe): _____



Marine Vacuum Service, Inc.

A WASHINGTON ENVIRONMENTAL COMPANY

MARINE AND INDUSTRIAL CLEANING

TANK REMOVAL

P.O. Box 24263 Seattle, Washington 98124

Telephone (206) 762-0240

FAX (206) 763-8084

1-800-540-7491

CERTIFICATE OF UST DESTRUCTION

DATE: February 19, 1999

METAL RECLAIMING FACILITY:

Seattle Iron & Metal
Harbor Island
Seattle, Wa.

DISPOSAL FACILITY:

Marine Vacuum Service
1516 South Graham St.
Seattle, Wa. 98108

TANK REMOVAL CONTRACTOR:

Northwest Tank & Environmental
1720 100TH PL, S.E.
Suite 101
Everett, Wa 98101

TANK IDENTIFICATION:

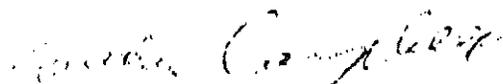
TANK OWNER: SeaLand

TANK LOCATION: Seattle, Washington

TANK CAPACITY: 1 - 3,000 Gallon Tank

DESTRUCTION DATE: 01/22/99

Marine Vacuum Service, Inc. certifies that the above described tank(s) have been rendered unusable for the storage of any fluids, and all removed fluids, sludges, and the tank(s) were disposed of in accordance with all applicable Local, State and Federal regulations.



Representative
Marine Vacuum Service

DISE # D4M1302341

EPA # WAD980974521

A MINORITY BUSINESS ENTERPRISE ID # D4M1302341



December 07, 1998

1720 100th Pl. S.E.

Suite 101

Everett, WA 98208

(425) 742-9622

FAX: (425) 338-9749

TOLL FREE:

1-800-742-9620

Maintenance 24 hours:

(425) 379-8735

Toxics Cleanup Program
Department of Ecology
P.O. Box 47655
Olympia, WA. 98504-7655

Attn: Environmental Specialist

RE: UBI #600-581-910, Tank I.D. # T-17

To whom it may concern,

The following is letter to accompany a closure and assessment checklist for the site listed above. Its intent is to notify your Department of an ongoing characterization of the soils surrounding the 3,000 gallon waste oil tank that was removed on December, 7, 1998. There are some investigative steps being taken by the Owner, (Sealand Services), the Environmental consultant (CETT) and Pierce County Health Department, to verify the source of contamination encountered in the excavation pit of the removed waste oil tank.

Upon removal the tank was noted in excellent condition, associated piping was not leaking and there were no signs of overfill or spillage at the fill point. However, the immediate area surrounding the UST has signs of petroleum impacted soils that has been sampled to determine if the contamination is related to the substance stored in the UST. Furthermore, an objective of the investigation will be to determine if the contamination present is related to historical contamination or to a cleanup site located directly adjacent to the Sealand Property.

It has been concluded that the source of the contamination found is not related to the two (2) other storage tanks that are located on Sealand property which are registered as T-15 and T-16. These tanks have been recently upgraded and are monitored continuously by a Veeder-Root tank monitor system.

It is also important that tanks T-15 and T-16 are tagged appropriately to show that they have satisfied the upgrading requirements of 1998. All the appropriate paperwork has been submitted and the site is eager to receive the tags.

If you have any questions, please contact me personally at (425) 742-9622.

Thank You,

Remy Cano
President, NWTES

Tank and Line Testing

Maintenance

Vapor Recovery

Petroleum Piping

Cathodic Protection



UNDERGROUND STORAGE TANK 30 DAY NOTICE

FOR OFFICE USE ONLY
Site ID #:
Owner ID #:
Office validated by Ecology, this form serves as your temporary permit for the tanks listed below.

See back of form for instructions

Please ✓ the appropriate box: Intent to Install Intent to Close Both

Site Information

Site ID Number _____
(Available from Ecology if the tanks are registered)
 Site/Business Name SEA LAND SERVICES
 Site Address 3600 Port of Tacoma Rd
 City/State TACOMA, WA
 Zip Code 98424 Telephone (206) 593-1596

Owner Information ATTN: GUY BUZZON

(This form will be returned to this address)

UST Owner/Operator SEA LAND SERVICES
 Mailing Address 6000 Carnegie Boulevard
 City/State Charlotte, NC
 Zip Code 28209 Telephone (704) 571-2121

Tank Installation Company (if known). Fill out this section ONLY if tanks are being installed.

Service Company NORTHWEST TANK & ENVIRO. SVCS Contact Name Remy Cano
 Address 12720 4th Ave W. STE F406
 City Everett State WA P.O. Box _____ Telephone (425) 742-9622
 Zip Code _____

Tank Permanent Closure Company (if known). Fill out this section ONLY if tanks are being closed.

Service Company NORTHWEST TANK & ENVIRO Contact Name Remy Cano
 Address 12720 4th Ave W. STE F406
 City Everett State WA Zip Code 98204 Telephone (425) 742-9622

Tank Closure Information

Fill out this section ONLY if tanks are being closed.

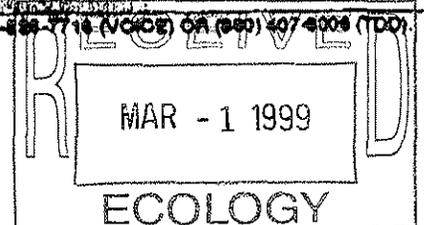
Tank Installation Information

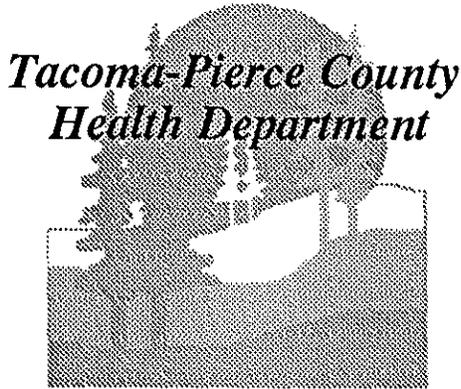
Fill out this section ONLY if tanks are being installed.

Tank ID #	Proposed Closure Date	Tank Capacity	Estimated Spill	Date Tank Last Used	Is Tank Present in Site (Y/N)	Is No. Date Tank Was Removed
?? #3	6/1/98	3000	1000	11/1986	Y	N/A

Tank ID	Approx. Install Date

To receive this document in an alternative format, contact the TOXICS CLEANUP PROGRAM at 1-800-828-7714 (VOICE) OR (800) 407-6008 (TDD).
 ECV 020-88 (Rev. 8/95)



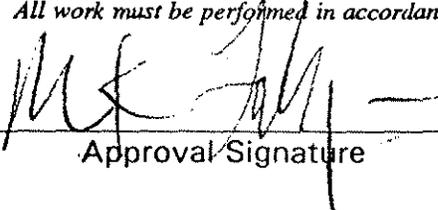


Permit # 98-111

UNDERGROUND STORAGE TANK REMOVAL PERMIT
Tacoma-Pierce County Health Department (TPCHD)

Site Location 3600 Port of Tacoma Rd.
Facility Name Sealand Services
Removal Firm Aspen Environmental
Number of Tanks to be Removed 1 3000 gal waste oil

All work must be performed in accordance with current laws, ordinances, resolutions and rules and regulations.


Approval Signature

VALIDATION:

TPCHD
Permit #
Date
Site
Status

Permit must be accessible at site - DO NOT ALTER OR DEFACE
Expires 180 days from validation date.
Forty-eight (48) hour notice must be provided to the TPCHD prior to removal/abandonment.
Site assessment report for TPCHD due 90 days after removal.



TACOMA-PIERCE COUNTY HEALTH DEPARTMENT
SOURCE PROTECTION PROGRAMS

3629 South D Street
Tacoma, WA 98408
(253)-798-6470

CONTENT AND FORM REQUIREMENTS FOR
UNDERGROUND STORAGE TANK
SITE ASSESSMENT/TANK CLOSURE REPORTS

The following are the minimum requirements for the content and form required for all underground storage tank site assessment/closure reports submitted to the Tacoma-Pierce County Health Department. Reports that do not meet these minimum requirements will be rejected. Additional requirements may be issued, depending on the technical nature of the site being assessed.

NOTE: Site assessment/closure reports must be submitted within 90 days of the completion of tank closure. If extended remediation is required, an additional fee to review reports may be charged.

1. Site diagram:
 - Provide information for the exact location of the UST(s) in relation to buildings, property lines, utilities, other structures, other USTs, etc.
 - Provide location of pump islands and tank piping
2. UST information:
 - List the dimension/size of UST(s).
 - State the type of UST(s) (e.g. single wall steel, fiberglass, etc.)
 - Describe the observed condition of UST(s).
 - List the age of UST(s).
3. Piping and pump information:
 - Describe type of piping and pumps.
4. Geological information:
 - Describe types of soil and/or UST bedding material in the pit.
 - Describe the proximity of the excavation to ground water and/or surface water.
5. Sample location diagram:
 - Provide dimensions of UST excavation.
 - Indicate exact location of all samples, including
 - Provide information on field instrument reading and odors noted.
6. Sampling procedures:
 - Indicate sampling method (e.g. backhoe, hand tool, etc.).
 - Indicate the type of samples (e.g. composite, discrete, etc.).
7. Provide name and address of analytical laboratory.
8. Provide table of analytical results, combined with a discussion of the significance of the data. Include analytical methods used. Attach copies of lab reports.
9. Provide receipts for the disposal of the UST(s) and piping
10. Specify if the excavation was backfilled and/or the disposition of the excavated soils.
11. Conclusions/Recommendations:
 - The report must include conclusions and recommendations of any further action needed.
12. Report should be written so it can stand alone. Department of Ecology's checklist should be included as enclosures. Additional enclosures required to be submitted include: pumping receipts, waste material analysis, tank cleaning/destruction certificates, copies of fire department permits and contaminated soil disposal receipts.

UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT

Sea-Land Container Terminal

1675 Lincoln Avenue

Tacoma, Washington

Appendix C - Correspondence



Federico Cruz-Uribe, MD, MPH
Director of Health

Governed by a local
Board of Health

- Community Based
- Competitive
- Integrated
- Preventive

♻️ Printed on 100% recycled paper
3629 South D Street
Tacoma WA 98408-6897

253/798-6500
TDD: 798-6050
800/992-2456

www.healthdept.co.pierce.wa.us

December 7, 1998

Guy Buzzoni
Sealand services, Inc
6000 Carnegie Blvd
Charlott, NC 27270

Dear Mr. Buzzoni:

This letter is to provide you with a copy of the Underground Storage Tank (UST) removal permit for tank(s) located at 3600 Port of Tacoma Road (enclosed). In addition, please find enclosed the requirements for site assessments and site closure reports to be completed upon UST removal. A site assessment report is due within ninety (90) days of UST removal.

As owner or operator of this facility, you are responsible to demonstrate that no contamination has occurred at this site (Pierce County Code Chapter 8.34; City of Tacoma Code Chapter 5.47) to the satisfaction of the Tacoma-Pierce County Health Department (TPCHD). Any cleanup or remediation at this property must be conducted in accordance with the Model Toxics Control Act Cleanup Regulation, WAC 173-340, and work plans approved by the TPCHD.

If you have any questions regarding the UST removal or remediation process, please contact the Source Protection Programs at 798-6470.

Sincerely,

Mark LaVergne
Environmental Health Specialist I
Source Protection Programs

Enclosures

FILE

CREATIVE ENVIRONMENTAL TECHNOLOGIES, INC.

PROVIDING ENVIRONMENTAL SERVICES TO THE NORTHWEST FOR 15 YEARS

January 6, 1999

SeaLand Services
Terminal Operations Services
Attn: Mr. Guy Buzzoni
6000 Carnegie Blvd.
Charlotte, N.C. 28209

Re: Tacoma Site

Dear Guy:

Please accept this as our proposal to accomplish the following work.

Collect maps, photograph and other evidence of activities that may have caused spills or releases of product that may have impacted the SeaLand Tacoma site.

Review any available environmental report concerning the site or any site that may have impacted the SeaLand site.

Perform a modified level II examination on the site to determine the extent of the contaminate, with the special emphasis on the origin or source of the release.

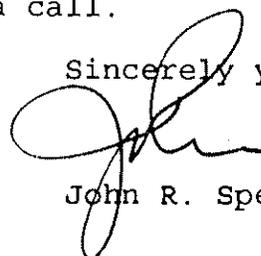
We will use a GeoProb™ to advance a 2" probe to groundwater levels taking samples of the soils in the vadose zone, at the soil/water interface and groundwater. We will field screen the samples as we take them, and use our best judgement as to the need to use laboratory analyses for confirmation. Since we are only looking for the contaminate plume, we do not feel it necessary to run each sample through the lab.

We will prepare a report with appropriate diagrams and plots to show the plume, and from the results of our investigation, will make our opinion as the nature, extent and source known. We will document our findings with appropriate evidence.

Our fee for this work will be on a time and material basis. However, we have set out a budget attached which will not be exceeded without specific permission from SeaLand.

We appreciate the opportunity to work for SeaLand. If you have questions, please give me a call.

Sincerely yours,



John R. Spencer

SeaLand:

Professional	Time	Rate	Amount	
Hydrologist	2 hr	75/hr	150	Prepare sampling plan, site specific health and safety plan, prep mob and administrative activities
Hydro/Sci	18 hr	75/hr	1,350	Mob on site with GeoProbe™ with driller, hydrogeologist and environmental technician. Advance 10 holes, sample and prepare samples for field screening. Composite or otherwise prepare samples for laboratory work De-mob cleanup.
Tech II	18 hr	55/hr	990	
Tech I	10 hr	65/hr	650	Acquire and review Sanborne and other maps and documents to determine historical activities on the site and surrounding sites that may have impacted the SeaLand site with diesel product in the subsurface.
Hydro/Sci	6 hr	75/hr	450	Receive and evaluate the results of the investigation. Prepare a summary report with opinions as to the nature, extent and source of the contaminate found in the subsurface of the SeaLand site. Principal is responsible for all work and will review the final product as well as interface with the Port for information gathering
Principal	4 hr	125	500	
Professional	Budget		4,090	
			3,600	GeoProbe™ two days @ \$1,800 per day with driller and support equipment
			750	Analytical Assume 10 samples TPH extended @75 \$750 total
			300	Field Sampling kit and PID in field \$300
			250	Health & Safety, service vehicle, \$250
Total Budget			8,890 ¹	

¹. Use of a backhoe will reduce the cost by approximately 2,600. However, repaving will be at the cost of the client and subject to the availability of asphalt plants being open. Weather providing, the project in the field may be done in one day. If so, reduce accordingly.

CREATIVE ENVIRONMENTAL TECHNOLOGIES, INC.

PROVIDING ENVIRONMENTAL SERVICES TO THE NORTHWEST FOR 15 YEARS

January 6, 1999

SeaLand Services
Terminal Operations Services
Attn: Mr. Guy Buzzoni
6000 Carnegie Blvd.
Charlotte, N.C. 28209

Re: Tacoma Site

Dear Guy:

Attached you will find copies of the analytical from the samples from the tank pull along with some pictures showing the oil in the excavation. You will also find a fax copy of the analytical of the oil in the tank.

The groundwater shows up on the photos quite well with the oil showing brown. The original telephonic results of the oil in the tank were not correct, After I saw the chromatigraph, it was apparent there was some diesel in the sample. The actual results indicated 20% diesel and 70% oil.

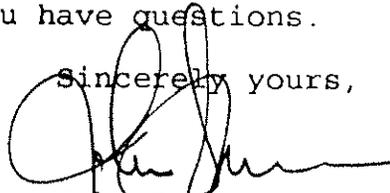
Since the tank seemed to be tight according to Remy Cano's report of December 7, 1998, there was no apparent reason for us to find product from that tank in the ground to the level we found.

It is still my opinion that there is a source other than SeaLand's waste oil tank. My belief remains that it may come from the other parcel. Based on this, and according to your fax, you will find attached our proposal to accomplish some additional testing, and gathering of information as to possible sources.

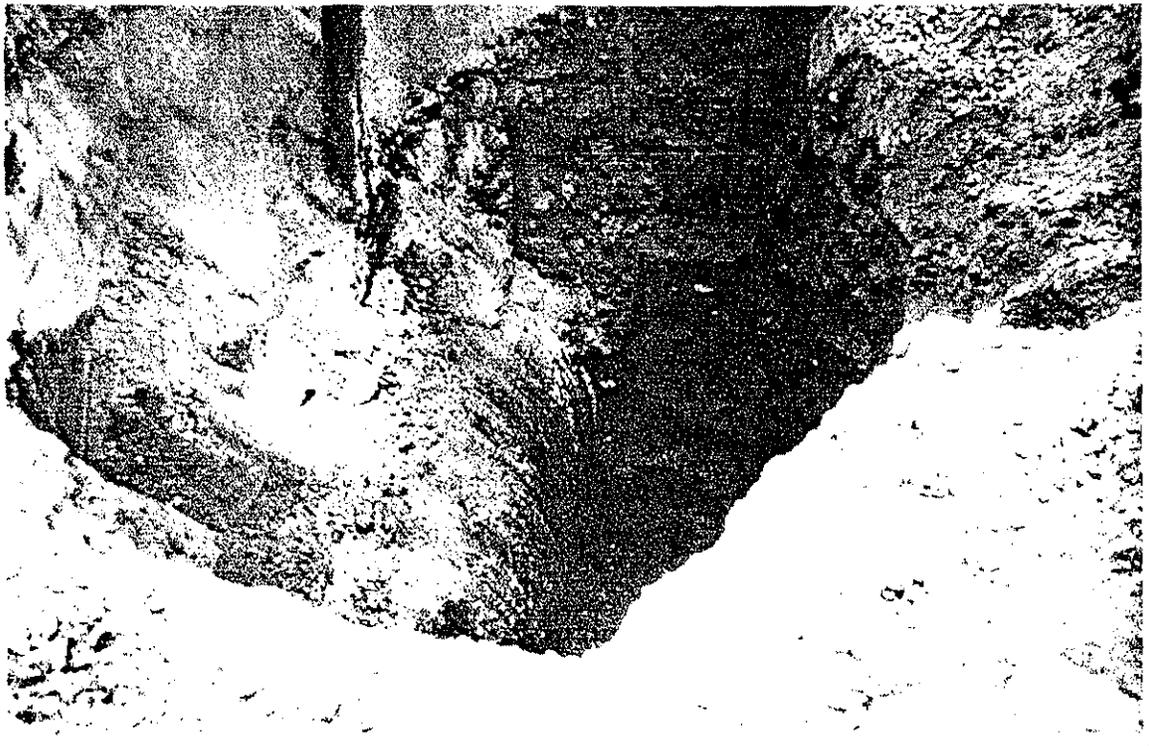
In anticipation of the further examination (and the fact that we had a chance to get the machine early), we have scheduled a GeoProb™ for additional testing for the 18th and 19th of January. If the weather holds up, we can probably finish the field work in one day, however we did budget two. If we need to reschedule, we need to know as soon as possible since the GeoProb™ is scheduled weeks in advance.

Please give me a ring if you have questions.

Sincerely yours,



John R. Spencer



Oil On Groundwater In Underground Storage Tank Excavation



Oil On Groundwater In Underground Storage Tank Excavation

Photographs Taken On December 7, 1998
During The removal Of A Waste Oil
Underground Storage Tank Located On The
South Side Of Building C.

Sealand Site
1675 Lincoln Avenue
Port Of Tacoma
Tacoma, Washington



December 07, 1998

1720 100th Pl. S.E.
Suite 101
Everett, WA 98208
(425) 742-9622
FAX: (425) 338-9749
TOLL FREE:
1-800-742-9620
Maintenance 24 hours:
(425) 379-8735

Toxics Cleanup Program
Department of Ecology
P.O. Box 47655
Olympia, WA. 98504-7655

Attn: Environmental Specialist

RE: UBI #600-581-910, Tank I.D. # T-17

To whom it may concern,

The following is letter to accompany a closure and assessment checklist for the site listed above. Its intent is to notify your Department of an ongoing characterization of the soils surrounding the 3,000 gallon waste oil tank that was removed on December, 7, 1998. There are some investigative steps being taken by the Owner, (Sealand Services), the Environmental consultant (CETI) and Pierce County Health Department, to verify the source of contamination encountered in the excavation pit of the removed waste oil tank.

Upon removal the tank was noted in excellent condition, associated piping was not leaking and there were no signs of overfill or spillage at the fill point. However, the immediate area surrounding the UST has signs of petroleum impacted soils that has been sampled to determine if the contamination is related to the substance stored in the UST. Furthermore, an objective of the investigation will be to determine if the contamination present is related to historical contamination or to a cleanup site located directly adjacent to the Sealand Property.

It has been concluded that the source of the contamination found is not related to the two (2) other storage tanks that are located on Sealand property which are registered as T-15 and T-16. These tanks have been recently upgraded and are monitored continuously by a Veeder-Root tank monitor system.

It is also important that tanks T-15 and T-16 are tagged appropriately to show that they have satisfied the upgrading requirements of 1998. All the appropriate paperwork has been submitted and the site is eager to receive the tags.

If you have any questions, please contact me personally at (425) 742-9622.

Thank You,

Remy Cano
President, NWTES

Tank and Line Testing
Maintenance
Vapor Recovery
Petroleum Piping
Cathodic Protection

SeaLand

Sea-Land Service, Inc.
6000 Carnegie Boulevard, Charlotte, NC 28209-4637

FAX

Date: February 2, 1999

No. of pages: **3**
(including cover sheet)

To: **JOHN SPENCER**
Location: **CETI**

Fax: **253.572.4207**
Phone: **253.627.3347**

From: **GUY BUZZONI**
Terminal Operations
Services
Fax: **704.571.4677**
Phone: **704.571.2121**

Name:	Location:	Fax:
cc: REMY CANO	Northwest Tank	425.338.9749

RE: **NEXT STEPS FOR REMOVAL OF 3,000 GALLON WASTE OIL UST
UST Work, Tacoma, Washington**

206-762-0240

John,

Thank you for your January 6th, 1999 proposal to continue site assessment work related to removal of the above referenced waste oil UST.

ENCLOSURES

Met with the Port of Tacoma during the week of January 22nd to review their record files. Sending you the following information via Airborne Express:

1. Letter to Sea-Land from the Tacoma-Pierce County Health Department, dated December 7th, 1998
2. 3 page UST Closure Observation / Sample Results Summary compiled by Sea-Land, dated January 25th, 1999
3. Portion of drawing titled "Location Plan & Phasing Plan", prepared by ABAM Engineering, dated 5-30-84, Scale enlarged to 1 inch = 200 feet

4. Figure 3, titled "Site Plan – Parcel A, UPRR/Port of Tacoma", prepared by Applied Geotechnology, dated June 22nd, 1990, Scale 1 inch = 200 feet
5. Summary of History of adjacent property leased to Sea-Land, prepared by the Port of Tacoma, undated.
6. 1 copy of report titled "Subsurface Exploration and Geotechnical Engineering Study, Marine Yard and CFS Area, Port of Tacoma, Washington", prepared by Hart Crowser & Associates, dated November 4, 1983.
7. Overlay plan of enclosure 3 with transparencies of enclosures 4 and enlarged Figure 2 of enclosure 6 compiled by Sea-Land

NEXT STEPS

At this time, would like to proceed as follows:

Do not want to continue with further field investigation of the above referenced UST removal.

Instead, the site assessment report for removal of the UST should be completed based on well-documented field observations, site photographs, sample results, laboratory test data, and additional review of record documentation enclosed. The report would be prepared for submission to the County Department of Health in response to their letter, enclosure 1.

Conclusions of the report would be written to:

1. support no further action by Sea-Land (tenant to the property owner) is required under the County Department of Health's jurisdiction of the UST program.
2. recommend continued action by the Port of Tacoma (landlord and property owner) under the State Department of Ecology jurisdiction.

Anticipate preparing DRAFT report with several review and comment iterations prior to submission to County Department of Health:

- two of DRAFT report reviews by Sea-Land
- one DRAFT report review by the Port of Tacoma
- submission of final report to Department of Health
- if Port of Tacoma agrees with DRAFT report, then Port of Tacoma will re-file notice of release with the Department of Ecology and follow-up accordingly.

These conclusions would be supported by observations during UST removal and samples results during UST removal obtained thus far.

John Spencer
February 2, 1999
Page 3 of 3

Additional review of record documentation further supports these conclusions:

- A. There was a former 1.25 million gallon diesel AST located at the former location of the 3,000 gallon waste oil UST.
- B. This 1.25 million gallon diesel AST was acquired with the property by the Port of Tacoma in 1979.
- C. The Port of Tacoma demolished this 1.25 million gallon diesel AST and associated product piping in 1981.
- D. The Port of Tacoma did not provide any documentation regarding location of product piping removed, nor location of potential contamination encountered during demolition of the 1.25 million gallon diesel AST.
- E. Test Pit TP-20 excavated at the location of the former 3,000 gallon waste oil UST in 1983 noted "strong fuel odor" between depth of 6 to 10.5 feet.

Please review this information and provide comments. Do you agree / disagree with the approach? Also, when will the first DRAFT report be available?

UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT
Sea-Land Container Terminal
1675 Lincoln Avenue
Tacoma, Washington

Attachment 1 - UST Closure Observation / Sample results

UST Closure Observation / Sample Results

25-Jan-99

UST Characteristics:

3,000-gallon waste oil
Single-wall steel
Installed around 1984
Removed December 7, 1998

Observations During UST Removal:

UST was in excellent condition.
Associated piping was not leaking
No signs of overfill or spillage at the fill port.
Immediate area surrounding the UST had signs of petroleum-impacted soil.
Free product was observed on surface of groundwater at bottom of excavation.

Samples During UST Removal:

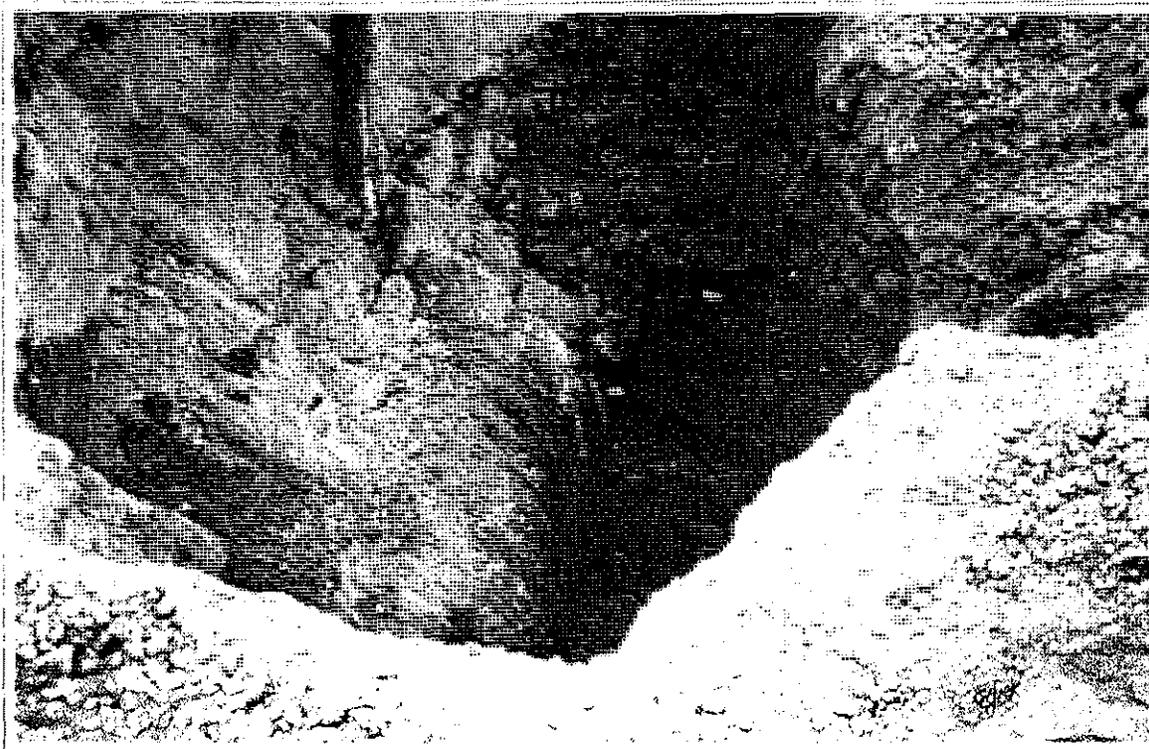
Sample	Location	Results*	
		Diesel (mg/kg)	Gasoline (mg/kg)
S-1	Post-Excavation - Bottom of UST	6,600	370
		95%	5%
S-4	Post-Excavation - Sidewall of UST	190	140
		58%	42%
S-3	UST Sludge	260,000	720,000
		27%	73%

Note * Extended Diesel Range by WTPH-D Modified Method

Potential Conclusions To This Point:

There is not apparent reason to find product from this former UST in the ground to the level encountered.

There is a potential source of the product encountered other than this UST.

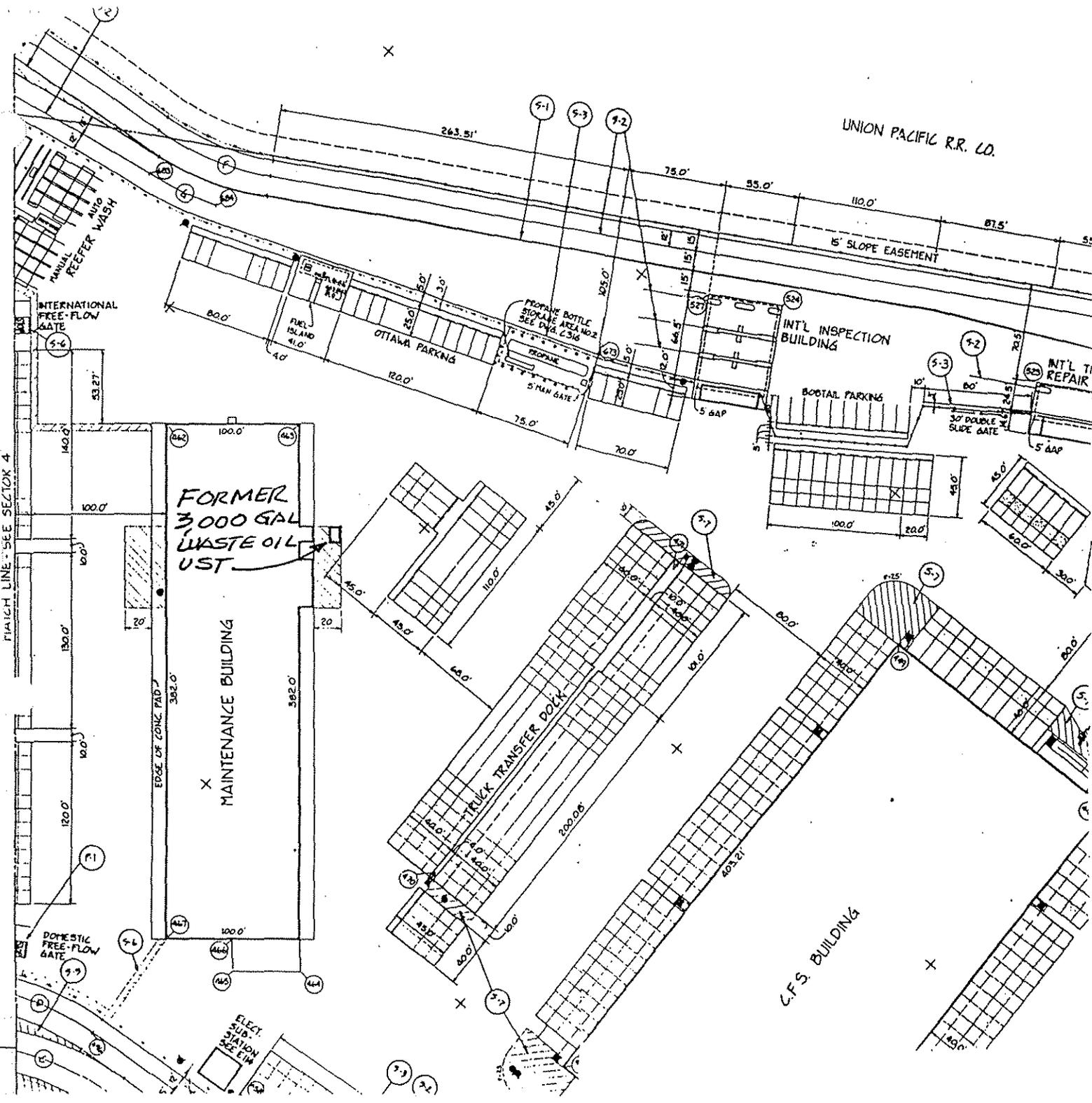


Oil On Groundwater In Underground Storage Tank Excavation



Oil On Groundwater In Underground Storage Tank Excavation

Photographs Taken On December 7, 1998
During The removal Of A Waste Oil



FINISH LINE - SEE SECTOR 4

UNION PACIFIC R.R. CO.

FORMER
3000 GAL
WASTE OIL
UST

MAINTENANCE BUILDING

TRUCK TRANSFER DOCK

LFS BUILDING

INT'L INSPECTION BUILDING

INT'L TI REPAIR

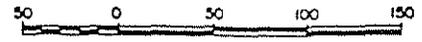
DOMESTIC FREE-FLOW GATE

INTERNATIONAL FREE-FLOW GATE

MANUAL REEFER WASH

PROPANE BOTTLE STORAGE AREA NO. 2 SEE DWG. L2306

ELECT. SUB. STATION SEE PLAN



REFERENCE

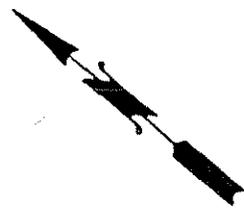
DRAWN	ENT
DATE	5-29-84
CHECKED	L.C.
DATE	5-30-84
CHECKED	L.C.
DATE	5-30-84
CONT NO.	560

**PORT OF TACOMA
TACOMA TERMINALS, INC.
SITE PLAN**

FIELD BOOK (B)	
APPROVED	<i>John A. Tanyard</i>
PROJECT MANAGER	5/21/84
DATE	
DATE	5/21/84
DATE	

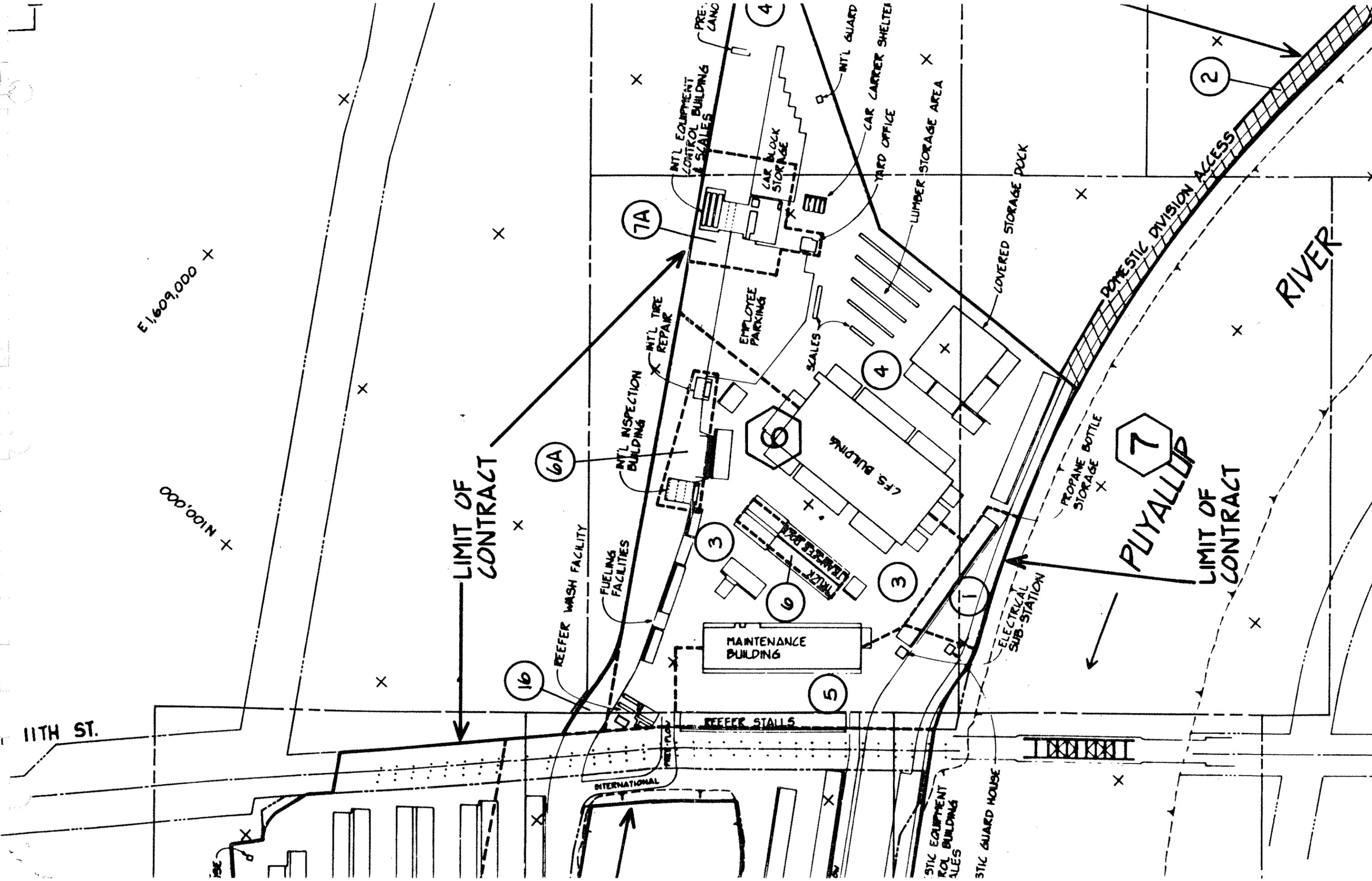
SCALE	AS NOTED
DRAWING NO.	EP-3880-23-C106
SHEET	8 OF 88

MARK	REVISION	BY	APP	DATE



UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT
Sea-Land Container Terminal
1675 Lincoln Avenue
Tacoma, Washington

Attachment 2 - Port Of Tacoma Terminal Site Plan



E 1,609,000 X
1100'000 X

11TH ST.

LIMIT OF CONTRACT

PUYALLUP

LIMIT OF CONTRACT

RIVER

INTERNATIONAL

STIC EQUIPMENT ROY BUILDING

STIC GUARD HOUSE

7A

6A

16

3

9

5

3

4

2

7

REEFER STALLS

MAINTENANCE BUILDING

LFS BUILDING

TRUCK BRIDGE

EMPLOYEE PARKING

NTL INSPECTION BUILDING

NTL TIRE REPAIR

NTL EQUIPMENT CONTROL BUILDING & SCALES

CAR BLOCK STORAGE

CAR CARRIER SHELTER

YARD OFFICE

LUMBER STORAGE AREA

COVERED STORAGE DOCK

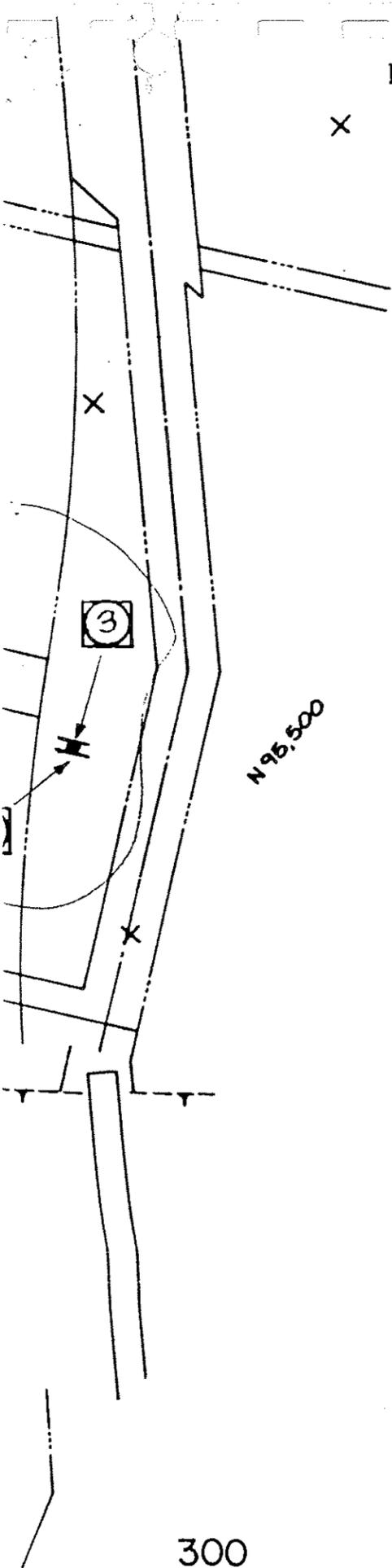
PROPANE STORAGE

ELECTRICAL SUB-STATION

DOMESTIC DIVISION ACCESS

PRE-CANAL

NTL GUARD



NOTE: The earthwork, paving, drainage, curbing, fencing, etc. for the access roads in Areas 2 and 2A shall be performed under separate contract. However, this contract shall be responsible for signage (including striping), and lighting. The site contractor must coordinate with the road contractor with respect to:

1. Scheduling
2. Placement of poles, conduit, etc.
3. Placement of signs and foundation
4. Striping



SCALE IN FEET

AWN RHT
 TE 5-29-84

CHECKED J.T.P.
 TE 5-30-84

CHECKED P
 TE 5-30-84

NT. NO. 560

PORT OF TACOMA

TACOMA TERMINALS, INC.

LOCATION SHEET & PHASING PLAN

LD BOOK (S) _____

SCALE AS NOTED

APPROVED [Signature]
 PROJECT MANAGER

[Signature]
 CHIEF ENGINEER

5/31/84
 DATE

5/31/84
 DATE

DRAWING NO.
EP-3880-23-G002

SHEET 2 OF 88

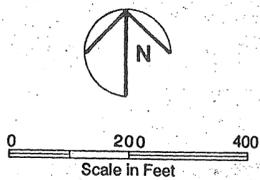
UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT
Sea-Land Container Terminal
1675 Lincoln Avenue
Tacoma, Washington

Attachment 3 - Port Of Tacoma Aerial Photo - June 20,1990



LEGEND

- ⊕³⁵ Number and approximate location of Test Pit
- Approximate Property Boundary
- ⊕^{MW-1} Number and approximate location of Monitor Well



PARCEL A
SEE FIGURE



Applied Geotechnology Inc.
Geotechnical Engineering
Geology & Hydrogeology

Site Plan - Parcel A

UPRR/Port of Tacoma
Tacoma, Washington

PT054280

FIGURE
3

ISS NUMBER	DRAWN	APPROVED	DATE	REVISED	DATE
	DFF	<i>R.J.</i>	22 Jun. 90		

Attachment 4 - Site History

1. History of adjacent property leased to SeaLand

- | | <u>Reference</u> |
|--|---|
| a. Property owned by True Oil Company from ? through 1942. | 3/27/74 site map; lease exhibit |
| b. Property purchased by Milwaukee Railroad in 1942.

Above-ground tank onsite with capacity of 1.25 million gallons. Tank was used for diesel storage. | 3/27/74 site map
SWR 251 memo |
| c. Property purchased by Port in May, 1979.
(Parcel No. 6 on lease drawings) | purch/sale agr. |
| d. Port did not operate tank. | per J. Terpstra
(Exec. Dir.)
Mike Gerke
(Rail Coord.)
Mike Sawers
(Oper. Mgr.) |
| e. Port started demolition of structures on properties purchased from Milwaukee Road to build the SeaLand terminal. | |
| f. Port demolished tank and pulled lines in July 1981.
Contract was straightforward. Nothing unusual was encountered (per Bob MacLeod; Chief Engr.)
Contract required all lines to be pulled and to remove and dispose of any contaminated soil, if encountered. | SWR 251 |
| g. Tank was empty (w/exception of some sludge on bottom)
Sludge was mixed with clean sand and was removed and disposed. | SWR 251 memo |



UST SITE ASSESSMENT / SITE CHARACTERIZATION REPORT
Sea-Land Container Terminal
1675 Lincoln Avenue
Tacoma, Washington

Attachment 5 - Hart Crowser Subsurface Exploration & Geotechnical Engineering Study

**Subsurface Exploration and
Geotechnical Engineering Study**

Marine Yard and CFS Area

Port of Tacoma, Washington

Prepared for

**The Port of Tacoma and
Tacoma Terminals, Inc.**

November 4, 1983

J-1280

J-1280

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<u>Artificial Fill</u>	4
<u>Upper Silt</u>	5
<u>Upper Sand</u>	5
<u>Lower Silt</u>	5
<u>Lower Sand</u>	5
<u>Groundwater</u>	6
GEOTECHNICAL ENGINEERING RECOMMENDATIONS	6
<u>Site Preparation and Pavement Considerations</u>	6
<u>Structural Fill</u>	8
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-----	---------------------------------

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FIGURES

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J-1280

SUBSURFACE EXPLORATION AND GEOTECHNICAL ENGINEERING STUDY
MARINE YARD AND CFS AREA
TACOMA TERMINALS, INC.
PORT OF TACOMA, WASHINGTON

INTRODUCTION

This report presents the results of our subsurface exploration program and geotechnical engineering study for the planned development of the Marine Yard and CFS areas at the Port of Tacoma by Tacoma Terminals, Inc. The site is located immediately northeast of the Puyallup River at the Milwaukee Waterway. The site configuration is given in Figure 1, Vicinity Map. The location of pertinent site features are presented on Figures 2 and 3. The site is divided into five general areas for development: the CFS Area, the Marine Yard area, the existing TOTE yard, a CFS area access road, and a levee access road.

The purpose of our study was to assess existing subsurface conditions, and develop geotechnical engineering recommendations for site preparation, structural fill, pavements, foundation types, foundation treatment, and earthwork and foundation construction considerations. This study was accomplished in general accordance with our proposal dated July 11, 1983, as formally authorized by the Port of Tacoma on July 18, 1983. Verbal notice to proceed was received earlier.

This report has been prepared for the exclusive use of the Port of Tacoma, Tacoma Terminals Inc., and their design consultants for specific application to this project. Preliminary conclusions and recommendations have been presented informally to the Port of Tacoma and the several design consultants as the project has progressed. Our work has been accomplished in accordance with generally accepted geotechnical engineering practice. No other warranty, expressed or implied, is made.

The locations of the explorations advanced for this study are shown on Figures 2 and 3, Site and Exploration Plans. The exploration procedures are discussed and the exploration logs are presented in Appendix A. Laboratory tests were completed to determine the basic physical and geotechnical properties and to aid in the classification of the site soils. The results of the laboratory tests are presented in Appendix B.

The subsurface conditions interpreted from the explorations and the soil properties inferred from field and laboratory tests formed the basis for geotechnical analyses. These analyses were performed to determine the

relevant geotechnical parameters for design and to make conclusions and recommendations regarding the geotechnical aspects of design and construction.

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The following presents a summary of our principal findings and recommendations for the project:

- o Subsurface conditions disclosed in the explorations generally consisted of surficial fill deposits underlain by stratified compressible silt and sand.
- o Spread footing support for the proposed major structures in the CFS area appears feasible contingent on pretreatment of foundation soils by preloading techniques.
- o Spread footing support of Marine Yard buildings is recommended. Due to the proximity of current site grades (comprised of existing fill) to proposed final grades, the use of a somewhat lower design footing bearing pressure is recommended.
- o Post construction settlement of proposed structures can be limited to tolerable amounts by preloading. A one to two month preload duration should be utilized for project planning purposes.
- o The settlement response of preload and site fills should be monitored to verify design assumptions presented in this report.
- o In topographically lower areas of the CFS site where compressible soil deposits are indicated, estimated settlements of up to 1-1/2 feet may occur due to the weight of up to 10 feet of fill. Utility construction and paving should be deferred until observed settlement has ceased.
- o Debris fill present in local portions of the project site should be removed and wasted off-site prior to subsequent construction activities.
- o Pavement support characteristics depend on the amount of select import fill which will be in place above existing site soils. Limited stripping would be required in portions of the CFS area and Marine Yard in building or pavement areas.
- o Significant quantities of select import fill will be required. Mass fill to raise site grades and structural fill in paving and building areas should be densely compacted.

Information appearing in this SUMMARY is subject to conditions stated elsewhere in this report. Specific results of engineering studies pertaining to the various structures and facilities are presented subsequently.

SITE AND PROJECT DESCRIPTION

The major project elements are shown on the Vicinity Map, Figure 1, and the Site and Exploration Plans, Figures 2 and 3. The development of the geotechnical engineering recommendations contained in this report was based on the site subsurface conditions as disclosed in the explorations, a final grade of elevation 19 feet plus or minus, and the planned site development, pavement areas, and building locations.

Our understanding of the site development includes construction of industrial warehouses and loading docks, office and storage buildings, truck maintenance buildings, underground tank storage, and associated paved areas for parking, storage and traffic. The scope and location of field explorations accomplished for this study was based on preliminary plan locations of these features. Design phase calculations and construction recommendations address the project configuration shown on Whitacre Engineer's site plans dated September 20, 1983.

This study does not include design recommendations for the structures located in the TOTE yard as their location and configuration was not yet certain at the time of this report. Explorations for the CFS Area access road have not yet been completed, as right of entry was not available. Specific design recommendations have been deferred for these project elements.

The Marine Yard area is bounded by the Milwaukee Waterway, the Puyallup River and East Eleventh Street. The CFS area is bounded by the Puyallup River on its southwest, and East Eleventh Street along its northwest boundary. The levee access road begins at the southwest corner of the CFS area and extends south along the Puyallup River about 1500 feet. The CFS area access road extends roughly 1600 feet and runs southeast from the southeast corner of the CFS area connecting to Lincoln Avenue.

Existing conditions at the site include areas of light to dense grass and brush with occasional areas of scattered small trees. Areas of existing asphalt paving and concrete pavement are present, together with zones of randomly placed debris. Past site development and activity has included the placement of hydraulic fill and the randomly placed debris.

The variance in ground surface elevations across the CFS area is on the order of 9 feet (average elevations +9 to +18) and is due principally to the previous site filling and development. A ditch is also located within the CFS area; the elevation of the bottom of the ditch is about 6.5 feet. The ditch is connected to the Puyallup River by a 24-inch corrugated metal

pipe. The outlet side of the CMP culvert is fitted with a flap gate to allow drainage at low tides. The existing gravel surface within the Marine yard is relatively uniform at an average elevation of +17 to +18 feet.

Areas of planned pavements were assessed in terms of near-surface soils and expected fill placement. Recommendations for structural foundations were prepared for anticipated building-specific loads and site soil stratigraphy. In the case of some of the small structures, a typical loading and generalized soil stratigraphy were utilized. The foundation structural loads, as provided to us by the project structural engineer, are summarized in Table 1 in a subsequent section of this report.

For the purpose of this report, we have assumed building locations in the Marine Yard area associated with the bridge option configuration. Foundation performance for the Van Maintenance Building was reassessed since the current planned location of the building is outside the limits of the existing preload fill and structural loads had been modified since preliminary design.

SUBSURFACE CONDITIONS

Based on the explorations completed, the subsurface soils relevant to the site engineering have been grouped in five general categories.

- o artificial fill
- o upper silt layer
- o upper sand layer
- o lower silt layer
- o lower sand layer

The distribution of these layers with respect to a portion of the CFS area is given in Figure 4, Generalized Subsurface Profile. The location of the cross section is given in Figure 3. The variability of site soils can be seen in this figure. The deposition of the natural soil layers was a function of the tidal-river interaction, and some variation with irregular soil layer elevation and thickness may be anticipated throughout the site. A brief description of the major soil units is included below.

Artificial Fill

Artificial fill placed at this site includes a generally uniform hydraulic fill unit, and isolated areas of a random mixture of debris, including trees, grass, railroad ties, metal, and organic-rich material within a gravelly sand matrix. The mixed fill was randomly placed and was noted mostly within the CFS area. The random fill measured in the explorations ranged in thickness of 0.5 to 4 feet and is inferred to be up to 6 to 7 feet thick in places.

Groundwater

Groundwater was noted during the test pit excavations and auger borings, between elevations +2 and +10.5 feet. Subsequent water levels in observation wells placed in the auger borings were between elevations +8.5 to 10.4 feet. Some fluctuations in groundwater levels are expected due to fluctuations in river and tidal levels, as well as rainfall. Piezometers sealed in the upper sand located approximately 1 mile to the east were observed over a 24 hour period as part of an ongoing study. Based on that data, daily tidal cycles may affect groundwater levels on the order of 1 foot for locations distant from the waterways.

GEOTECHNICAL ENGINEERING RECOMMENDATIONS

Site Preparation and Pavement Considerations

Site preparation should consist of removal of all heavy vegetated growth such as trees and brush. Within proposed building and paved areas near proposed final grades in the CFS area and the Marine Yard, we recommend surficial organics be stripped. Any debris fill encountered within building areas at the site should be removed, wasted off-site and replaced with compacted engineered fill.

Stripping would not be recommended in the lower topographic areas (below about elevation 11 feet) in the central portion of the CFS area. Areas covered by tall grass should be mowed and/or rolled prior to construction. The soils anticipated at or near the ground surface in this area consist of fine grained upper silt deposit. Our opinion is that stripping of these site soils would not be beneficial since stripping activities would tend to cause unnecessary disturbance of the surficial soils.

It appears that necessary stripping depths in the Marine Yard area to remove generally sparse accumulations of sod and organic-rich topsoil would be in the range of 1/2 foot or less. Existing concrete pavement, if present within planned building areas, utility trenches, or within about 1-1/2 feet of final grade, should be removed. A large portion of the ground surface is bare of vegetation and would generally require no stripping. Following stripping as necessary, the exposed soils of the project area should be pre-rolled to a dense, non-yielding condition.

The portions of the CFS area with existing ground surface elevations greater than about 11 to 12 feet should be stripped of surficial vegetation and organic-rich topsoil and pre-rolled to a dense non-yielding condition. We estimate stripping depths on the order of about 1/2 foot or less in the existing higher-elevation areas of the CFS area would be required, such as along the levee road, the abandoned railroad embankment (south property line) and at the northern corner of the site. The area surrounding the

existing surcharge fill generally contains sparse vegetation and would not require stripping.

In addition to stripping of the surficial organic-rich material, overexcavation of any debris fill encountered during site work is recommended. Debris fill was disclosed predominantly in the southeast corner area of the CFS site, but it is also noted in various other isolated locations. Overexcavation should include complete removal of debris fill in building areas. The debris could extend up to about 6 or 7 feet or more in depth below the existing ground surface. The small backhoe used for the test pit explorations could not excavate completely through the debris fill. In some areas the debris included large timbers. Our depth estimate is based on an assumption that the debris fill could extend down to the general natural site grade assumed to be elevation 9 to 11 feet. This assumption is not substantiated by direct subsurface information.

We recommend a minimum of 3 feet of overexcavation of debris fill in paved areas at these locations and in any other areas of the site where accumulations or organic-rich material or debris fill are disclosed during construction. If debris fill is left in place beneath paved areas, it should be recognized that there is some potential for differential settlement of the pavement section. Some overexcavation may also be necessary to lower the existing material to grade at the railroad embankment within the lumber storage building outline.

Following stripping and overexcavation as required, we recommend pre-rolling and compaction of all areas to receive fill, building foundations, or paving. Pre-rolling should be accomplished with a large, self-propelled vibratory roller. The purpose of pre-rolling would be to provide a degree of compaction to the near-surface soils and to delineate any areas of excessively soft soils which may be present. Pre-rolling should be accomplished to compact the subgrade to a firm, non-yielding condition.

Soft areas that are evident during pre-rolling should be overexcavated down to firm soils and replaced with densely compacted fill. As an alternative, those soils that are soft primarily because of being too wet could be scarified, allowed to dry and recompacted.

Pre-rolling should result in a minimum degree of compaction, which varies with depth below final grade. Subgrade soils within 2 feet of planned final grade should be compacted to at least 95 percent of modified Proctor maximum dry density. The upper 12 inches of the existing subgrade soils that are more than 2 feet below final grade should be compacted to at least 92 percent.

The central portion of the CFS area, where existing ground surface elevations are less than 12 feet, could be filled with an initial lift of up to 18 inches of free-draining structural fill without prior stripping or

pre-rolling. We recommend that this initial lift contain approximately 30 percent gravel if construction is accomplished in wet site conditions or wet weather. In addition, we recommend clearing grass and brush and removing any mounds or piles of organic-rich material from the area prior to placing fill. Placement and compaction of the initial thicker lift of fill in this area should provide a firm stable surface for placement and compaction of subsequent structural fill lifts.

Structural Fill

The placement of fill as outlined in the previous section of this report refers to fill necessary to achieve final grade in paved and building areas (approximately elevation +19 feet MLLW). This fill plus fill required for backfill behind walls, beneath slabs and additional fill for "dock-height" structures is considered structural fill.

We recommend that all structural fill placed within 2 feet of final grades be compacted to at least 95 percent of the modified Proctor maximum dry density as determined by ASTM D 1557. Structural fill placed within building areas should be uniformly compacted for its full depth to the 95 percent density requirements.

We recommend that the mass of structural fill placed outside building areas at depths greater than 2 feet below final grade be compacted to 92 percent of modified Proctor maximum density. We recommend lift thickness of the fill not exceed 8 to 10 inches.

We recommend the select import structural fill material be a well-graded sand, or a sand and gravel with a maximum size of 4 to 6 inches. We recommend that maximum percentage of fines (material passing the No. 200 sieve based on the minus 3/4-inch fraction and wet sieve analysis) be limited to 5 percent or less for wet weather construction and 10 percent or less for dry weather construction. In addition, it is recommended that the fines, if any contained in the borrow material, be non-plastic as determined by ASTM D 423 and 424.

We understand that a portion of the existing preload fill at the Maintenance Building location may be used for structural fill. The preload fill appears to consist of two soils: an upper soil of slightly silty gravelly sand and a lower soil of very sandy gravel. The upper preload soil contains on the order of 10 percent fines; the lower preload soil has on the order of 2 percent fines. Use of the upper preload soil may be possible only during dry conditions as this soil is sensitive to changes in moisture content. The lower preload soil would be an acceptable structural fill in wet site or wet weather conditions.

We recognize that a large quantity of borrow material will be required for this site, and that low-cost sources and transportation of the borrow materials is desirable. A previous study (J-1120, dated December 20, 1982)

accomplished by Hart-Crowser & Associates for the Port of Tacoma identified three sources of borrow material that could be obtained at reasonable prices utilizing barge transport to the site. The Glacier Sand and Gravel Pit in Steilacoom contains primarily a gravelly coarse to medium sand to a coarse to medium sand with less than 5 percent fines. The Lonestar Pit contains a uniformly grading fine gravel and a uniformly graded sand, both with less than 5 percent fines. The Maury Island Pit contains a very gravelly medium to fine sand that can contain on the order of 6 percent fines. In our opinion, any of these sites would produce acceptable fill material. There may be additional borrow sources in the area of the site that are able to produce inexpensive, acceptable fill soil. It is our recommendation that given the high probability of construction during the wet season, sources of borrow material containing less than 5 percent fines should be utilized.

We recommend all soils utilized as structural fill be moisture-conditioned to within plus or minus 2 percent of the optimum moisture content prior to placement. Suitable compaction equipment would depend on the texture of the soils to be compacted. For the material recommended herein, compaction is best accomplished with vibratory rollers, (or vibrating plate compactors for fill next to walls).

The anticipated construction sequence involves placement of structural fill which would be subsequently covered by preload fill. Upon removal of the temporary preload fill and grading to the desired elevation, the various buildings will be constructed. Construction activities and grading at the site could tend to disturb and loosen the upper portions of the structural fill. For this reason we recommend the surface of the fill should be recompacted to a dense, non-yielding condition corresponding to the recommended 95 percent of the modified Proctor maximum dry density.

We recommend that the general site grades in the central portion of the CFS area be raised to about elevation 15 feet prior to construction of the major preload fills planned in this area. This would provide a suitable working platform, reduce disturbance to the underlying fine grained soils and control settlement behavior and stability.

Foundations and Settlement

Design loading conditions for the various specific and representative buildings are given in Table 1. Spread footing support for these loads would be feasible, contingent on preload pre-treatment of the site soils. It is our understanding that lateral loads, which are not listed in Table 1, can be significant. We understand that in the case of the Lumber Storage Dock and the Car Carrier Shelter, the spread footings will be embedded to resist the lateral loads. The recommended allowable bearing pressures for spread footings for the various structures are given in Table 1. The recommended pressures depend on the amount of densely compacted structural fill that will be placed below the anticipated footing grades at

specific building locations. In general, where 3 feet or more of structural fill would be required below footings to achieve final grade at a building site, an allowable bearing pressure of 3500 psf could be utilized. Otherwise, the recommended allowable bearing pressure is 2500 psf.

Isolated spread footings and continuous strip footings should have a minimum width of 24 and 18 inches, respectively. The base of all footings should be located a minimum of 18 inches below the surface of the adjacent floor slab or the adjacent finished exterior grade, whichever is lower. Foundations meeting the above criteria may be designed for the allowable soil bearing pressure presented in Table 1. The allowable bearing pressures may be increased up to one-third to accommodate transient traffic, wind or seismic loads.

Recommended values of passive pressures and friction on the base of footings to resist lateral loads are presented in the Retaining Walls section of this report. These recommendations would also be appropriate for other footings subjected to lateral loads.

Settlements from the anticipated structural loadings will occur from elastic compression of the fill (old and new) and the two native sand layers, together with consolidation settlement within the silt layers. Without pre-treatment of the existing soils, settlement of the structures (post-fill construction) may be as large as 6 inches with up to 4 inches of differential settlement. Expected total settlements without treatment are given in Table 1.

These settlements would be unacceptable in terms of structural performance. We recommend the use of preload fills at the noted building sites to reduce the degree of post-construction settlement to more acceptable levels. Subsequent to removal of the preload fills, the post-construction settlement of the buildings will occur rapidly as the loads are applied. Without the preload fills, building settlements would occur slowly over a period of a few months. An indication of this settlement behavior is available from the preload placed for the Van Maintenance Building. Observed settlements occurred primarily over a period of two months.

Estimated post-construction settlements assuming preload fill pre-treatment are given in Table 1 and are typically on the order of 1/2 to 1 inch. Differential settlements are estimated to be 1/2 to 2/3 of the above total settlement values.

Estimated settlements for the various smaller buildings are on the order of 2 inches or less without preloading. In recommending no preload for these areas, we have assumed that given the use, size, and type of structure anticipated at these sites, these settlements represent tolerable levels of displacement. If less settlements are required, preload fills can be designed for each structure, as desired, to limit this displacement.

Settlements of the structural fill to raise site grades due to its weight alone, have been estimated to be on the order of up to 1 to 1-1/2 feet in the area of significant fill heights in the CFS area. Significantly smaller settlement magnitudes of the fill prior to building construction is expected in the Marine Yard. Structural fill placement and preload fill construction will result in settlements which would increase import fill quantities. We recommend utility construction and site paving be deferred until significant settlement has ceased.

It should also be noted that the placement of extensive long-term loads (say greater than one month duration) such as storage, or stationary equipment on the ground or pavement surface, could result in future settlements of the ground surface and might affect adjacent foundations. Areas which may be utilized for possible bulk storage purposes could be preloaded to limit future settlements.

The preload for the Van Maintenance Building was completed by September, 1982 and remains in-place currently. Based on information provided to us, the planned location of the Maintenance Building is approximately 90 feet further to the northeast of the existing northern edge of the preload fill. We recommend that future preloading be extended at this site to the northeast of the existing preload to limit the possibility of differential settlement.

Preload Fill Requirements

Required heights of preload fill are based on expected structural loads and a preload soil density of 130 pcf for sand and gravel and 110 pcf for sand. If design considerations require structural loads or construction details differing from assumptions listed in this report, the preload fill heights should be modified to reflect the changes. Recommended preload fill heights are given in the following table for the structures as grouped previously. These fill heights are in addition to fill required to reach final grade, and are measured from final grade (floor slab) elevation or dock-height fill elevation. The preload heights are based on a nominal duration of one to two months as outlined subsequently.

An important advantage of preloading is the flexibility in its application to achieve a given result within prescribed time limits. If the project construction schedule can not accommodate the projected preload times, greater preload heights could be used with shorter required durations. It is essential however, to monitor the progress of the preload. Field measured time rate of settlement data would enable us to refine our settlement estimates and requirements for preload duration. For this reason, we recommend installation of a series of settlement plate monuments.

It should be noted that the height of preload fill for the Transfer Docks is above the fill height required between dock walks in the 10-foot wide section. In addition, the fill recommended at the Van Maintenance Building may be extended, in height, to match the existing preload, if so desired.

We recommend preload fill soils be similar to the soils utilized structural fill. From a construction standpoint, the structural fill and preload fill will probably be constructed at the same time and similar considerations regarding wet weather would apply. To make effective use of import soils brought to the site, we recommend the earthwork construction sequence be established to allow use of the preload fill as general site fill in paved areas following completion of the building preloading. As a construction expedient, once 1 foot above the top elevation of structural fill, compaction of the preload fill may be accomplished using larger lifts, provided the density assumed in the analysis (130 pcf for sand and gravel or 110 pcf for sand) can be achieved.

We recommend the preload fill remain in-place for building areas long enough to allow 90 percent of the consolidation settlement to occur. We have estimated preload durations of 4 to 8 weeks based on theoretical time estimates and performance of the existing preload fill at the Van Maintenance Building and we recommend this preload period at the full preload height be assumed for project planning purposes. Longer times to construct the preload fill may require longer times to achieve 90 percent consolidation. We recommend the full height of the preload extend beyond the building limits and pavement areas a minimum of 10 feet and should be sloped down at an angle no steeper than 1-1/2H:1V.

Significant variation in the thickness and characteristics of the compressible layers exists beneath the larger structures and we recommend that the settlement and related times be monitored for the major preload fills. Field measured time rates of settlement would enable us to refine our estimates of settlement under the structural foundation loads. We recommend a minimum of four settlement plates within both the CFS Building and lumber storage dock preload fill and at least two settlement plates within each of the other preloaded areas. A schematic diagram of a typical settlement plate installation is given in Figure 5. Requirements for settlement plate installation and building specific recommendations for settlement plate locations can be provided once construction begins.

Settlement plates should be installed immediately prior to fill construction. Initial settlement plate readings should be obtained immediately at the time of placement of the plates and prior to placement of any structural and/or preload fill. Readings of the settlement plates could be taken by standard optical leveling methods and should be obtained at regular intervals during the entire filling and preload period. During the initial two weeks of the preload, we recommend that a minimum of three readings be taken per week.

Uplift Pressures

It is our understanding that the storage fuel tanks for the development will be located underground at the eastern portion of the CFS yard. Information with regard to depth of burial was not available at the time of this report. Based on limited observations of water levels, it appears that the elevation of the groundwater at this site is on the order of +9 to +10 feet (MLLW) which corresponds roughly with mean high high water. Maximum tidal fluctuations at Tacoma are on the order of 11 feet, and thus, provided the tank bottom is not located below elevation +11 feet, minor uplift pressure from runoff infiltration only would be expected. Uplift pressures for tanks located below elevation +11 feet can be estimated using hydrostatic uplift pressure distribution beginning at elevation +11 feet.

Retaining Walls

It is our understanding that walls retaining fill material will be required for dock-height structures (CFS Building, Lumber Storage Dock, Transfer Dock) and for below-grade truck-scales. We recommend that these walls be designed for the following lateral pressures, assuming compacted structural fill. For yielding walls, (i.e., walls that displace outward a minimum of .001 H), the lateral active earth pressure used for design may be computed using an equivalent fluid pressure of $35 H$ (pcf); where H equals the height of the wall. For non-yielding walls (i.e. rigid walls restrained by floor slabs or flexural stiffness) the lateral earth pressure may be based on "at-rest" equivalent fluid pressure of $55 H$ (pcf). Passive earth pressure resistance at the toe of the walls may be based on an allowable equivalent fluid pressure of $300 h$, where h is the embedment of the footing and the backfill adjacent to the footing is densely compacted as structural fill. An allowable coefficient of sliding friction along the base of the wall may be used as 0.4.

The preceding lateral earth pressure recommendations are based on horizontal backfill, uniform soil conditions for backfill, and no build-up of hydrostatic pressure behind the walls. The effect of surcharges, such as traffic or floor loads should also be included. For a uniformly distributed load behind the wall, a corresponding uniformly distributed pressure equal to 35 percent or 50 percent of the surcharge should be added to the lateral soil pressure for yielding and non-yielding walls, respectively.

Pavement Design

Based on final site grades near elevation 19 feet, it appears that most of the CFS area pavements would be underlain by new fill generally in excess of 2 feet or more in thickness. Perimeter areas of the CFS area are currently within about 2 feet of final grade, and the Marine Yard area is currently within about 1 to 2 feet of final grade.

All fill beneath paved areas should be placed and compacted in accordance with our recommendations for structural fill contained in this report. For design purposes, we recommend using a design CBR value of 25 percent for pavements constructed above significant depths of select gravelly import fill, where 2 feet or more of fill would be added. This CBR value is based on laboratory CBR tests on a recompacted sample of the existing preload fill (i.e., slightly silty gravelly sand) taken from the area surrounding the preload. For clean, predominantly medium to fine sand import fill, an estimate of the CBR value is 15 percent.

Pavements in the Marine Yard, and near-grade portions of the CFS area, may be designed using a CBR value of 10 percent for the existing site soils. This CBR value is based on laboratory tests on fine to medium sand from the Marine Yard area and very silty sand from the levee road area of the CFS area. It appears that the new levee road would be on a combination of new fills and existing near-surface soils. We recommend that pavement design for this area consider the lower CBR materials present near design grades along the existing levee road embankment.

Seismic Considerations

Resistance to liquefaction during strong ground shaking exhibited by the natural soils at the site will partly be a function of their in-place density. A measure of their relative density of soils at this site is obtained from the Standard Penetration Test (SPT), which was performed in the auger borings and the results of the cone penetrometer probes.

Values of soil relative density in many areas are low, indicating possible susceptibility to liquefaction during large magnitude earthquakes. Similar conditions exist over other areas of the Port of Tacoma as well as other port areas and alluvial valleys of the Puget sound area. In our opinion, no economical means of treatment exists for this site and therefore, the possibility of damage from liquefaction and resulting ground distortion or settlements during large magnitude earthquakes should be recognized.

ADDITIONAL RECOMMENDATIONS

It is recommended that Hart-Crowser & Associates be provided the opportunity for a general review of the final plans and specifications in order that the geotechnical engineering recommendations may be properly interpreted and implemented in the design and specifications.

We recommend that Hart-Crowser & Associates continue to provide geotechnical services during placement of fill and foundation construction. This includes observations and review of:

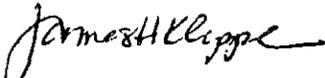
- o Site preparation, including pre-rolling and removal of undesirable existing fill,

- o Placement and compaction of structural fill,
- o Preload fill construction and behavior,
- o Other geotechnical considerations that may arise during construction.

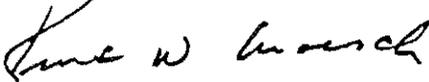
The purpose of these observations and review would be to observe compliance with design concepts, specifications or recommendations and to allow design changes or evaluation of appropriate construction measures in the event that subsurface conditions differ from those anticipated prior to the start of construction. Field observations may also be useful as a means of documenting construction practices and conditions for use in defense of the owner against possible claims by the contractor or others.

We appreciate this opportunity to be of service to you. We would be pleased to discuss this report or any aspects of the project with you.

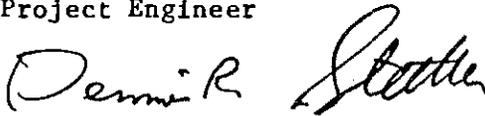
HART-CROWSER & ASSOCIATES, INC.



JAMES H. KLEPPE, P.E.
Senior Staff Engineer



KURT W. GROESCH, P.E.
Project Engineer



DENNIS R. STETTLER, P.E.
Vice President



JHK/KWG/DRS:mw

TABLE 1 Foundation Design Criteria

AREA/ STRUCTURE DESIGNATION	DESIGN LOADS			ALLOWABLE BEARING PRESSURE IN PSF	SITE FILL HEIGHT TO DESIGN GRADE IN FEET	CALCULATED SETTLEMENT IN INCHES		
	MAXIMUM COLUMN IN KIPS	MAX. WALL IN KIPS PER LINEAL FOOT	SLAB LIVE LOAD			SITE FILL	STRUCTURE WITHOUT PRELOAD	STRUCTURE AFTER PRELOAD
CFS Area								
CFS Building	209	4.5	.5 ksf	3,500	9	12 to 18	4 to 6	½ to 1
Lumber Storage Dock	282	---	.5 ksf	3,500	4 to 7	12 to 18	~4	½ to 1
Truck Transfer Dock	16	3 - 4		2,500	2 to 9	3 to 18	2½	½
International Equip- ment Control Building	106	1.5	HS-20/44	3,500	~5	3 to 6	≤ 2	½ to 1
Other Structures	<30	~1	HS-20/44	3,500	~5	3 to 6	≤ 2	----
Marine Yard								
Domestic Equipment Control Building	66	~1	HS-20/44	2,500	2 to 3	1	≤ 2	----
Other Structures	<30	~1	HS-20/44	2,500	2 to 3	1	<2	----

* Includes dock height fill, where applicable

Recommended foundation for all structures is spread footings.

Other CFS area buildings include Car Carrier Shelter, International Tire Repair, International Inspection, Yard House, Guard House and Scale.

Other Marine Yard buildings include Domestic Tire Repair and Domestic Inspection.

TABLE 2 Summary of Preload Recommendations

STRUCTURE DESIGNATION	PRELOAD HEIGHT IN FEET		PRELOAD * DURATION IN WEEKS
	SAND and GRAVEL	SAND	
CFS Building	9	10½	4 - 8
Lumber Storage Dock	8	9½	4 - 8
Truck Transfer Dock	4	5	4 - 8
International Equipment Control Building	4	5	4 - 8
Maintenance Building	8	9½	6 - 8

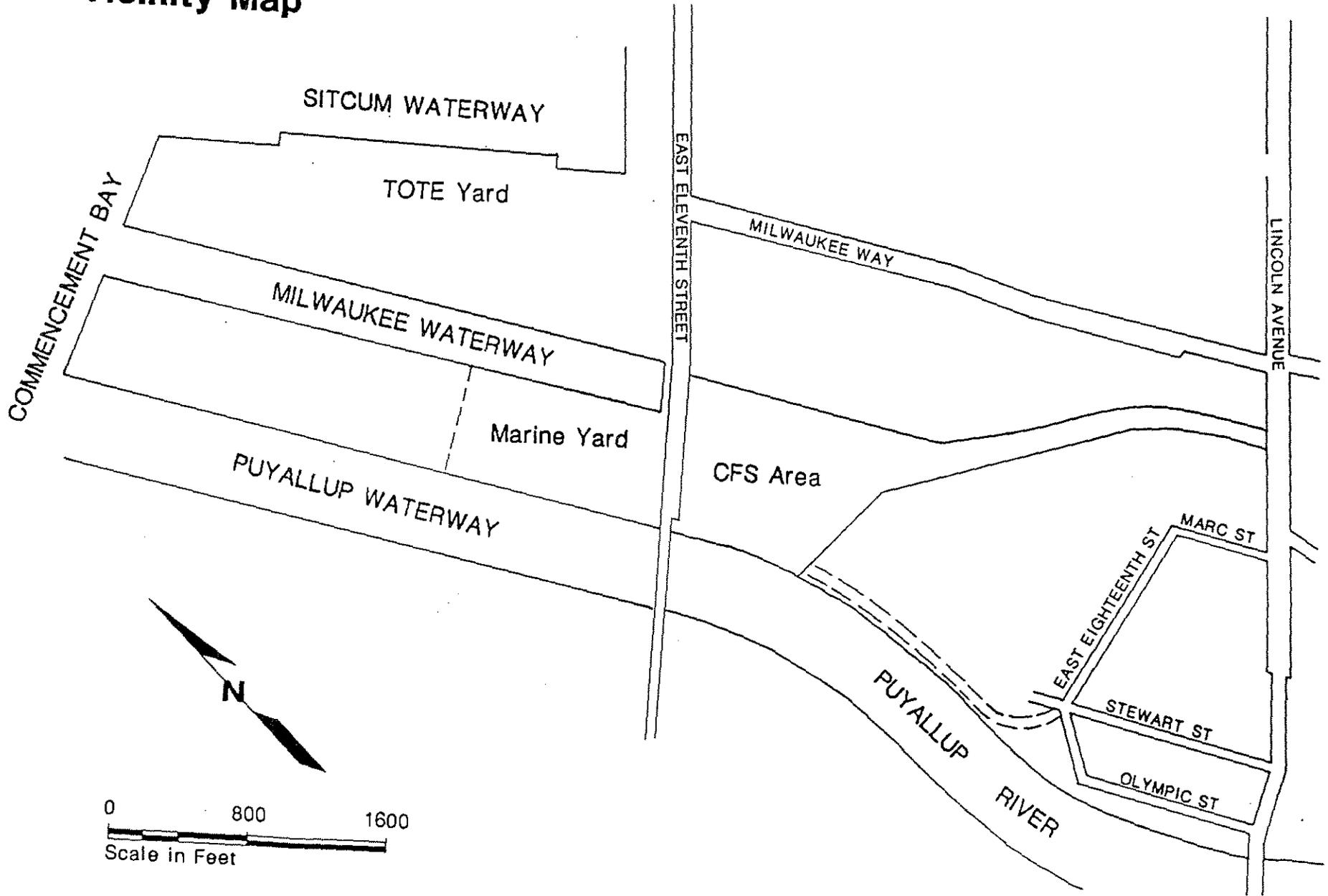
*(After completion of Fill)

TABLE A-1 Ground Water Level Observations

Boring Number (Completion Date)	Approx. Ground Surface Elevation in Feet	Depth in Feet			Depth to Ground Water in Feet		
		Boring Bottom	Screened Section		At Time of Drilling	8/17/83	10/18/83
			Top	Bottom			
B-1 (7/20/83)	13	39.0	31.8	36.8	8.0	3.9	3.9
B-2 (7/26/83)	10	39.0	33.4	38.4	6.0	0.1	+0.2*
B-3 (7/26/83)	11	39.0	32.0	37.0	--	1.4	1.5
B-4 (7/20/83)	11	44.0	36.1	41.1	8.5	0.9	1.0
B-5 (7/21/83)	11	39.0	32.5	37.5	8.0	1.2	1.3
B-6 (7/22/83)	12	39.0	33.1	38.1	4.5	2.1	1.7
B-7 (7/21/83)	14	39.0	32.4	37.4	11.0	5.2	5.3
B-8 (7/22/83)	17	39.0	13.2	33.2	--	8.8	9.0
B-9 (7/25/83)	18	53.5	45.6	50.6	--	7.3	5.8
B-10 (7/25/83)	18	29.0	24.0	29.0	15.0	--	6.3

Note: * - Measured water level above ground surface.

Vicinity Map



**APPENDIX A
FIELD EXPLORATIONS**

The field explorations accomplished for this study were completed from July 19 to July 26, 1983 and consisted of seven Dutch cone penetrometer probes thirteen hollow-stem auger borings, and forty-six test pits. The explorations were accomplished in the CFS area (located southeast of East 11th Street and east of the Puyallup River), the Marine Yard area (located northwest of East 11th Street and between the Puyallup and Milwaukee Waterways), the existing TOTE yard (just west of Sitcum Waterway) and along the new levee access road along the Puyallup River.

The auger boring and Dutch cone probe locations were surveyed by the Port of Tacoma. Location of some borings and probes were relocated in the field. The test pits were located by hand taping from a survey baseline. Elevations were interpolated from topographic maps provided by the Port of Tacoma. The approximate locations of the explorations are given in Site and Exploration Plans, Figures 2 and 3.

The borings and test pits were continuously observed and soil conditions logged by Messrs. Bruce McDonald and Jon Sondergaard, engineering geologists and Mr. John Zipper, geotechnical engineer, all of Hart-Crowser & Associates. The Dutch cone probes were performed by Subterranean, Inc., of Gig Harbor, Washington.

Soil conditions and stratification were generalized from the logs of the Dutch cone penetrometer probes, from observations during drilling operations and from samples recovered from the borings and test pits. Material changes noted on the exploration logs are often gradational in nature and conditions may vary at locations distant from where the explorations were undertaken.

DUTCH CONE PENETROMETER PROBES

The seven Dutch cone penetrometer probes were advanced to depths of 60 to 61 feet below ground surface. Six probes (P-1 through P-6) were performed at the CFS area and one (P-7) at the Marine Yard. In areas where fill or debris prevented initial advancement of the cone penetrometer, a shallow auger boring was completed and the hole backfilled with sand prior to the probe penetration.

The probes were accomplished by Subterranean, Inc., of Gig Harbor, Washington, under subcontract to Hart-Crowser & Associates. The principles of the Dutch cone system are shown on Figure A-1. The system is mounted on a truck which provided the necessary reaction weight for the applied loads.

From the results of the penetrometer probes a direct correlation is obtained between the point resistance of the cone and the bearing capacity of the soil, and between the sleeve friction and frictional characteristics of the soil. The relative density or consistency of the soil being probed is empirically related to the cone resistance, q_c . Further, comparing the values of q_c , sleeve friction (f_s) and the friction ratio ($FR=f_s/q_c$ in percent) leads to an interpretative soil classification. Generally, a friction ratio value less than 2 indicates sand; a value between 2 and 4 indicates a silt-sand mixture, clayey sand or silt; values greater than 4 indicate a clayey silt or clay. Organic soils typically have high friction ratios. The soil classification system is summarized graphically at the bottom of Figure A-1. The detailed interpretative logs of the Dutch cone penetrometer probes accomplished for this study are presented in Figures A-2 through A-8.

Auger Borings

The thirteen subsurface borings were accomplished by FLD Industries under subcontract to Hart-Crowser & Associates. A CME 750 all-terrain drill rig with 3 3/8" ID hollow-stem auger was used. Eleven borings ranging from 39 to 44 feet in depth were completed in the CFS area and two borings (B-9 and B-10) were completed to depths of 53 and 29 feet, respectively, in the Marine Yard area.

Both driven, disturbed (split-spoon) and pushed, relatively undisturbed samples were taken. The disturbed samples were obtained on 5-foot intervals in general accordance with the Standard Penetration Test procedure as described in ASTM D 1586-67. The number of blows required to drive the sampler with a 140 pound hammer free-falling 30 inches was recorded in three 6-inch intervals. The number of blows required to drive the sampler the final 12 inches is the Standard Penetration Resistance which is plotted on the boring logs at the respective sample elevations. The Penetration Resistance value is a measure of the in-place density of the sampled soils and is used to classify the samples into relative density categories. Samples were recovered from the split-barrel sampler, classified and placed in water-tight jars to return to our laboratory for further testing.

In cohesive (clay or silt) soils, a 3-inch diameter thin-walled steel tube sampler was pushed below the auger to obtain a relatively undisturbed sample for consolidation tests. The tubes were sealed at the ends and returned to our laboratory for subsequent extrusion and classification and testing. Undisturbed samples of silt and clay soil were obtained near the locations of Dutch Cone probes P-2, P-4, and P-5 once the general soil stratigraphy had been established. The borings for the undisturbed sampling are designated B-11, B-12 and B-13.

All samples were transported back to our Seattle laboratories for further classification and testing. The interpretive logs of the hollow-stem auger borings are presented in Figures A-9 through A-21.

Observation wells were installed in ten hollow-stem auger borings, (B-1 through B-10). The wells generally consisted of 3/4" inch P.V.C. pipe, hand slotted at the tip and backfilled with the natural site soils. At B-8, twenty feet of 2" inch I.D. riser pipe was installed above 20 feet slotted pipe with of .020 inch slotted openings. The slotted pipe section is installed at the bottom of the auger boring. Details of the observation well installation are given in Table A-1. Water levels at time of drilling are given on the boring logs and in Table A-1 as water levels measured at two subsequent dates.

Test Pits

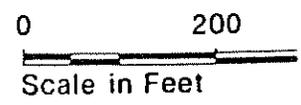
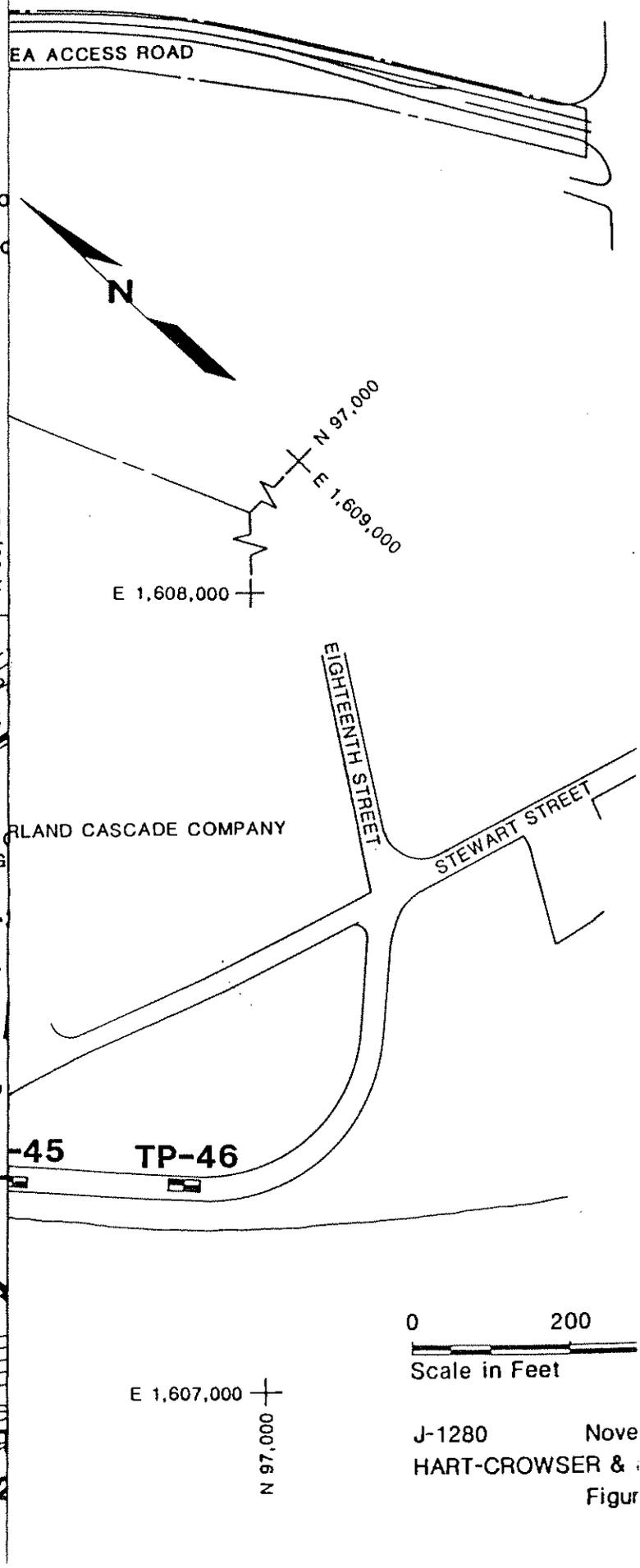
A series of forty-six test pits were excavated across the site utilizing a tractor-mounted backhoe owned by Mr. James Meeker and under subcontract to Hart-Crowser & Associates. Descriptive logs were developed in the field by observation of the soil disclosed in the test pits. Representative samples of soil types encountered were placed in plastic jars or bags and returned to our laboratory for further observation and testing. Based on the field logs and laboratory classification tests, descriptive logs of the test pits have been prepared indicating the soil type encountered and the depth where changes in soil type occurred. Sample depth and number, water content (in percent), other tests performed and groundwater levels encountered during excavation are also presented. The consistency or density of the soil is based on interpretation and can not be measured during the excavation of the pits. The presentation of consistency and density in the test pit logs is enclosed with parentheses to indicate that the value is only estimated. The logs are shown in this Appendix, Figures A-22 through A-44. The legend identifying the symbols used in the test pit logs is presented in Figure A-44.

In addition to the soil classifications mentioned above, soil consistency and strength were approximately assessed using a pocket penetrometer and torvane test equipment. These index tests are able to provide relative differences in consistency and strength of cohesive soils. The pocket penetrometer test consists of a small, probe that is hand-pushed into natural soil; the force that is required to push the probe is measured in terms of soil unconfined strength. The torvane consists of small vanes arranged radially. The torvane is also hand-pushed into natural soil and then twisted until failure. The torque necessary to fail the soil contained on the perimeter of the vanes is measured in terms of soil shear strength. These test results were considered in the interpretation of the soil stratigraphy. Values of pocket penetrometer and torvane tests (in tons per square foot) are given on the test pit logs, where applicable.

Site and Exploration Plan

Area

- ⊕ HC-1 Boring Location and Number, Previous
- ⊙ P-1 Probe Location and Number, Previous
- ⊕ B-1 Boring Location and Number
- ⊙ P-1 Probe Location and Number
- ▭ TP-13 Test Pit Location and Number
- ↔ A A' Profile Location and Designation



J-1280 Nove
HART-CROWSER &
Figur

Probe Log P-1

SOIL INTERPRETATION

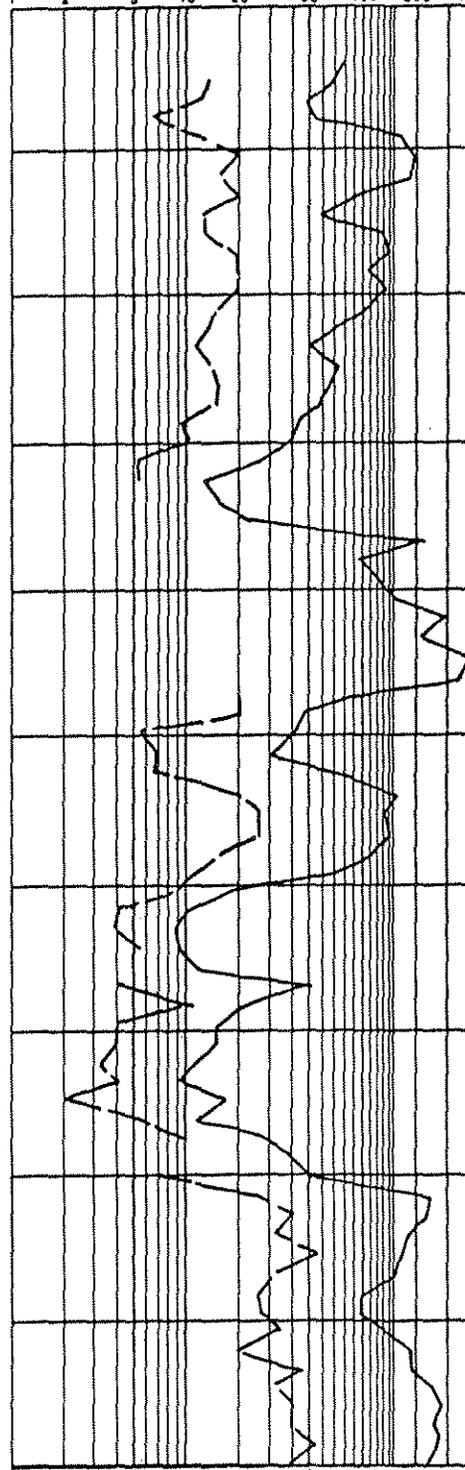
Approximate Ground Surface Elevation in Feet 15

Pre-excavated through Gravel fill.	0
Medium dense, silty SAND.	
Dense SAND.	5
Silty Sand layer.	
Medium dense.	10
Loose, silty SAND.	15
Medium stiff, clayey SILT.	
Loose to medium dense GRAVEL.	20
Loose, silty SAND and SAND.	25
Dense SAND.	
Medium stiff, clayey SILT.	30
Sand layer.	35
Loose SAND.	40
Dense.	
Very dense.	45
	60

Depth Feet

CONE PENETRATION RESISTANCE

Tone/Sq. Ft. 1 2 5 10 20 50 100 200 400

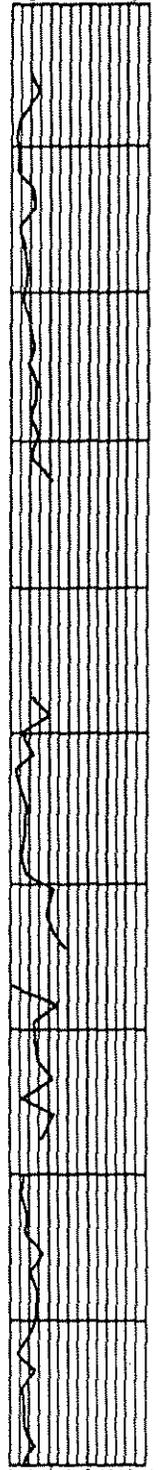


0.1 0.2 0.5 1 2 5 10
Tone/Sq. Ft.

SLEEVE FRICTION

FRICTION RATIO %

0 2 4 6 8 10 12 14

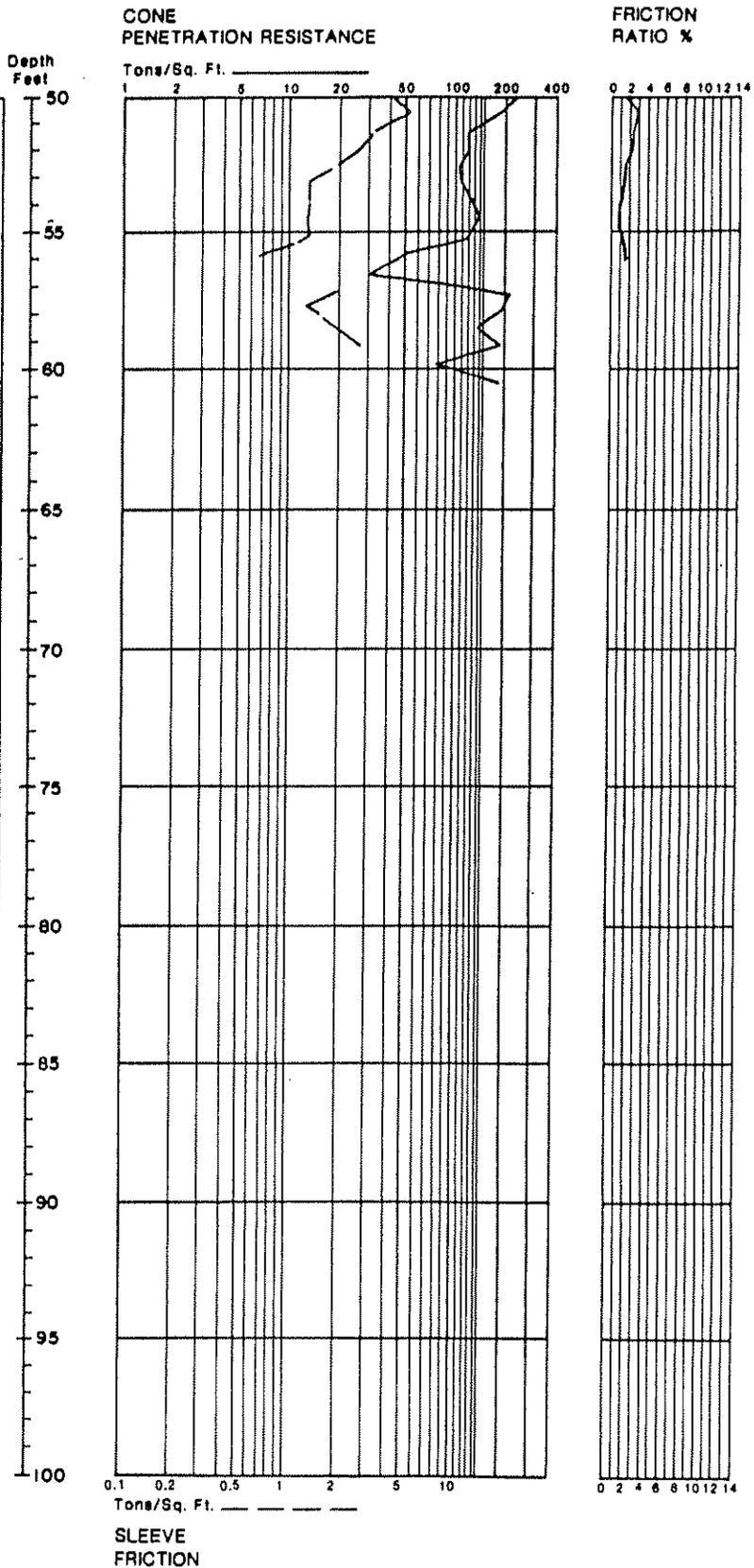


0 2 4 6 8 10 12 14

Probe Log P-1

SOIL INTERPRETATION

Dense.
Silty layer.
Bottom of Probe 60.3 Feet. Completed 7/24/83.

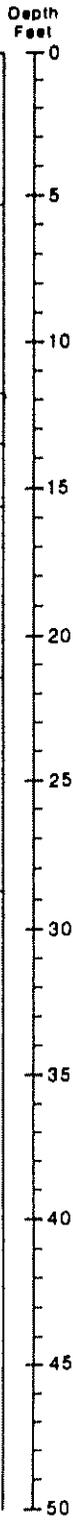


Probe Log P-2

SOIL INTERPRETATION

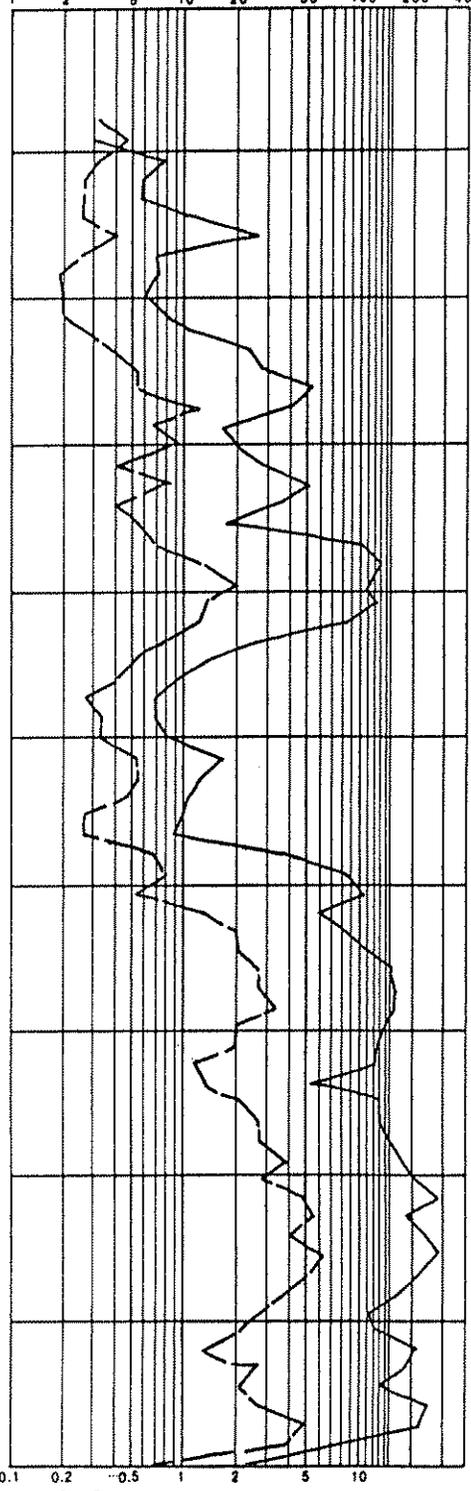
Approximate Ground Surface Elevation in Feet 12

0 - 5	Predrilled and backfilled with compacted sand.
5 - 10	Soft to medium stiff, clayey SILT. Sandy layer.
10 - 12	Loose SAND.
12 - 15	Medium stiff to stiff, clayey SILT.
15 - 20	Loose SAND. Silty layer. Dense.
20 - 30	Medium stiff, clayey SILT.
30 - 35	Medium dense SAND Dense.
35 - 40	Silty sand layer. Very dense.
40 - 45	Dense.
45 - 50	Silty layer.



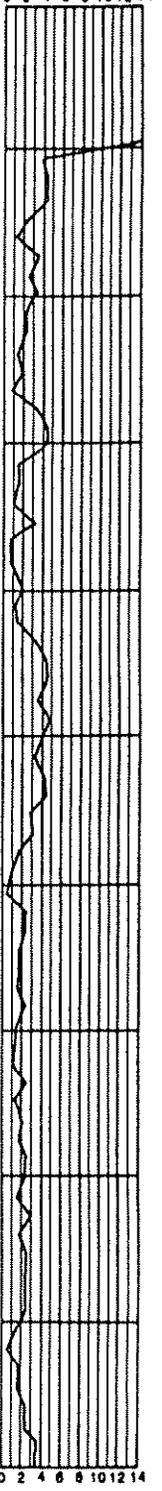
CONE PENETRATION RESISTANCE

Tons/Sq. Ft. 1 2 5 10 20 50 100 200 400



FRICITION RATIO %

0 2 4 6 8 10 12 14



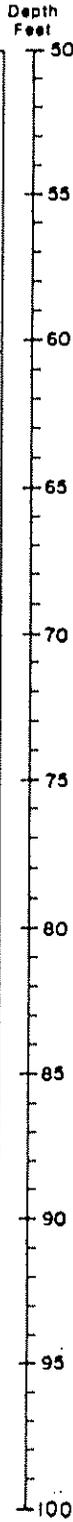
SLEEVE FRICTION

Probe Log P-2

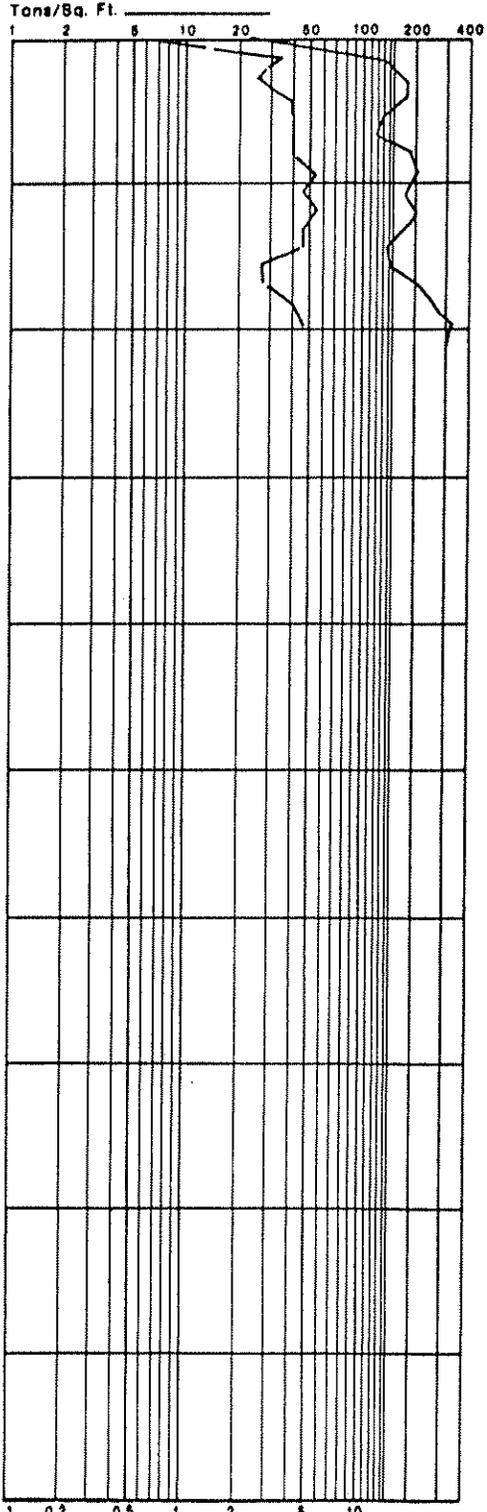
SOIL INTERPRETATION

Very dense.

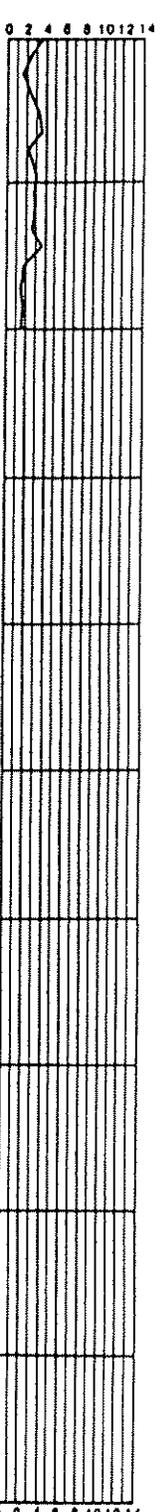
Bottom of Probe 60.3 Feet.
Completed 7/25/83.



CONE PENETRATION RESISTANCE



FRICION RATIO %



Tons/Sq. Ft.

SLEEVE FRICTION

Probe Log P-3

SOIL INTERPRETATION

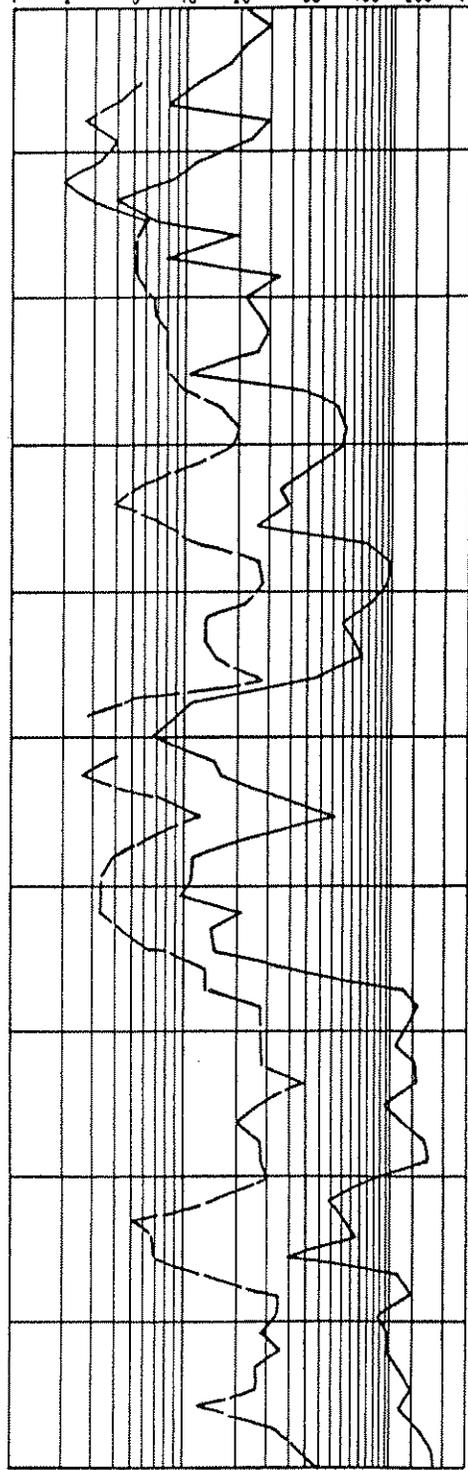
Approximate Ground Surface Elevation in Feet 14

Loose SAND.
Medium stiff, clayey SILT.
Loose SAND.
Soft to medium stiff, clayey SILT.
Loose, silty SAND
Silt layer.
Medium dense SAND.
Loose.
Dense.
Medium dense.
Medium stiff, clayey SILT and/or sandy SILT.
Loose to medium dense SAND.
Medium stiff, clayey SILT.
Sandy layer.
Dense SAND.
Medium dense.
Silty layer.
Dense.
Very dense.

Depth Feet
0
5
10
15
20
25
30
35
40
45
50

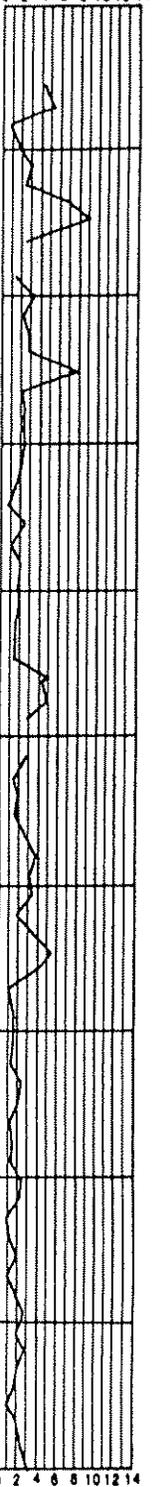
CONE PENETRATION RESISTANCE

Tons/Bq. Ft. 1 2 5 10 20 50 100 200 400



FRICTION RATIO %

0 2 4 6 8 10 12 14



Tons/Bq. Ft.

SLEEVE FRICTION

Probe Log P-3

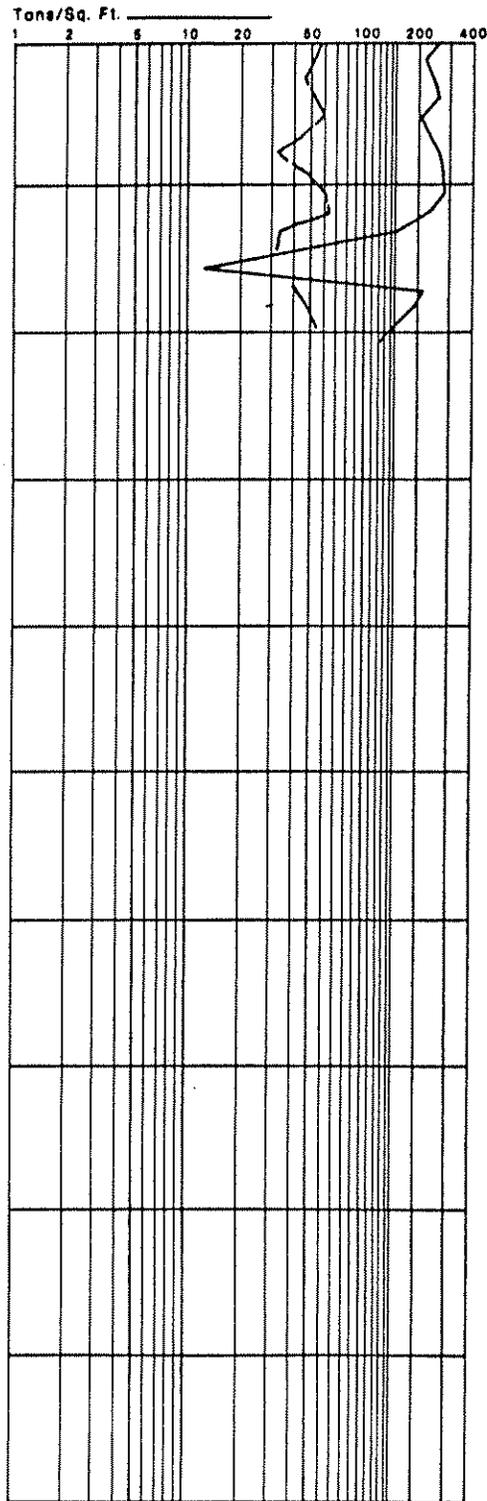
SOIL INTERPRETATION

Silty layer.
Dense.

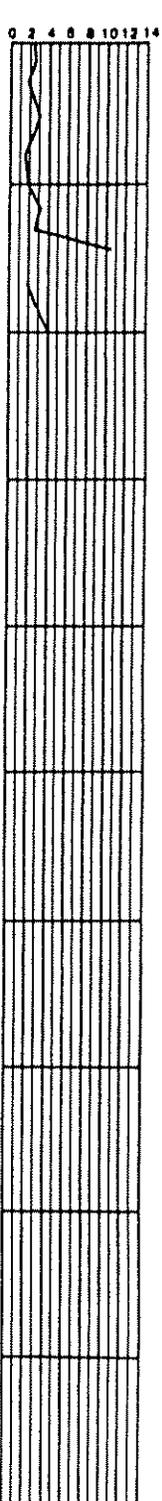
Bottom of Probe 60.3 Feet.
Completed 7/24/83.



CONE PENETRATION RESISTANCE



FRICTION RATIO %



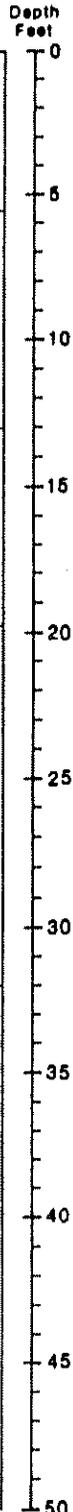
SLEEVE FRICTION

Probe Log P-4

SOIL INTERPRETATION

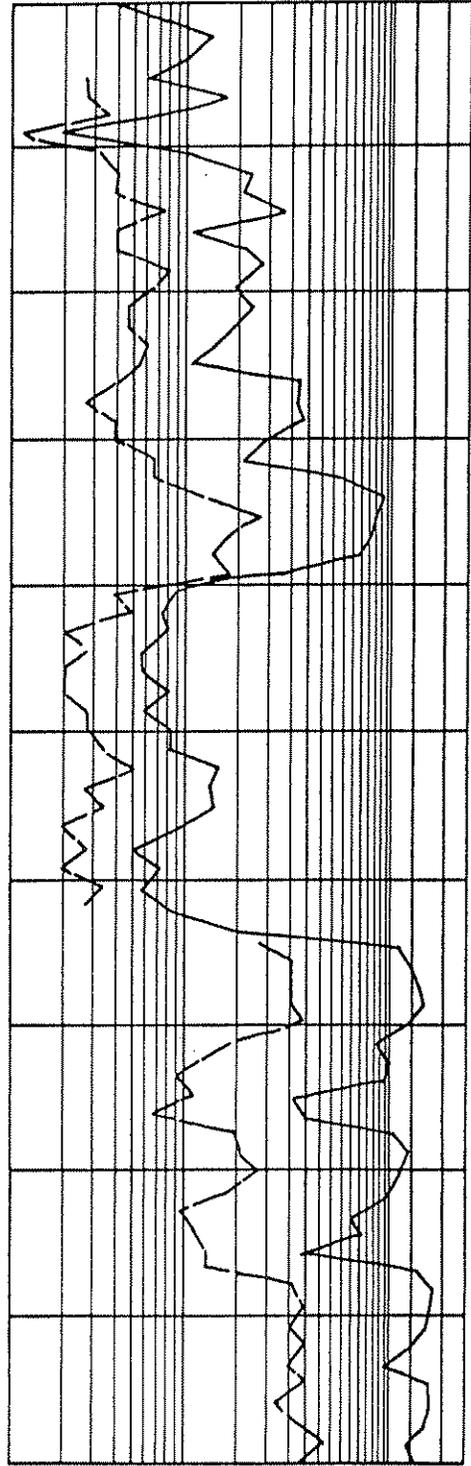
Approximate Ground Surface Elevation in Feet 10

Medium stiff, clayey SILT.
Soft to medium stiff.
Loose SAND and silty SAND.
Silt layer.
Silt layer.
Loose SAND.
Silty sand layer.
Medium dense to dense.
Soft to medium stiff, clayey SILT and/or sandy SILT.
Dense SAND.
Silty sand layer.
Silty sand layer.
Dense to very dense.



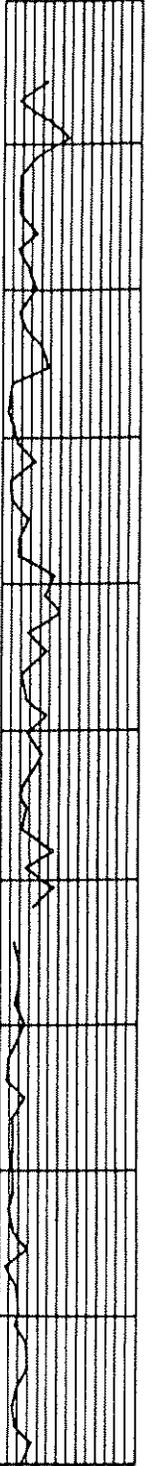
CONE PENETRATION RESISTANCE

Tons/Sq. Ft. 1 2 5 10 20 50 100 200 400



FRICION RATIO %

0 2 4 6 8 10 12 14



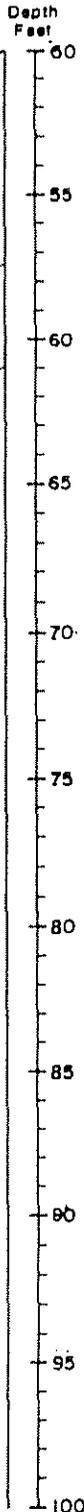
Tons/Sq. Ft. ---

SLEEVE FRICTION

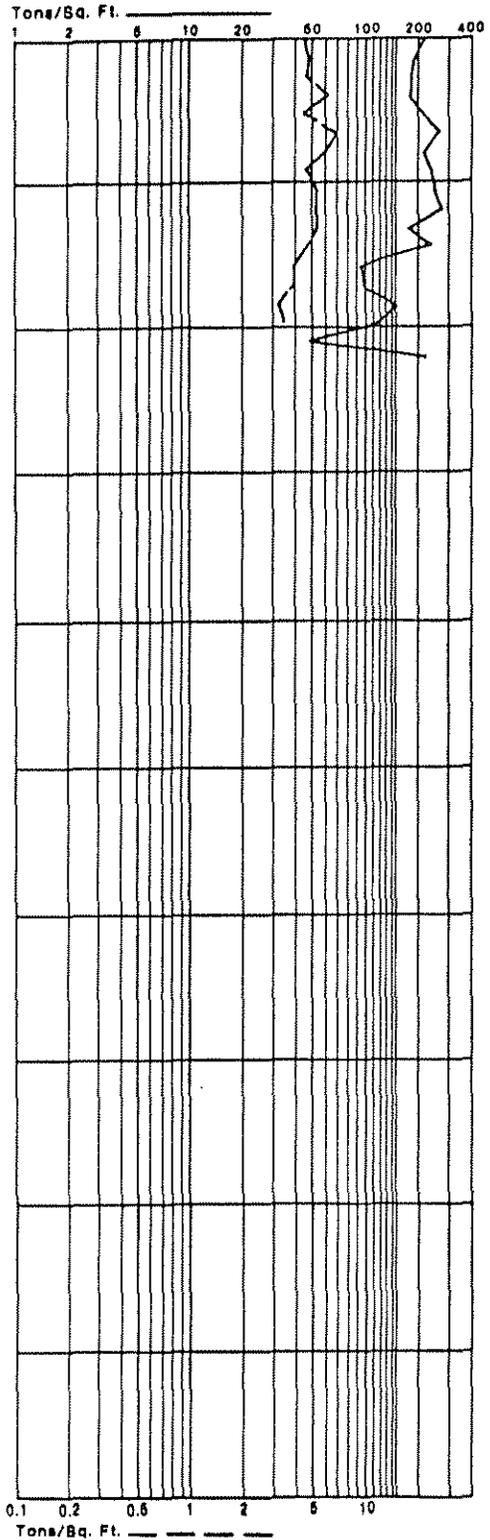
Probe Log P-4

SOIL INTERPRETATION

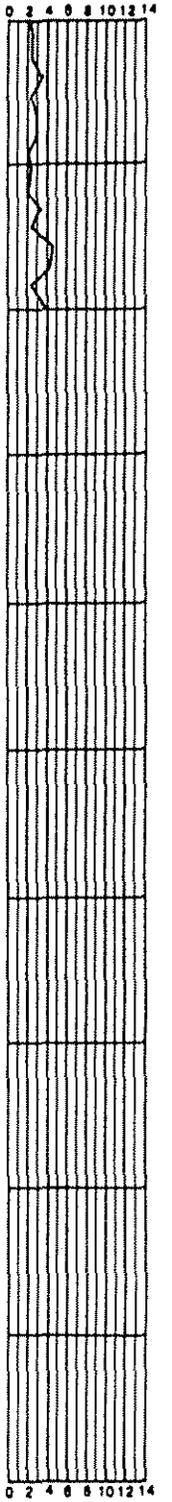
Dense to very dense SAND.
Dense, silty SAND.
Silt layer.
Bottom of Probe 61.0 Feet. Completed 7/25/83.



CONE PENETRATION RESISTANCE



FRICION RATIO %



SLEEVE FRICTION

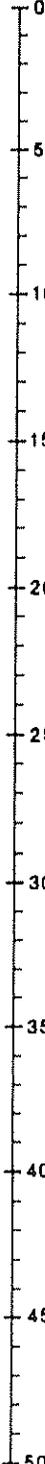
Probe Log P-5

SOIL INTERPRETATION

Approximate Ground Surface Elevation in Feet 11

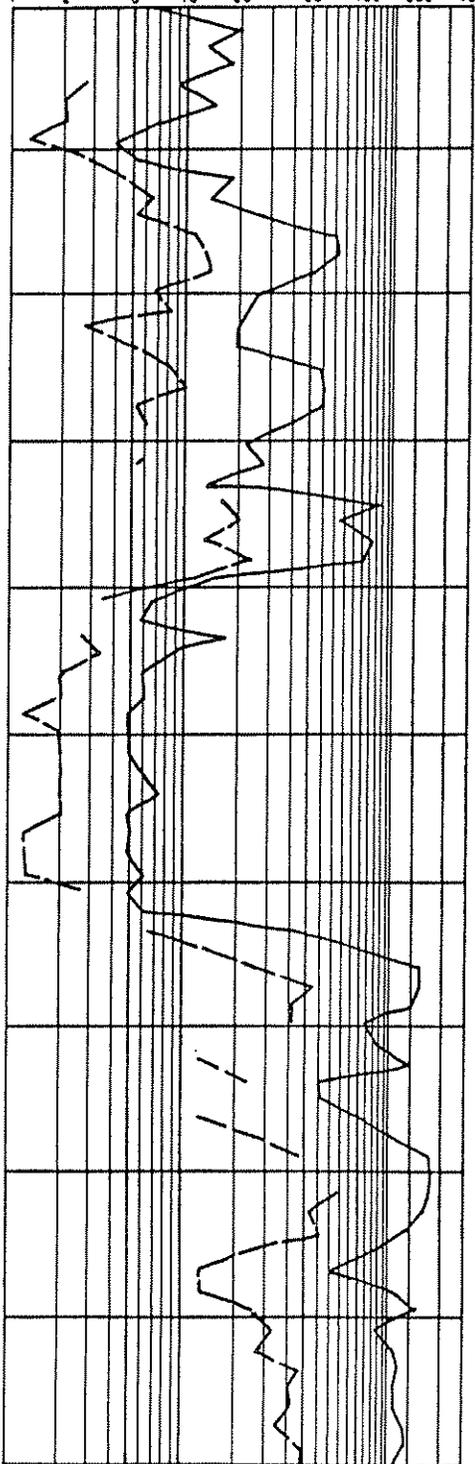
Soft to medium stiff, clayey SILT
Loose to medium dense SAND.
Loose, silty SAND and/or sandy SILT.
Loose to medium dense SAND.
Silty layer.
Silty layer.
Medium dense to dense.
Soft to medium stiff, clayey SILT.
Sandy layer.
Soft.
Dense SAND.
Silty Sand layer.
Very dense.
Dense.

Depth Feet



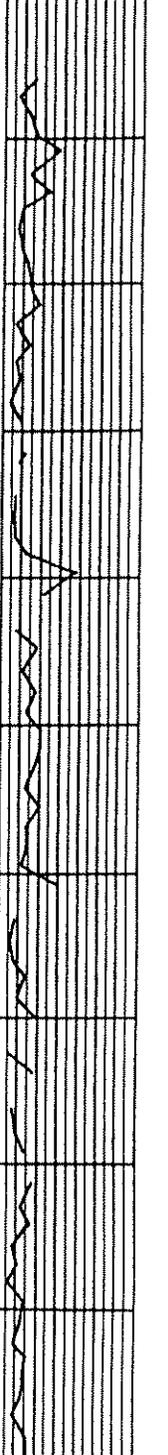
CONE PENETRATION RESISTANCE

Tons/Sq. Ft. 1 2 5 10 20 50 100 200 400



FRICTION RATIO %

0 2 4 6 8 10 12 14



0.1 0.2 0.5 1 2 5 10
Tons/Sq. Ft. --- --- ---

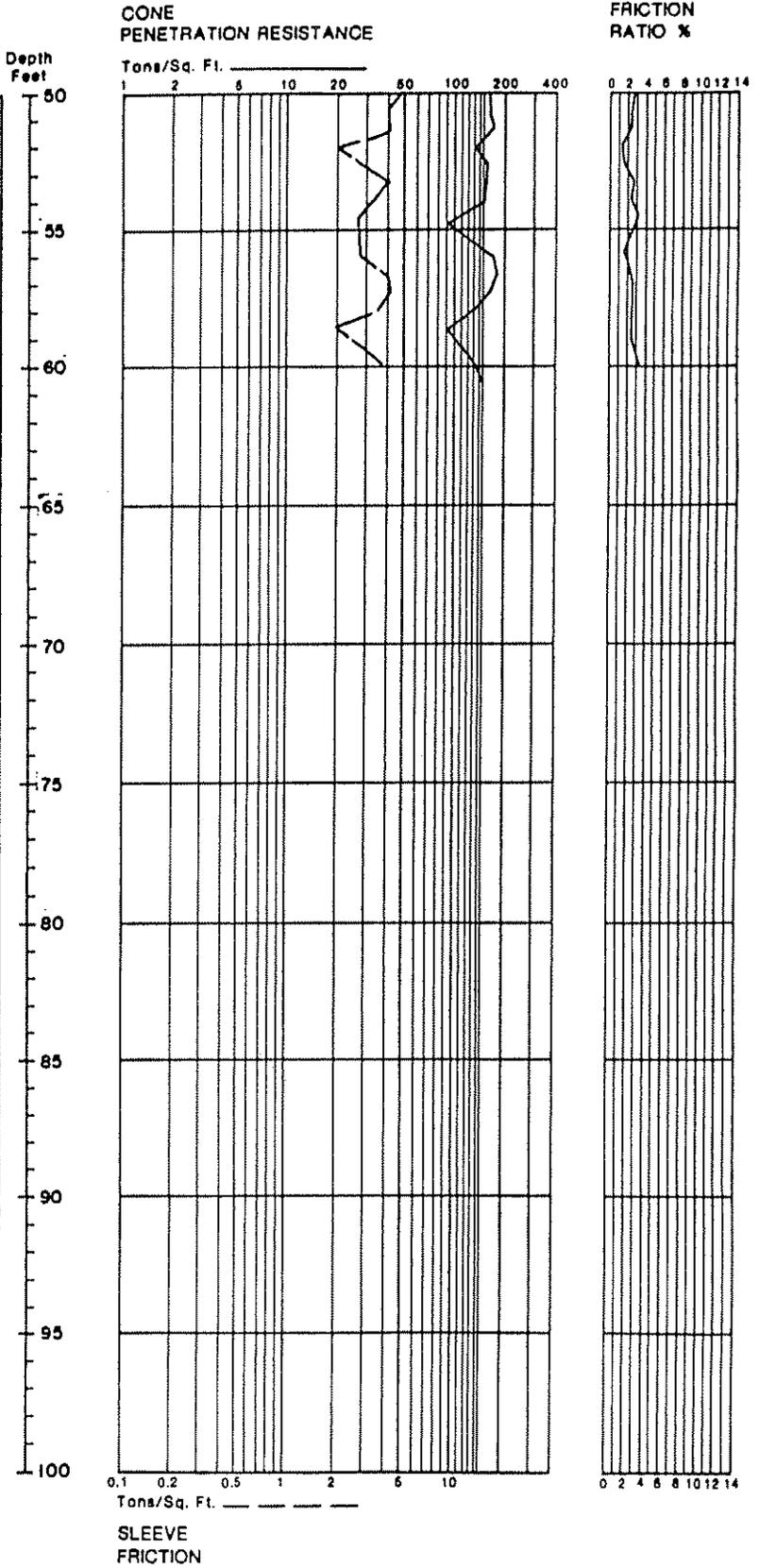
SLEEVE FRICTION

Probe Log P-5

SOIL INTERPRETATION

Dense SAND.

Bottom of Probe 60.3 Feet.
Completed 7/25/83.



Probe Log P-6

SOIL INTERPRETATION

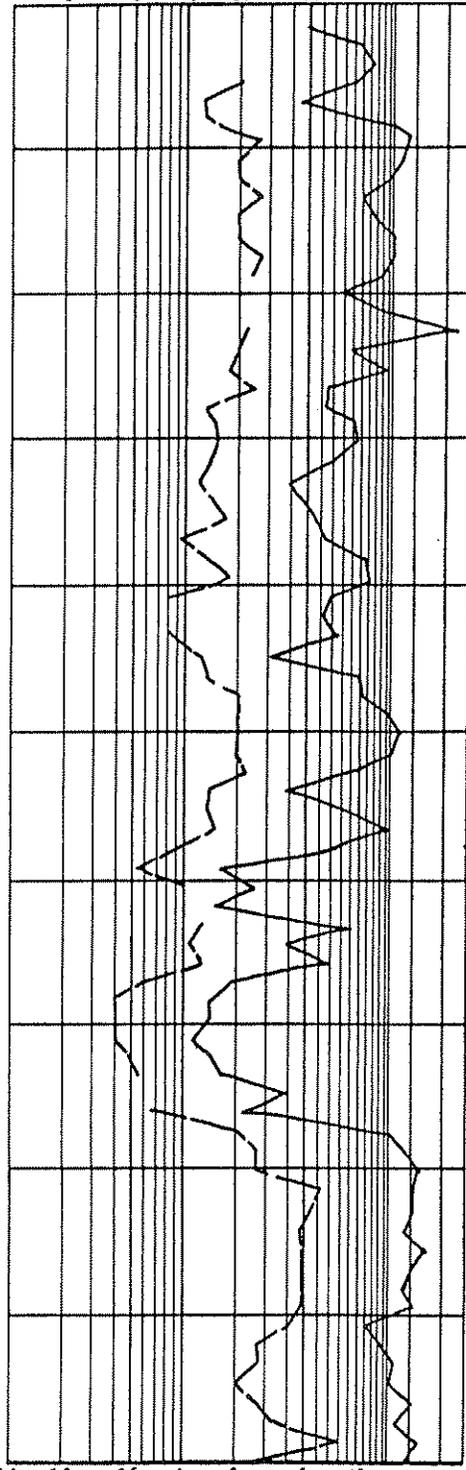
Approximate Ground Surface Elevation in Feet 13

Medium dense SAND.
Silty layer.
Dense.
Medium dense to very dense, gravelly SAND.
Medium dense SAND.
Medium dense, silty SAND or sandy SILT.
Medium dense SAND.
Silty layer.
Dense.
Silty layer.
Stiff, clayey SILT.
Loose to medium dense SAND.
Medium stiff, clayey SILT.
Sandy layer.
Dense to very dense SAND and silty SAND.
Dense.

Depth Feet
0
5
10
15
20
25
30
35
40
45
50

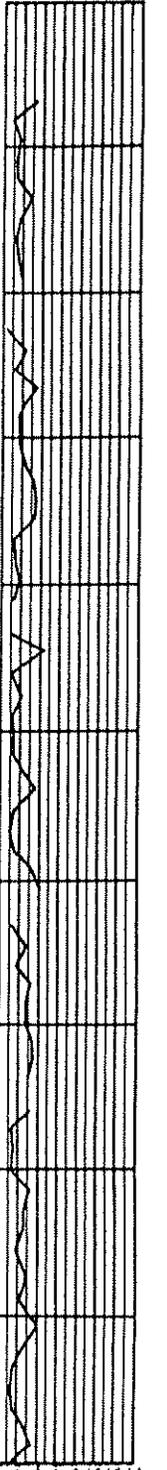
CONE PENETRATION RESISTANCE

Tone/Sq. Ft. _____
1 2 5 10 20 50 100 200 400



FRICITION RATIO %

0 2 4 6 8 10 12 14

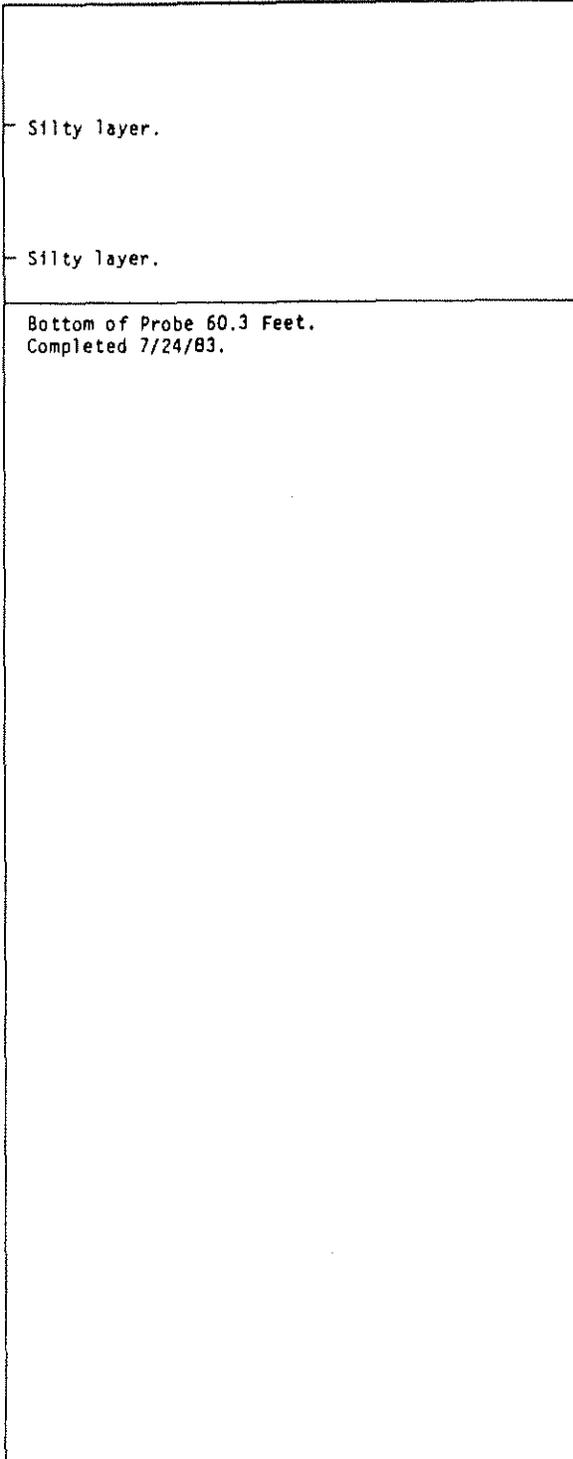


Tone/Sq. Ft. _____

SLEEVE FRICTION

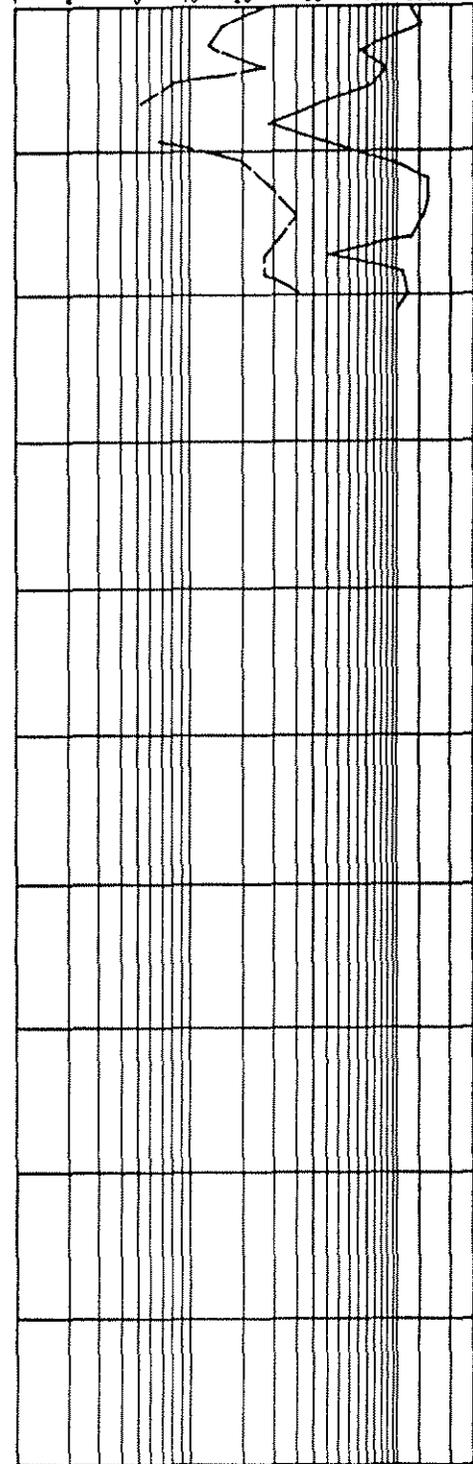
Probe Log P-6

SOIL INTERPRETATION



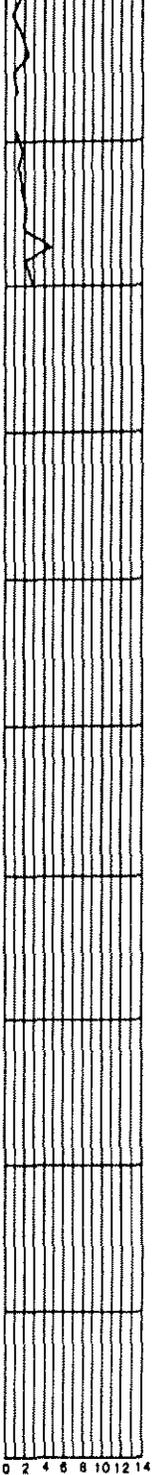
CONE PENETRATION RESISTANCE

Tons/Sq. Ft. 1 2 5 10 20 50 100 200 400



FRICION RATIO %

0 2 4 6 8 10 12 14



SLEEVE FRICTION

Probe Log P-7

SOIL INTERPRETATION

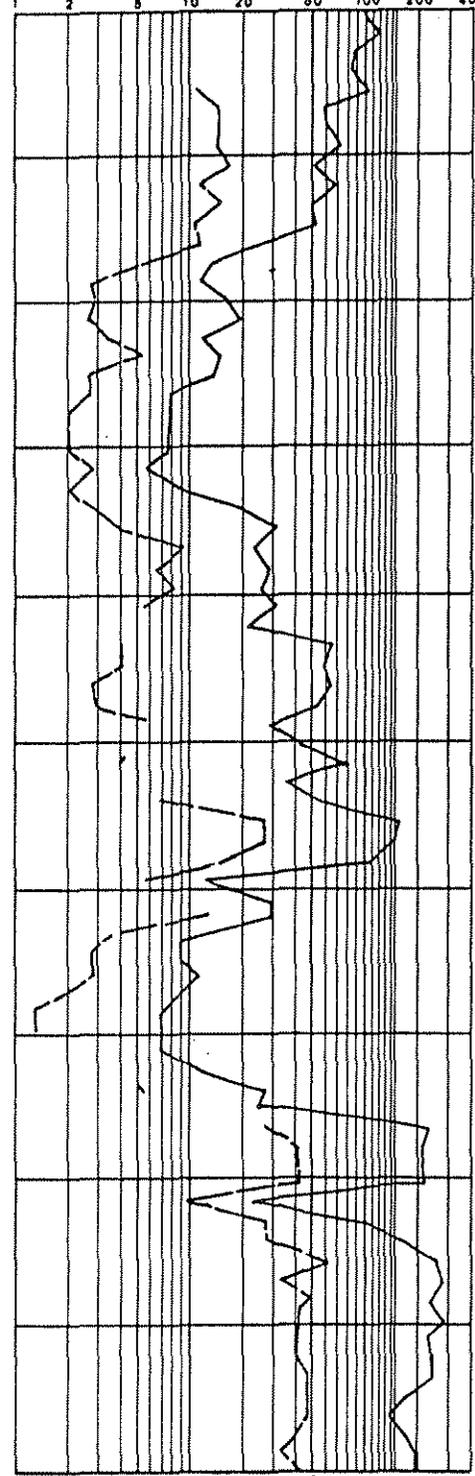
Approximate Ground Surface Elevation in Feet 17

Medium dense SAND.
Medium dense, silty SAND
Medium stiff, clayey SILT and/or sandy SILT.
Soft to medium stiff.
Loose, silty SAND and/or sandy SILT.
Medium dense SAND. Loose to medium dense
Dense. Silty layer. Loose.
Soft to medium stiff, clayey SILT and/or sandy SILT.
Loose SAND. Dense to very dense. Silty layer Very dense.
Dense.

Depth Feet
0
5
10
15
20
25
30
35
40
45
50

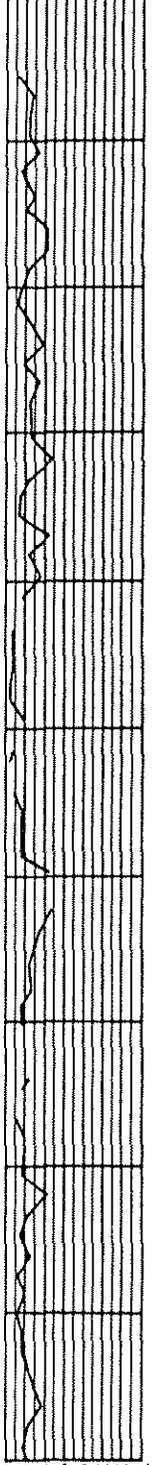
CONE PENETRATION RESISTANCE

Tons/Sq. Ft. 2 5 10 20 50 100 200 400



FRICION RATIO %

0 2 4 6 8 10 12 14



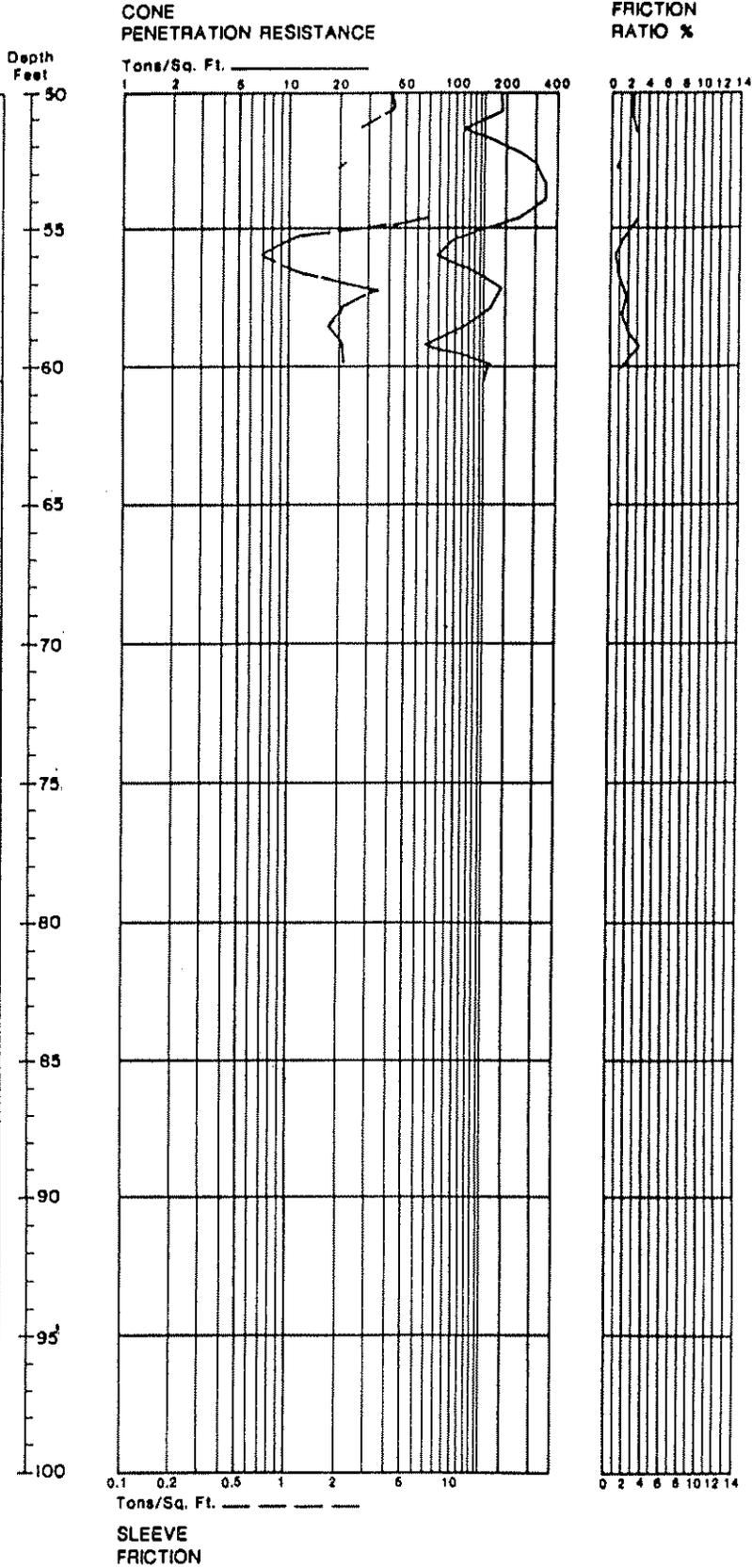
Tons/Bq. Ft. ---

SLEEVE FRICTION

Probe Log P-7

SOIL INTERPRETATION

Dense SAND.
Very dense.
Dense.
Silty sand layer.
Bottom of Probe 60.3 Feet. Completed 7/25/83.



Boring Log B-1

SOIL
INTERPRETATION

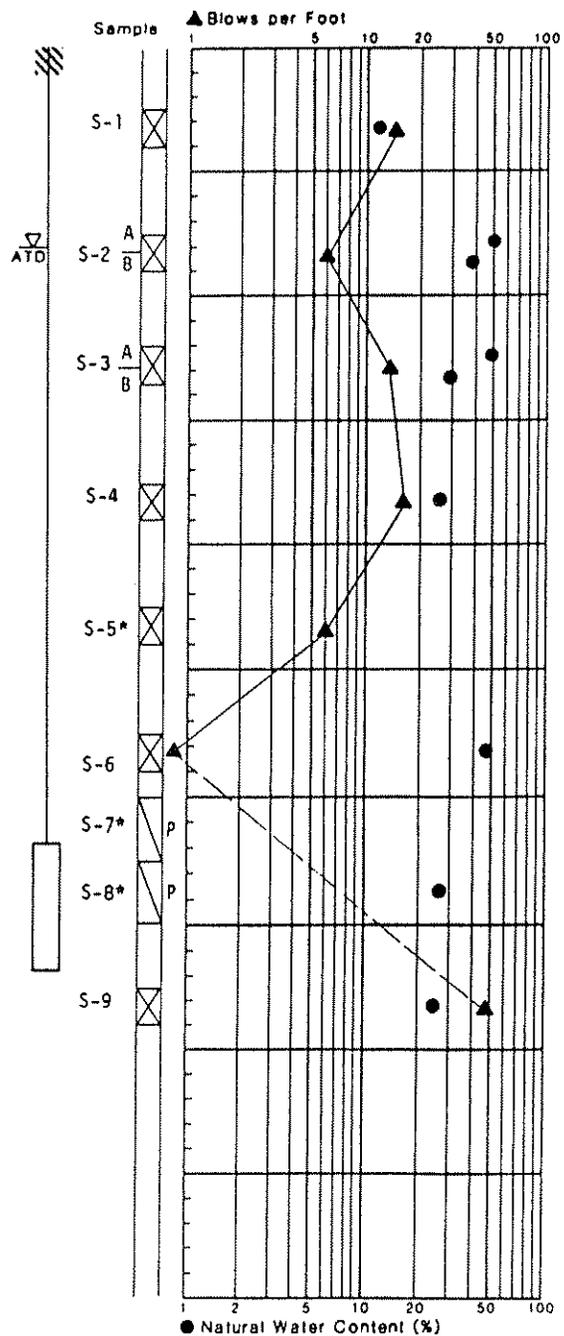
STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY
TESTS

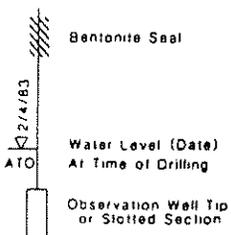
Approximate Ground Surface Elevation in Feet 13

Medium dense, moist, brown, fine to medium SAND. (FILL).	0
Soft, wet to saturated, dark brown, slightly clayey SILT with scattered organics.	5
Loose to medium dense, saturated, dark gray, silty, fine SAND with scattered organics and fine sandy SILT interbeds.	10
Loose to medium dense, saturated, dark gray, fine to medium SAND with scattered root and shell fragments.	15
Very soft, wet to saturated, light gray to brown, slightly fine sandy, clayey SILT with numerous organics.	20
Medium dense to dense, saturated, dark gray to black, fine to medium SAND.	25
Bottom of Boring at 39.0 Feet. Completed 7/20/83.	30
	35
	40
	45
	50

Depth
Feet



Groundwater Level



Sampling

- ☒ 2' O.O. Split Spoon Sample
- ☐ 3' O.O. Shelby Tube Sample
- ▨ Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- QU Unconfined Compression, tsf
- TV Torvane, tsf
- PP Pocket Penetrometer, tsf

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained

Water Content (%)



Notes

- 1 Soil descriptions are interpretive and actual changes may be gradual
- 2 Water Level, if indicated, is for the date specified and may vary with the time of year

Boring Log B-2

SOIL INTERPRETATION

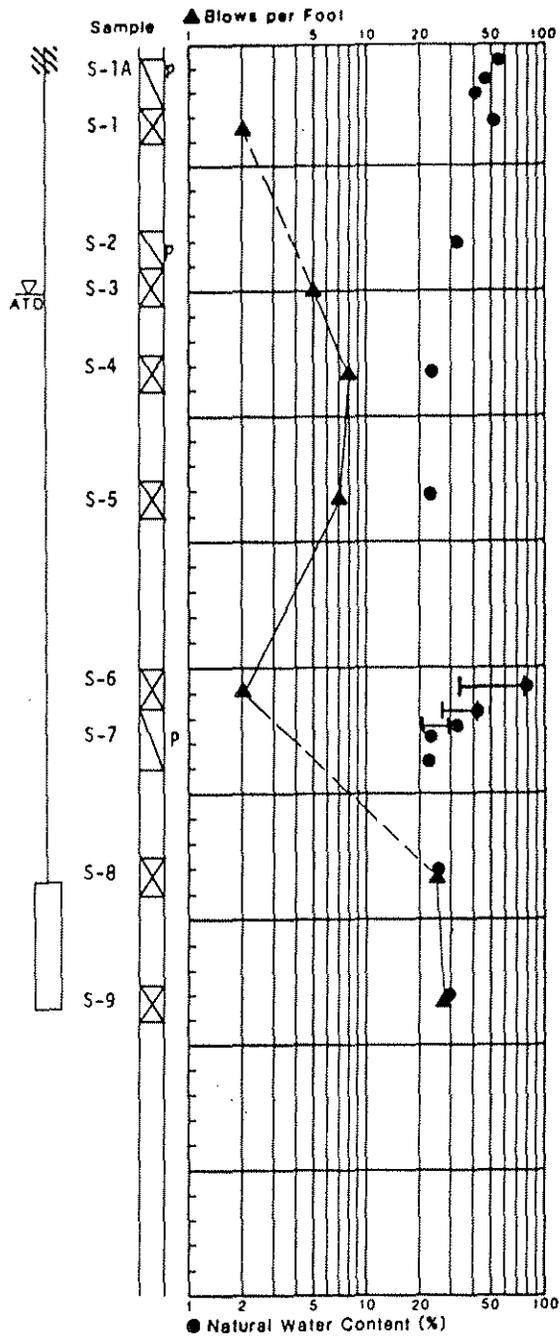
STANDARD PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY TESTS

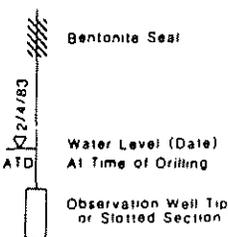
Approximate Ground Surface Elevation in Feet 10

Soft to medium stiff, wet to saturated, dark brown to dark gray to black, laminated, fine sandy SILT with organics, and clay lens.	0
Loose, saturated, black, fine to medium SAND.	5
Loose, saturated, black to dark brown, silty, fine to medium SAND with scattered silt lenses, wood fragments and shell fragments.	10
Very soft, saturated, green-brown, slightly fine sandy SILT with lenses of silty sand to very soft, saturated, clayey SILT.	15
Medium dense, saturated, black, fine to medium SAND.	20
Medium dense, saturated, black, slightly silty to silty, fine to medium SAND.	25
Bottom of Boring at 39.0 Feet. Completed 7/26/83.	30
	35
	40
	45
	50

Depth Feet



Groundwater Level



Sampling

- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- DU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

Notes

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained

Water Content (%)



- 1 Soil descriptions are interpretive and actual changes may be gradual.
- 2 Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-3

SOIL INTERPRETATION

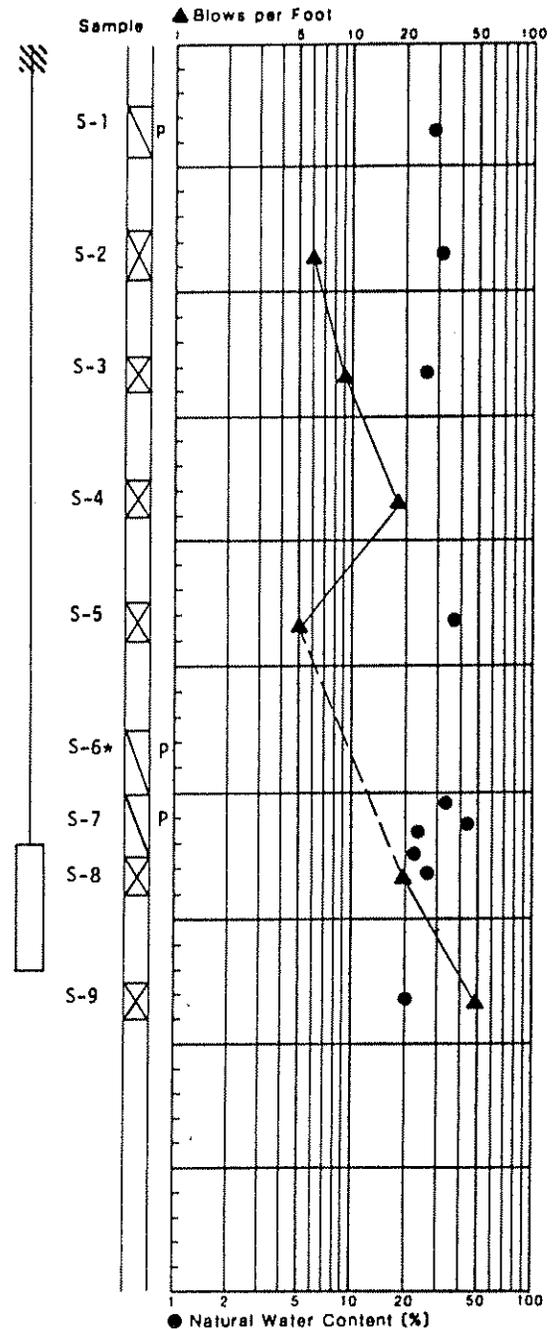
STANDARD PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY TESTS

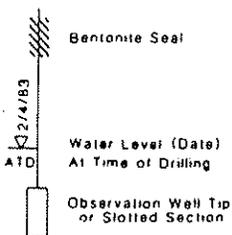
Approximate Ground Surface Elevation in Feet 11

Loose, moist, black, very silty, fine SAND with gray silt laminations.	0
Loose, wet to saturated, black, fine to medium SAND.	5
	10
	15
Soft, saturated, green, clayey SILT.	25
Loose, wet, gray to black, very silty, fine to medium SAND.	30
Dense, saturated, black, fine to medium SAND.	35
Bottom of Boring at 39.0 Feet. Completed 7/26/83.	40
	45
	50

Depth Feet



Groundwater Level



Sampling

- ☒ 2' O.D. Split Spoon Sample
- ☐ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- X Permeability Test
- DS Direct Shear
- QU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained

Water Content (%)



Notes

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-4

SOIL
INTERPRETATION

STANDARD
PENETRATION RESISTANCE

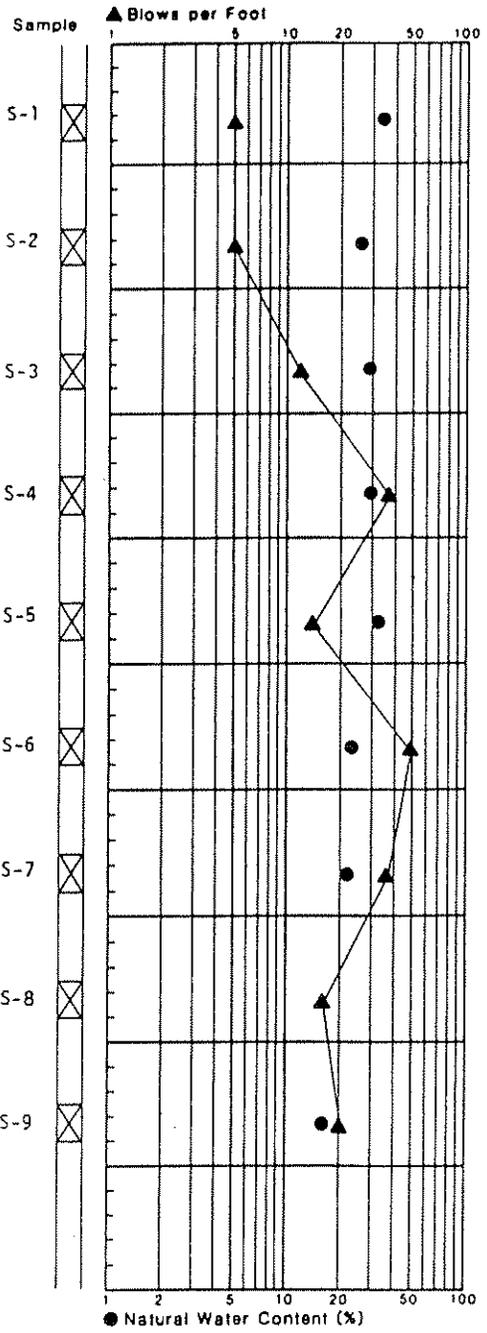
(140 pound weight, 30 inch drop)

LABORATORY
TESTS

Approximate Ground Surface Elevation in Feet 11

Loose, wet, dark gray, very silty, fine SAND to very fine sandy SILT with scattered root fragments.	0
Loose to medium dense, saturated, dark gray to black, fine to medium SAND with scattered fine sandy Silt interbeds and root fragments.	5
Dense, saturated, dark gray, fine to medium SAND with scattered shell fragments.	10
Medium dense to dense, wet to saturated, dark gray, slightly silty to silty, fine SAND with scattered shell fragments.	15
Dense, saturated, dark gray to black, fine to medium SAND.	20
Medium dense, saturated, dark gray, slightly silty to silty, fine SAND with zones of numerous shell fragments and interbeds of fine to medium sand.	25
Bottom of Boring at 44.0 Feet. Completed 7/20/83.	30
	35
	40
	45
	50

Depth
Feet



Groundwater Level	Sampling	Laboratory Tests	Notes
Bentonite Seal	2' O.D. Split Spoon Sample	GS Grain Size Analysis	1 Soil descriptions are interpretive and actual changes may be gradual. 2 Water Level, if indicated, is for the date specified and may vary with the time of year
Water Level (Date) At Time of Drilling	3' O.D. Shelby Tube Sample	CN Consolidation Test	
Observation Well Tip or Slotted Section	Cutting Sample	K Permeability Test	
	No Sample Recovery	DS Direct Shear	
	Sampler Pushed Hydraulically, Not Driven	QU Unconfined Compression, 1st	
		TV Torvane, 1st	
		PP Pocket Penetrometer, 1st	
		Water Content (%)	
		Plastic Limit — Natural — Liquid Limit	

Boring Log B-5

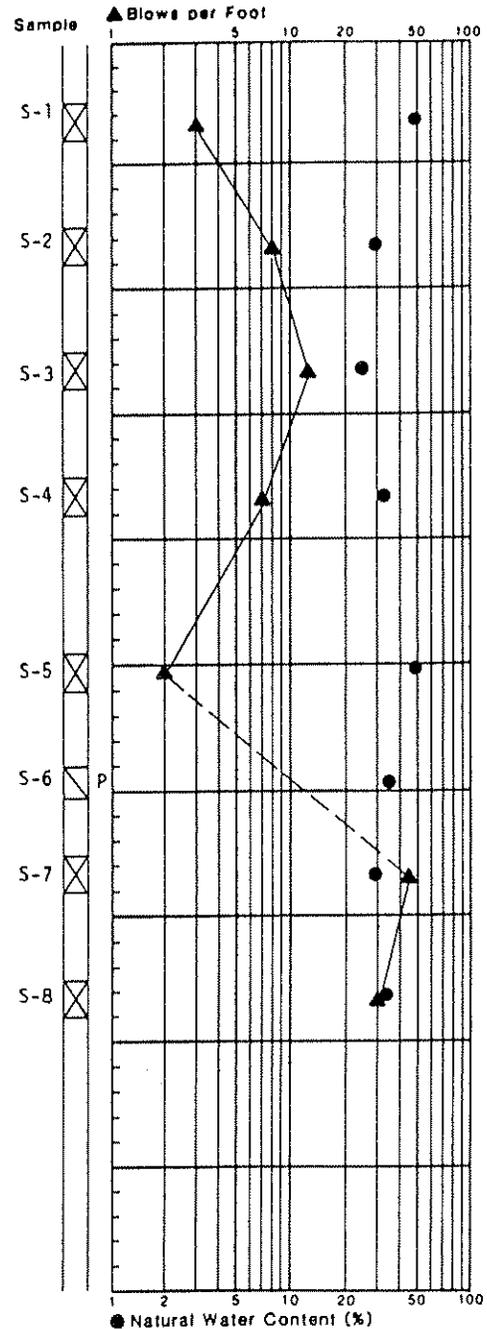
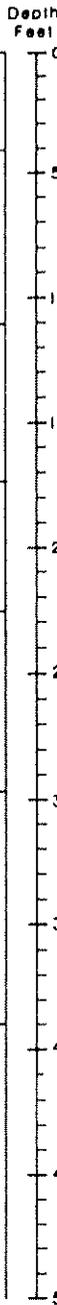
SOIL
INTERPRETATION

STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

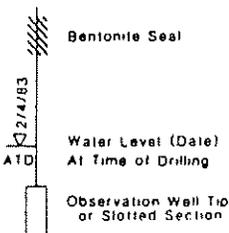
LABORATORY
TESTS

Approximate Ground Surface Elevation in Feet 11

Soft, wet to saturated, gray to brown, fine sandy SILT to very silty, fine SAND with scattered root fragments.	0
Loose, wet to saturated, dark gray to black, fine to medium SAND.	5
Medium dense, saturated, dark gray to black, silty, fine to medium SAND with scattered organics.	10
Loose, saturated, dark gray to black, fine to medium SAND.	20
Soft, saturated, gray to brown, clayey SILT.	25
Dense, saturated, dark gray to black, fine to medium SAND.	30
Bottom of Boring at 39.0 Feet. Completed 7/21/83.	40
	45
	50



Groundwater Level



Sampling

- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- OU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained

Water Content (%)



Notes

- 1 Soil descriptions are interpretive and actual changes may be gradual.
- 2 Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-6

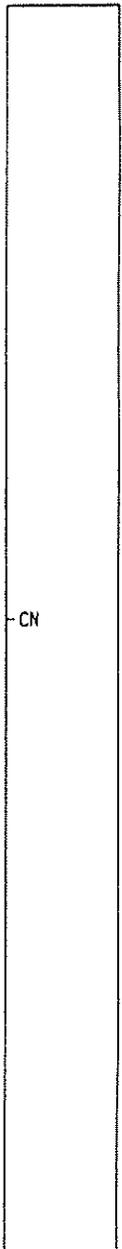
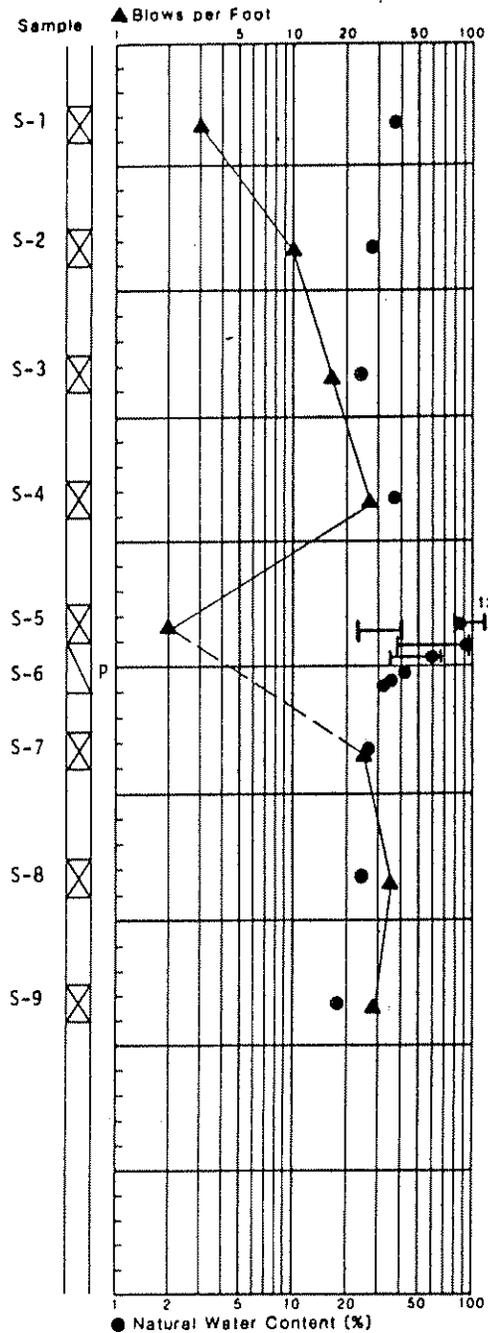
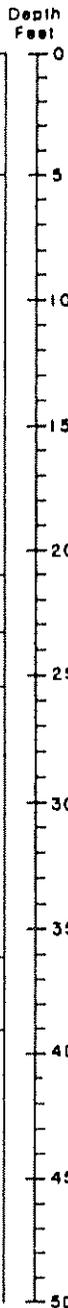
SOIL
INTERPRETATION

STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

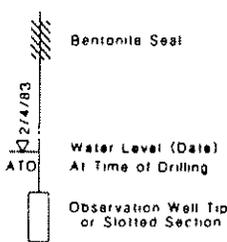
LABORATORY
TESTS

Approximate Ground Surface Elevation in Feet 12

Loose, wet, black, slightly silty, fine SAND.	0
Loose to medium dense, saturated, black fine to medium SAND.	5
Very soft, saturated, gray, slightly fine sandy SILT.	10
Very soft, wet, brown to gray, clayey SILT to silty CLAY with scattered organics and lens of silty sand.	15
Medium dense to dense, wet to saturated, dark gray, fine to medium SAND with scattered laminated silt lenses and wood fragments.	20
Medium dense, saturated, gray slightly silty, fine to medium SAND.	25
Bottom of Boring at 39.0 Feet. Completed 7/22/83.	30
	35
	40
	45
	50



Groundwater Level



Sampling

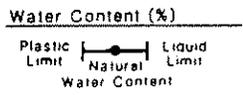
- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- ★ No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- OS Direct Shear
- QU Unconfined Compression, 1st
- TV Torvané, 1st
- PP Pocket Penetrometer, 1st

Notes

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained



1. Soil descriptions are interpretive and actual changes may be gradual
2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-7

SOIL
INTERPRETATION

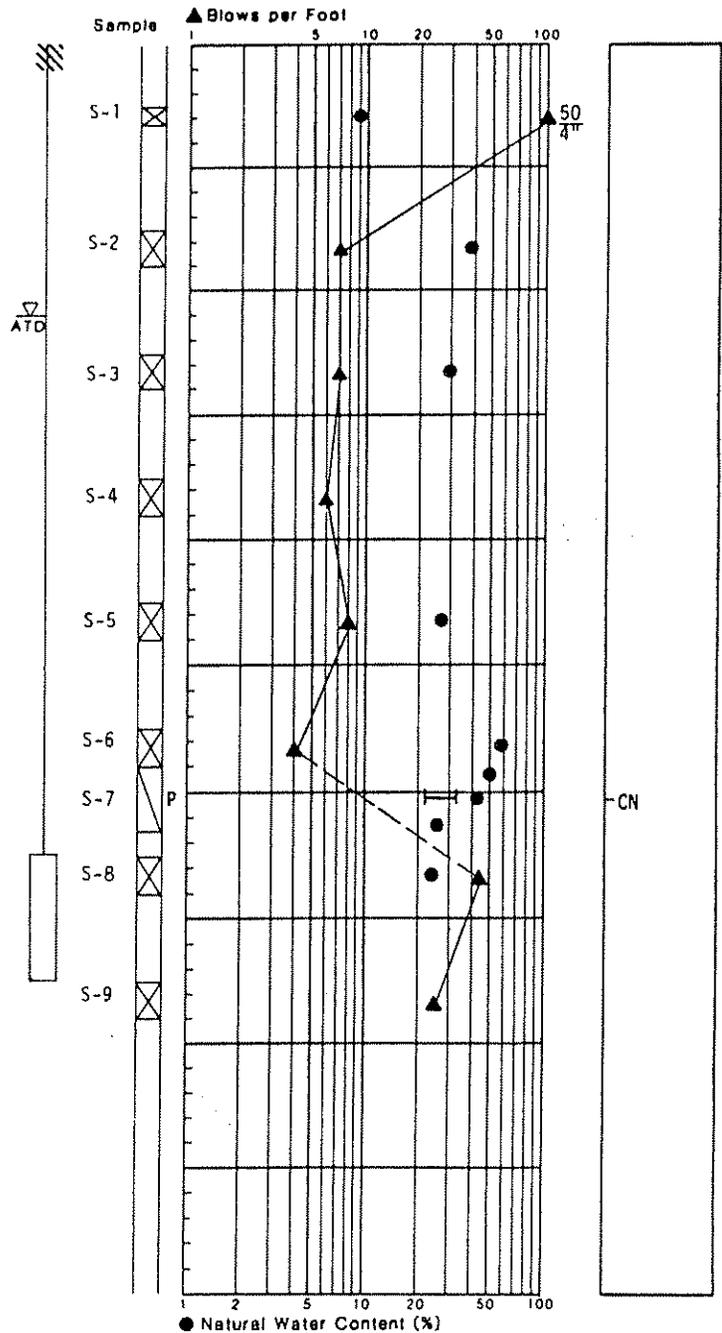
STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY
TESTS

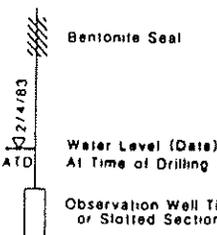
Approximate Ground Surface Elevation in Feet: 14

Very dense, moist, gray to brown, sandy GRAVEL with abundant wood and concrete debris. (FILL).	0
Loose, wet, dark gray, laminated, very fine sandy SILT.	5
Loose, saturated, dark gray to black, fine to medium SAND.	10
Loose, saturated, dark gray to black, silty fine SAND with scattered shell fragments.	20
Loose, saturated, dark gray to black, fine to medium SAND with numerous shell fragments and scattered zones of silty, fine SAND.	25
Soft, wet to saturated, light gray, clayey SILT, silty CLAY to slightly clayey, fine sandy SILT with scattered root fragments and clay lens.	30
Medium dense to dense, saturated, dark gray to black, fine to medium SAND.	35
Bottom of Boring at 39.0 Feet. Completed 7/21/83.	40
	45
	50

Depth
Feet



Groundwater Level



Sampling

- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- OS Direct Shear
- OU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained



Notes

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-8

SOIL
INTERPRETATION

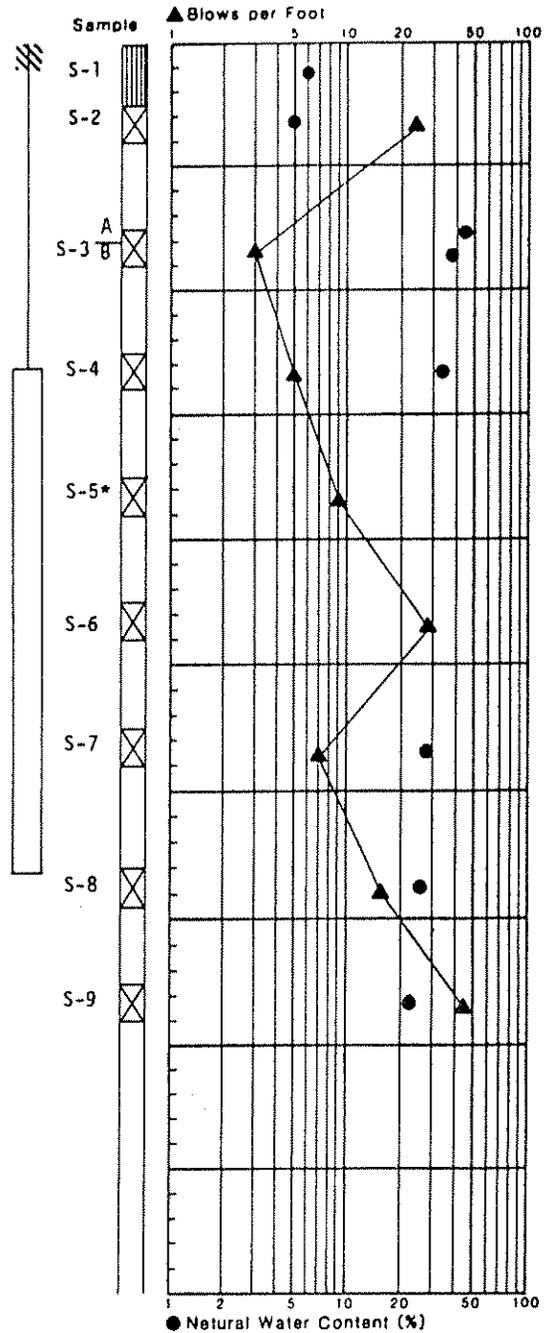
STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY
TESTS

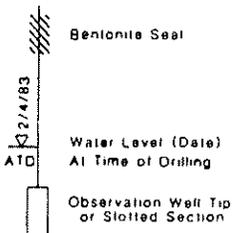
Approximate Ground Surface Elevation in Feet 17

Loose to medium dense, damp, gray to brown, fine to medium SAND with scattered gravel and wood fragments (FILL).	0
Soft, wet, gray, laminated, clayey SILT with scattered root fragments.	5
Loose to medium dense, saturated, dark gray to black, fine to medium SAND with scattered silt interbeds and shell fragments.	10
Loose, saturated, gray to dark gray, silty, fine SAND with a trace of shell fragments.	15
Medium dense, saturated, gray, silty, fine SAND with scattered silt interbeds.	20
Dense, saturated, dark gray to black, fine to medium SAND.	25
Bottom of Boring at 39.0 Feet. Completed 7/22/83.	30
	35
	40
	45
	50

Depth
Feet



Groundwater Level



Sampling

- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- QU Unconfined Compression, 1sf
- TV Torvane, 1sf
- PP Pocket Penetrometer, 1sf

Notes

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Water Content (%)



Boring Log B-9

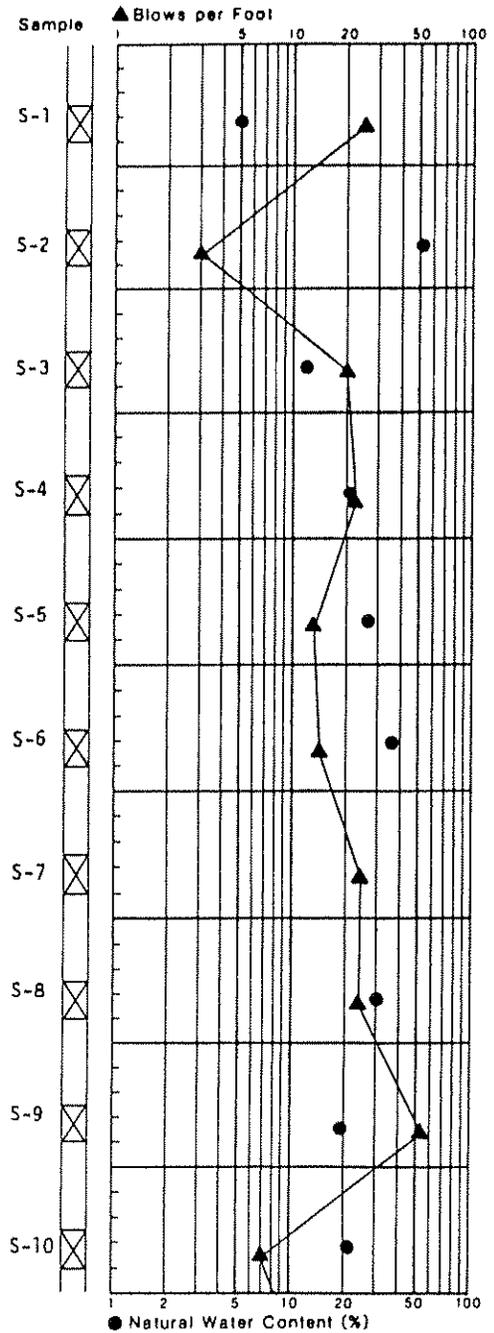
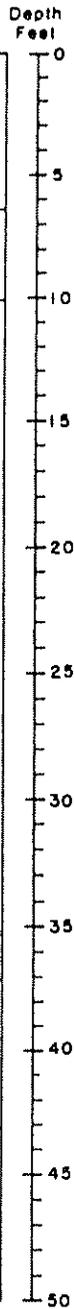
SOIL
INTERPRETATION

STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY
TESTS

Approximate Ground Surface Elevation in Feet 18

Medium dense, damp, gray to brown, fine to medium SAND. (FILL).	0
Soft, moist, black, massive SILT. (FILL).	5
Medium dense, moist to wet, black, fine to medium SAND with scattered gravel and silty sand.	10
	15
	20
	25
	30
	35
Medium dense, wet, black, silty, fine SAND with thin, gray silt interbeds.	40
Very dense, wet, black, fine to medium SAND.	45
Loose, wet to saturated, green-black, silty, fine to medium SAND with scattered shell fragments.	50



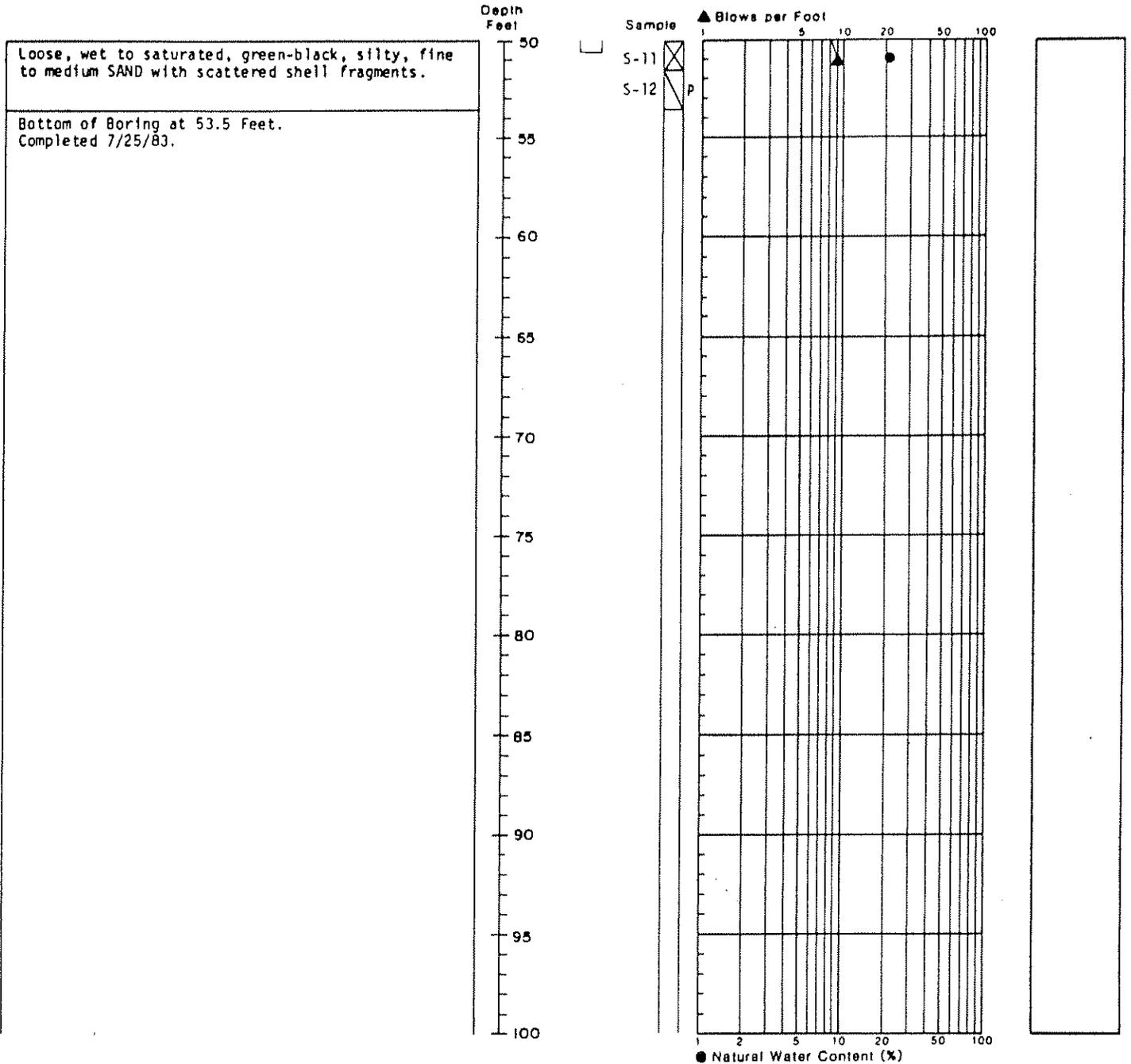
Boring Log B-9

SOIL
INTERPRETATION

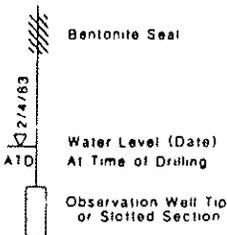
STANDARD
PENETRATION RESISTANCE

LABORATORY
TESTS

(140 pound weight, 30 inch drop)



Groundwater Level



Sampling

- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- ★ No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- OU Unconfined Compression, tsf
- TV Torvane, tsf
- PP Pocket Penetrometer, tsf

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained

Water Content (%)



Notes

- 1 Soil descriptions are interpretive and actual changes may be gradual.
- 2 Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-10

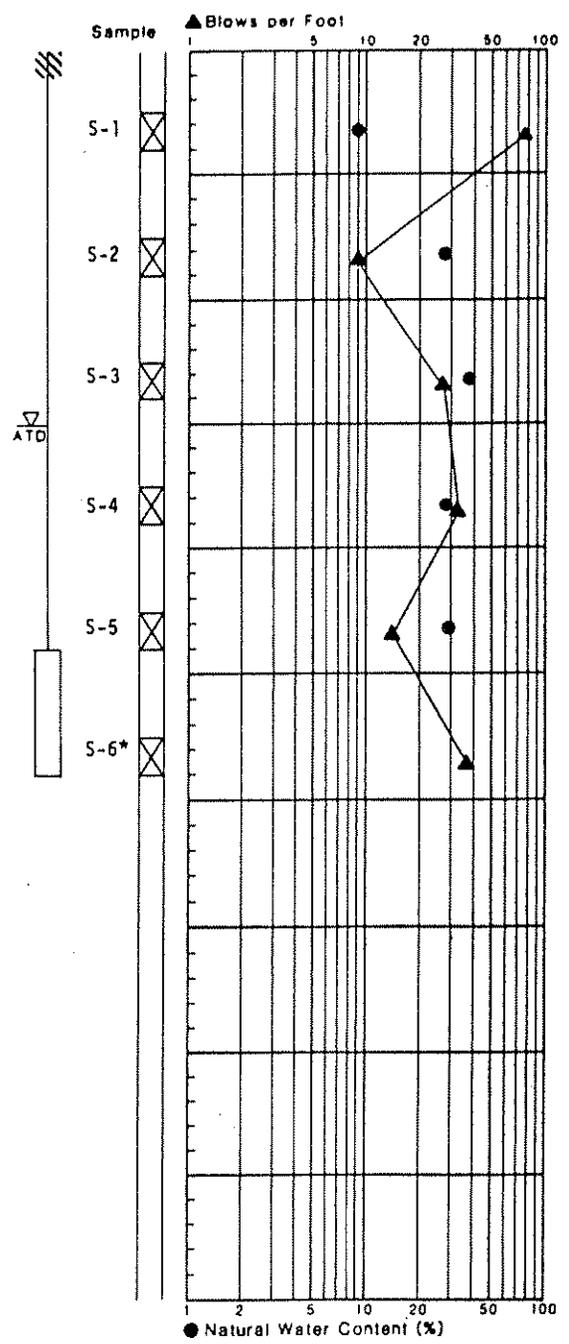
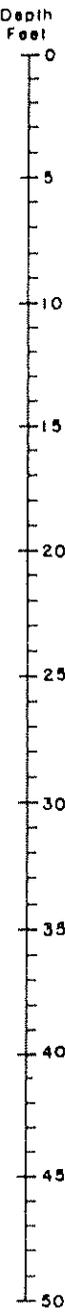
SOIL INTERPRETATION

STANDARD PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

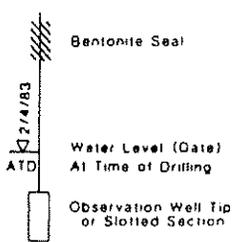
LABORATORY TESTS

Approximate Ground Surface Elevation in Feet 18

Very dense, damp, gray, slightly gravelly, silty SAND with numerous wood fragments. (FILL).	0
Loose, wet, black, silty SAND with scattered gravelly and numerous wood fragments. (FILL).	5
Medium dense to dense, saturated, black, fine to medium SAND.	10
Bottom of Boring at 29.0 Feet. Completed 7/25/83.	15
	20
	25
	30
	35
	40
	45
	50



Groundwater Level



Sampling

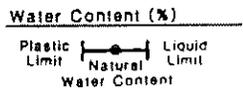
- ☒ 2' O.D. Split Spoon Sample
- ☒ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- ★ No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- OU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

Notes

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained



Notes

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-11

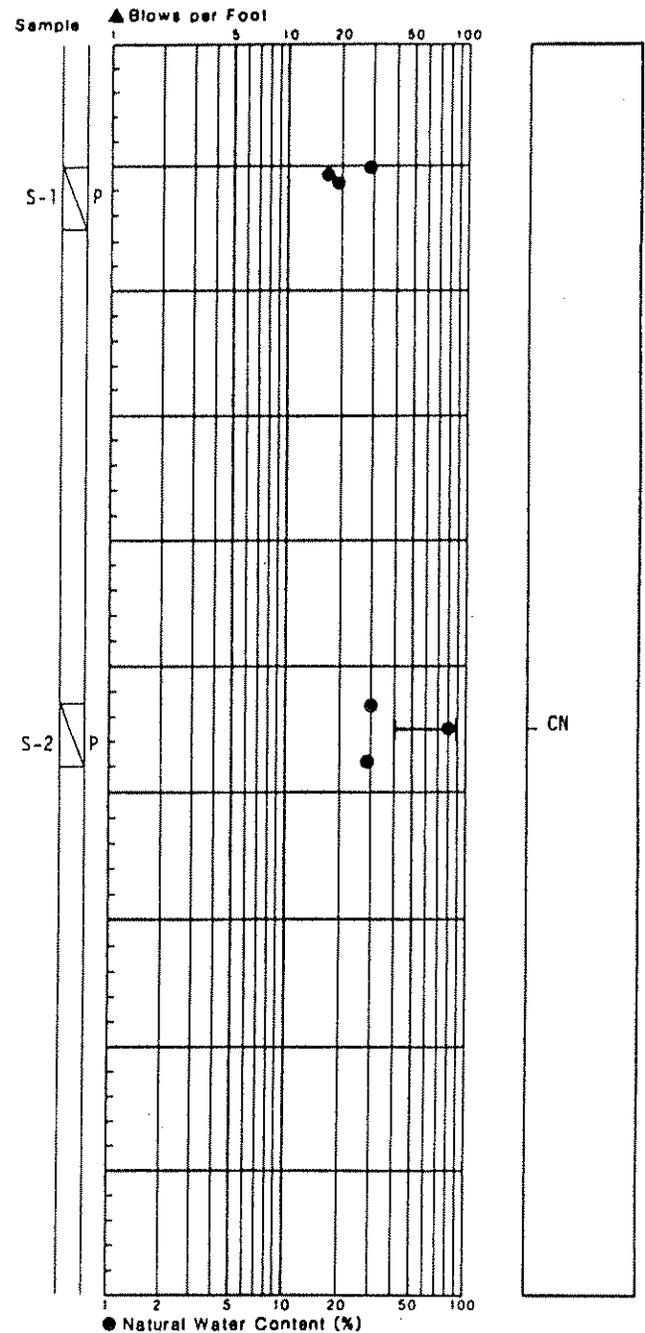
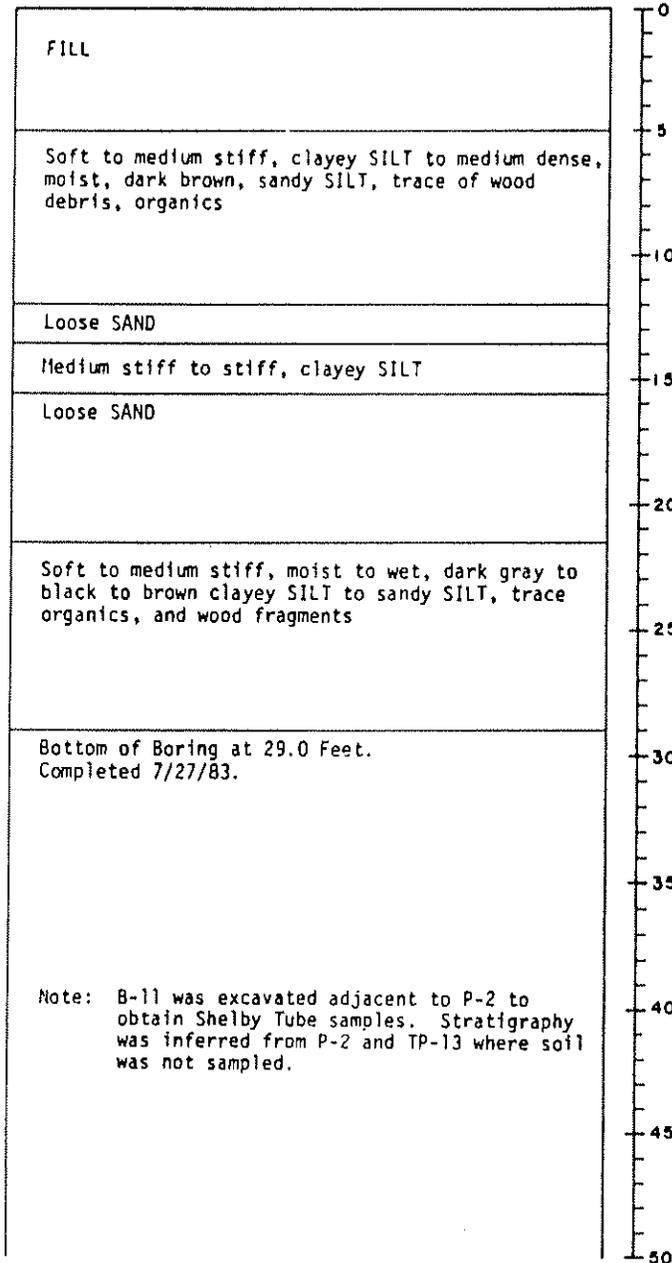
SOIL
INTERPRETATION

STANDARD
PENETRATION RESISTANCE

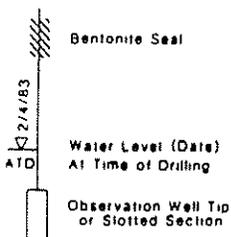
LABORATORY
TESTS

(140 pound weight, 30 inch drop)

Approximate Ground Surface Elevation in Feet 12



Groundwater Level



Sampling

- ☒ 2' O.D. Soil Spoon Sample
- ☐ 3' O.D. Shelby Tube Sample
- ▨ Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- K Permeability Test
- DS Direct Shear
- QU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

- TUU Triaxial Unconsolidated Undrained
- TCU Triaxial Consolidated Undrained
- TCD Triaxial Consolidated Drained



Notes

1. Soil descriptions are interpretative and actual changes may be gradual
2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Boring Log B-12

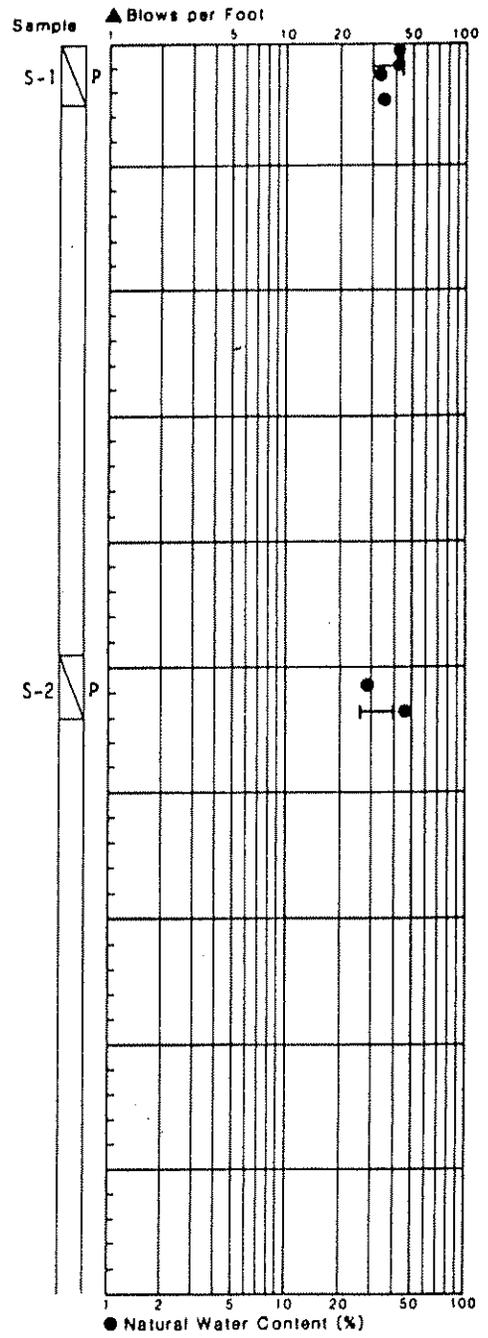
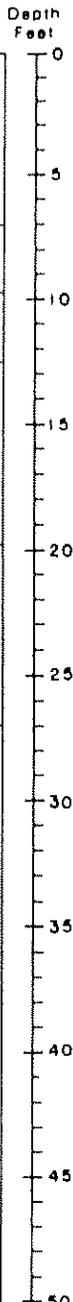
SOIL INTERPRETATION

STANDARD PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY TESTS

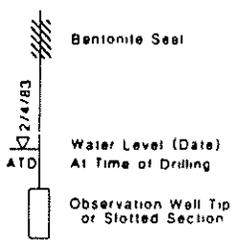
Approximate Ground Surface Elevation in Feet 11

0	Soft to medium stiff, moist, tan to brown, clayey SILT, trace of roots, to fine sandy SILT to silty SAND.
5	Loose to medium dense SAND
10	Loose, silty SAND and/or sandy SILT
15	Loose to medium dense SAND
20	Soft to medium stiff saturated, black to gray, clayey SILT with lens of sand to medium dense, SAND with lens of clayey silt.
25	
30	Bottom of Boring at 27.0 Feet. Completed 7/27/83.
35	Note: B-12 was excavated adjacent to P-5 to obtain Shelby Tube samples. Stratigraphy was inferred from P-5 where soil was not sampled.
40	
45	
50	



CN

Groundwater Level



Sampling

- 2' O.D. Split Spoon Sample
- 3' O.D. Shelby Tube Sample
- Cutting Sample
- * No Sample Recovery
- P Sampler Pushed Hydraulically, Not Driven

Laboratory Tests

- GS Grain Size Analysis
- CN Consolidation Test
- X Permeability Test
- GS Direct Shear
- GU Unconfined Compression, 1st
- TV Torvane, 1st
- PP Pocket Penetrometer, 1st

Notes

- TUU Triaxial Unconsolidated Undrained
 - TCU Triaxial Consolidated Undrained
 - TCD Triaxial Consolidated Drained
- Water Content (%)**
-

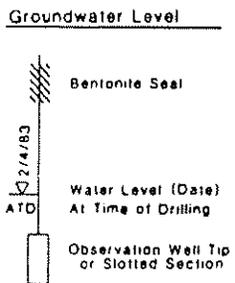
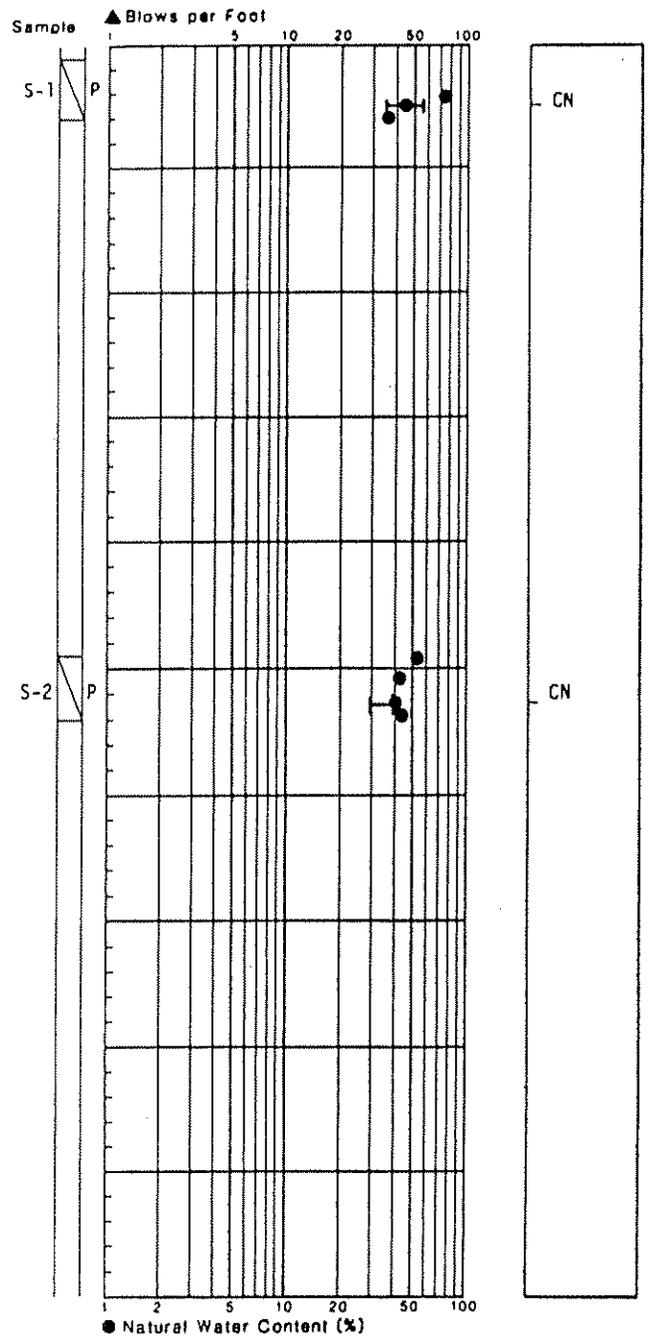
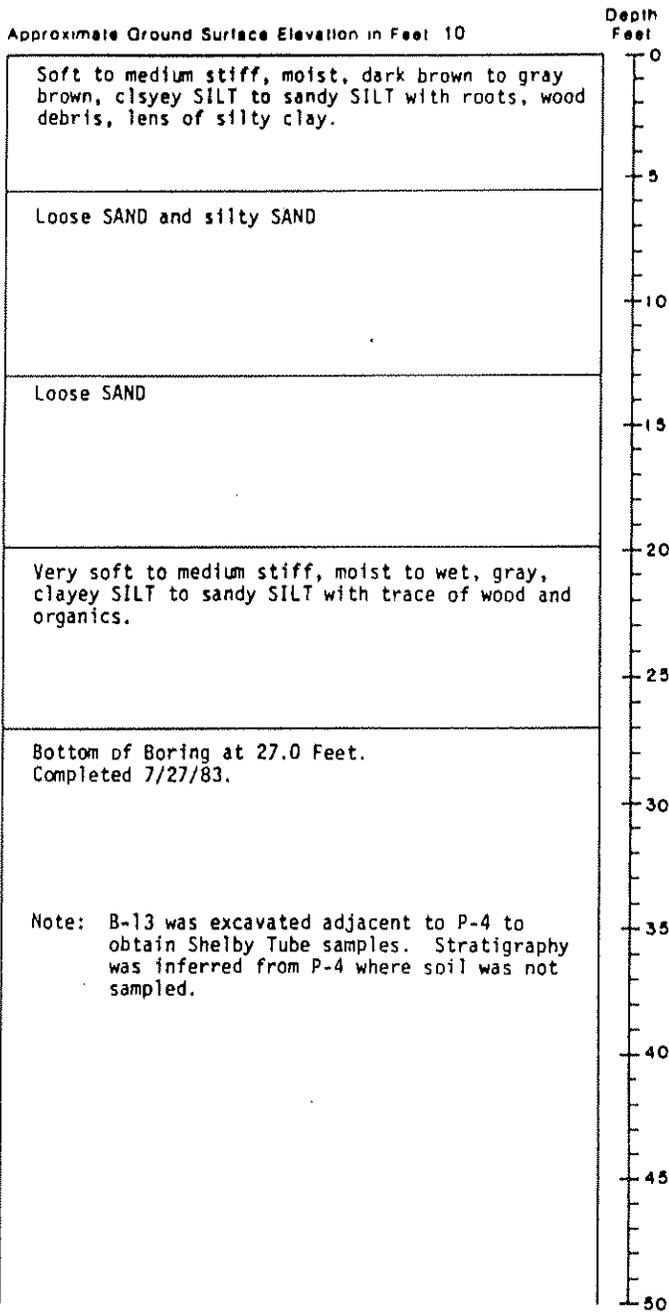
- 1 Soil descriptions are interpretive and actual changes may be gradual.
- 2 Water Level, if indicated, is for the date specified and may vary with the time of year

Boring Log B-13

SOIL
INTERPRETATION

STANDARD
PENETRATION RESISTANCE
(140 pound weight, 30 inch drop)

LABORATORY
TESTS



- Sampling
- ☒ 2' O.D. Split Spoon Sample
 - ☐ 3' O.D. Shelby Tube Sample
 - ▨ Cutting Sample
 - * No Sample Recovery
 - P Sampler Pushed Hydraulically. Not Driven

- Laboratory Tests
- GS Grain Size Analysis
 - CN Consolidation Test
 - K Permeability Test
 - DS Direct Shear
 - QU Unconfined Compression, 1st
 - TV Torvane, 1st
 - PP Pocket Penetrometer, 1st

- Notes
- TUU Triaxial Unconsolidated Undrained
 - TCU Triaxial Consolidated Undrained
 - TCD Triaxial Consolidated Drained
- Water Content (%)
- Plastic Limit — Natural Water Content — Liquid Limit

1. Soil descriptions are interpretive and actual changes may be gradual.

2. Water Level, if indicated, is for the date specified and may vary with the time of year.

Test Pit Log TP-1

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	6	GS	0	
S-2	5		1	(Loose), damp, dark gray, fine to medium SAND with scattered shell fragments (FILL).
S-3	28		3	(Medium stiff) moist, brown, fine sandy SILT.
			4	
			5	(Loose), damp, dark gray, fine to medium SAND with scattered shell fragments (FILL).
			6	
S-4	28		7	(Loose), wet, gray to brown, silty, fine SAND with thin, interbeds of fine, sandy SILT.
			8	Bottom of Test Pit at 7.5 Feet. Completed 7/19/83.
			9	Note: Severe caving below 5 feet depth.
			10	
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-2

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 18
S-1	14		0	Vegetative mat and organic-rich soil.
S-2	4		1	(Loose), moist, brown, silty, gravelly SAND overlying (loose), moist, black to brown, fine SAND.
			2	
S-3	4		3	(Loose), damp, fine to medium SAND (FILL).
			4	
			5	
			6	
			7	
			8	Bottom of Test Pit at 8.0 Feet. Completed 7/19/83.
			9	
			10	Note: Severe caving throughout depth excavated.
			11	
			12	
			13	
			14	
			15	

NOTES:

- Soil descriptions are interpretive and actual changes may be gradual.
- Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-3

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	16		0	(Loose), moist, dark brown, gravelly, silty SAND (FILL).
S-2	7		1	(Loose), damp, dark gray, fine to medium SAND (FILL) with scattered fine GRAVEL.
			2	
S-3	32	TV=0.3-0.4	3	(Medium stiff), wet, gray to brown massive, fine sandy SILT.
S-4	49	PP=2.5 TV=0.14-0.20 PP=0.25	4	(Soft), wet to saturated, gray to brown, thinly bedded clayey SILT to silty CLAY.
			5	
		♀ moderate	6	(Loose), wet, brown, fine to medium SAND.
			7	(Soft), wet, gray, interbedded fine sandy SILT and fine to medium SAND.
S-5	30		8	Bottom of Test Pit at 9.0 Feet. Completed 7/19/83.
			9	
			10	Note: Moderate seepage below 6.5 feet depth.
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-4

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	6	GS, CBR	0	(Loose), damp, dark gray, fine to medium SAND with occasional shell fragments (FILL).
S-2	6		1	
			2	Grades moist.
			3	
			4	
S-3	14		5	Bottom of Test Pit at 7.5 Feet. Completed 7/19/83.
			6	
			7	Note: Severe caving throughout depth excavated.
			8	
			9	
			10	
			11	
			12	
			13	
			14	
			15	

NOTES:

- Soil descriptions are interpretive and actual changes may be gradual.
- Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-5

Sample	Water Content In %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	9		0	Vegetative mat and organic-rich, silty SAND.
S-2	3		1	(Loose), damp, gray, fine SAND with scattered interbeds or brown silt and moderate fine roots.
			2	(Loose), damp, dark gray, fine to medium SAND (FILL).
			3	
			4	
			5	
			6	
S-3	19		7	
			8	
			9	Bottom of Test Pit at 8.0 Feet. Completed 7/19/83.
			10	
			11	Note: Severe caving throughout depth excavated.
			12	
			13	
			14	
			15	

Test Pit Log TP-6

Sample	Water Content In %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	--		0	(Loose), dry, slightly silty, sandy, crushed rock GRAVEL. (FILL).
S-2	12		1	(Medium dense), moist, brown, slightly silty, slightly gravelly SAND with scattered cinders, glass, and brick pieces (FILL).
S-3	5		2	(Loose to medium dense), damp, dark gray, fine to medium SAND (FILL) with silty fine SAND interbeds below 2.5 feet.
S-4	49	TV=0.1 PP=0.25 0.5	3	(Soft), saturated, gray, massive clayey SILT.
			4	
			5	(Loose), wet, brown, fine to medium SAND.
			6	(Loose), saturated, gray, fine SAND with (very soft), saturated, gray, clayey SILT interbeds.
		♀ rapid	7	(Loose), saturated, blue-gray, fine SAND to fine to coarse SAND.
			8	
			9	(Very loose), saturated, black wood fragments and organic debris.
S-5	186		10	Bottom of Test Pit at 10.0 Feet. Completed 7/19/83.
			11	
			12	
			13	Note: Severe caving below 6.5 feet depth. Rapid seepage below 6.5 feet depth.
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-7

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 18
S-1	6		0	(Loose), damp, dark brown, gravelly, silty SAND (FILL).
S-2	6		1	(Loose), damp to moist, dark gray, fine to medium SAND with substantial shell fragments.
			2	
			3	
			4	
			5	
S-3	16		6	Saturated below 6.0 feet.
			7	Bottom of Test Pit at 7.0 Feet. Completed 7/19/83.
			8	
			9	Note: Severe caving throughout depth excavated.
			10	
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-8

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 18
S-1	9		0	(Loose), damp, dark gray, slightly silty, fine to medium SAND (FILL) with scattered shell fragments.
S-2	9		1	Grades (medium dense), damp to moist, dark gray, fine to medium SAND (FILL).
			2	
			3	
			4	
			5	
			6	
			7	
			8	
S-3	8		9	Bottom of Test Pit at 9.0 Feet. Completed 7/19/83.
			10	
			11	Note: Slight caving below 6 feet depth.
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-9

Sample	Water Content in %	Other Tests	Depth In Feet	SOIL INTERPRETATION
				Approximate Ground Surface Elevation in Feet 18
S-1	4		0	(Loose), damp, brown, organic-rich, silty SAND with substantial fine roots.
S-2	20		1	(Loose), damp, dark gray, fine to medium SAND (FILL).
S-3	55	TV=0.1-0.05	2	(Soft to medium stiff), moist, gray to brown, interbedded, fine sandy SILT and fine to medium SAND.
			3	
S-4	138		4	(Very soft), saturated, gray to brown, silty CLAY to clayey SILT.
			5	(Medium dense), wet, dark gray, fine to medium SAND.
			6	
			7	
			8	
			9	(Medium stiff), wet, gray, fine sandy SILT with interbedded fibrous organic material.
			10	Bottom of Test Pit at 9.5 Feet. Completed 7/19/83.
			11	Note: Severe caving below 7 feet depth.
			12	
			13	
			14	
			15	

Test Pit Log TP-10

Sample	Water Content in %	Other Tests	Depth In Feet	SOIL INTERPRETATION
				Approximate Ground Surface Elevation in Feet 18
S-1	-		0	(Medium dense), damp, brown, sandy GRAVEL and COBBLES.
S-2	5		1	(Loose), damp, dark gray, fine to medium SAND (FILL).
			2	
			3	With scattered shell fragments below 3 feet.
			4	
			5	
			6	
S-3	19		6	Grades to wet.
			7	
			8	Bottom of Test Pit at 7.5 Feet. Completed 7/19/83.
			9	Note: Slight caving throughout depth excavated.
			10	
			11	
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP- 11

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION
				Approximate Ground Surface Elevation in Feet 17
S-1	6	GS	0	Vegetative mat and silty SAND.
S-2	11		1	(Loose), damp, dark gray to brown, fine SAND with substantial layering of silty fine SAND to around 1-inch thick.
S-3	6		2	
			3	(Loose), damp, dark gray, fine to medium SAND.
			4	
			5	
			6	
			7	
S-4	40		8	(Loose), saturated, gray to brown, interbedded fine to medium SAND and very silty, fine SAND with scattered (very soft), silty CLAY layers to 2-inch thickness.
			9	Bottom of Test Pit at 9.0 Feet. Completed 7/19/83.
			10	
			11	
			12	Note: Severe caving below 6 feet depth.
			13	
			14	
			15	

Test Pit Log TP-12

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION
				Approximate Ground Surface Elevation in Feet 17
S-1	--		0	(Medium dense), damp, dark brown, cemented, clean to slightly silty, fine to medium SAND with scattered pods of dark brown SILT (FILL).
S-2	6		1	(Loose), damp, dark gray, fine to medium SAND.
			2	
			3	
			4	
			5	
			6	
			7	Wet to saturated below 6.5 feet.
S-3	34		8	
			9	Bottom of Test Pit at 9.0 Feet. Completed 7/19/83.
			10	
			11	
			12	Note: Severe caving below 6 feet depth.
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-13

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION	
				Approximate Ground Surface Elevation in Feet 18	
			0	Vegetative mat and (loose), damp, brown, silty SAND.	
S-1	5		1	(Medium dense), damp, gray, gravelly, fine to medium SAND (FILL).	
S-2	8		2	(Loose to medium dense), moist, brown, silty, fine SAND (FILL).	
S-3	31		3	(Medium stiff), wet, gray to brown, slightly fine sandy SILT (FILL).	
			4	(Medium dense), damp, brown, fine to medium SAND.	
			5		
S-4	24		6	(Loose), wet, gray, silty, fine SAND with moderate amounts of wood debris from 5 to 7.0 feet and lenses of gray SILT. (FILL).	
			7		
			8		
			9		
			10		
			11		
			12	Bottom of Test Pit at 11.0 Feet. Completed 7/20/83.	
			13		
			14		
			15		

Test Pit Log TP-14

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION	
				Approximate Ground Surface Elevation in Feet 17	
			0	Vegetative mat and organic-rich silty SAND.	
S-1	11	GS, CBR	1	(Loose to medium dense), moist, brown, slightly silty, fine to medium SAND (FILL).	
			2		
S-2	3		3	(Loose), damp, dark gray, fine to medium SAND (FILL).	
			4		
			5		
			6		
			7		
S-3	40		8	(Medium stiff), saturated, gray to brown, mottled fine sandy SILT with SILT interbeds.	
			9		
			10	Bottom of Test Pit at 9.5 Feet. Completed 7/20/83.	
			11		
			12		
			13	Note: Moderate caving within upper 7.5 feet.	
			14		
			15		

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP- 15

Sample	Water Content in %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17.5
S-1	9		0	Vegetative mat and organic-rich, silty SAND.
			1	(Loose), damp, brown, fine to medium SAND (FILL).
S-2	18		2	(Medium dense), moist, slightly mottled brown to gray, silty, fine to medium SAND with interbeds of (stiff), fine sandy SILT (FILL).
S-3	3		3	(Medium dense to loose), damp, dark gray, fine to medium SAND (FILL).
			4	
			5	
			6	
S-4	39		7	(Medium stiff), saturated, brown to gray, heavily mottled, fine sandy SILT.
			8	
			9	
			10	Bottom of Test Pit at 10.0 Feet.
			11	Completed 7/20/83.
			12	Note: Slight caving from 4-7 feet depth.
			13	
			14	
			15	

Test Pit Log TP-16

Sample	Water Content in %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	7		0	Vegetative mat and organic-rich, silty fine SAND.
			1	(Loose), damp, brown, fine SAND with substantial fine roots (FILL).
S-2	4		2	(Loose to medium dense), damp, brown to dark gray, interbedded silty, fine SAND and fine to medium SAND (FILL).
			3	
			4	(Loose), damp, dark gray, fine to medium SAND with scattered silty fine SAND interbeds.
			5	
			6	
			7	
S-3	33		8	Saturated below 8.0 feet, with scattered organic debris (wood chips).
			9	
			10	Bottom of Test Pit at 10.0 Feet.
			11	Completed 7/20/83.
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

J-1280

August

1983

HART-CROWSER & associates inc.

Figure A-29

Test Pit Log TP-17

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 16.5
S-1	3		0	vegetative mat and organic rich, silty SAND.
			1	(Loose), damp, dark gray, fine to medium SAND with scattered slightly silty layers. (FILL).
S-2	26		2	
			3	(Medium dense), wet, mottled gray to brown, silty, fine SAND with fine sandy SILT layers (FILL).
S-3	4		4	(Medium dense), damp, dark gray, fine to medium SAND (FILL).
			5	
			6	(Medium stiff), moist, gray, fine sandy SILT.
			7	(Medium dense), damp, dark gray, fine to medium SAND (FILL).
S-4	35		8	(Stiff), moist, gray, thinbedded, fine sandy SILT.
			9	
			10	Bottom of Test Pit at 10.0 Feet.
			11	Completed 7/20/83.
			12	
			13	
			14	
			15	

Test Pit Log TP-18

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	--		0	(Medium dense), damp, brown to gray, gravelly SAND (FILL).
S-2	23		1	(Loose), moist, dark brown, slightly gravelly, silty, fine to medium SAND with substantial amounts of wood debris (FILL).
			2	
S-3	5		3	(Medium dense), damp, brown, fine to medium SAND (FILL) with fine roots to 3.5-foot depth (FILL).
			4	
			5	
			6	(Loose), wet, gray with heavy mottling, silty, fine SAND.
			7	
			8	
S-4	41		9	Grades to medium stiff, wet to saturated, gray to brown, massive, fine sandy SILT.
		TV=0.05	10	Around 1-inch thick layer (very soft), saturated, gray, silty CLAY.
			11	Bottom of Test Pit at 11.0 Feet.
			12	Completed 7/20/83.
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-19

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 16
S-1	13		0	(Loose), moist, brown, gravelly, silty, fine to medium SAND (FILL).
S-2	4		1	(Loose), damp, dark gray, fine to medium SAND (FILL) with substantial roots to 2 inches diameter to 2.5 foot depth.
			2	
			3	Grades (medium dense)
			4	
			5	
			6	
			7	
S-3	53	TV=0.1	8	(Soft), saturated, gray, laminated SILT with interbeds of clayey SILT.
		∇	9	1 inch thick interbeds of (very soft), silty CLAY below 9 foot depth.
S-4	46	○	10	
		TV=.05	11	
			12	Bottom of Test Pit at 11.0 Feet. Completed 7/20/83.
			13	
			14	Note: Sudden rapid seepage at 10 feet depth. Water level stabilized at 9 feet depth.
			15	

Test Pit Log TP-20

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 16
S-1	10		0	(Loose), damp, brown to dark gray, fine to medium SAND (FILL) with scattered fine roots from 1 to 2.5 foot depths.
S-2	8		1	
			2	
			3	
S-3	14		4	
			5	
			6	
			7	(Soft), wet to saturated, gray to brown, fine sandy SILT with occasional thin layers of (very soft), wet, gray, silty CLAY and strong fuel odor.
			8	
			9	
S-4	42		10	
			11	Bottom of Test Pit at 10.5 Feet. Completed 7/20/83.
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

J-1280

August

1983

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Figure A-31

Test Pit Log TP-21

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION	
				Approximate Ground Surface Elevation in Feet	18
S-1	9		0	vegetative mat and organic-rich, silty SAND.	
S-2	4		1	(Loose), damp, dark brown to black, silty, fine to medium SAND with scattered fine roots (FILL).	
			2	(Loose), damp, dark gray, fine to medium SAND (FILL).	
			3		
			4		
			5		
			6		
			7		
			8		
S-3	52	TV=0.1	10	(Soft), saturated, gray to brown, clayey SILT with interbeds of fine sandy SILT.	
			11	Bottom of Test Pit at 10.5 Feet.	
				Completed 7/20/83.	
			12		
			13		
			14		
			15		

Note: Severe caving in upper 9.5 feet.

Test Pit Log TP-22

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION	
				Approximate Ground Surface Elevation in Feet	18
S-1	9		0	(Loose), damp, brown, sandy crushed rock GRAVEL (varies to 1 to 4 inches thick) (FILL).	
S-2	10		1	(Loose), damp, brown, slightly silty, fine to medium SAND.	
			2	(Medium dense), damp, dark gray, fine to medium SAND.	
			3		
			4		
			5		
			6		
			7		
			8		
S-3	34		9	Medium dense, saturated, gray to brown, silty, fine to medium SAND with scattered thin clayey SILT layers.	
			10	Bottom of Test Pit at 9.0 Feet.	
				Completed 7/20/83.	
			11		
			12		
			13		
			14		
			15		

Note: Severe caving throughout depth excavated.

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP- 23

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 18
S-1	BS-1		0	(Medium dense), moist, brown, sandy crushed rock GRAVEL (FILL).
S-2	5		1	(Medium dense), moist, black, slightly silty, fine to medium SAND (FILL).
S-3	5		2	(Medium dense), damp, dark gray, fine to medium SAND with scattered silty interbeds (FILL).
			3	
			4	
			5	
			6	
			7	
			8	(Loose), saturated, mottled gray, silty, fine SAND with partings of organic material.
S-4	42		9	Grading to (Medium stiff), wet, gray, fine sandy SILT with thin layers of clayey SILT and silty SAND.
			10	Bottom of Test Pit at 10.5 Feet. Completed 7/20/83.
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP- 24

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	6		0	(Loose), moist, dark brown, slightly silty, fine to medium SAND.
S-2	5		1	(Loose), damp, dark gray, fine to medium SAND (FILL).
			2	
			3	
			4	
			5	
			6	
S-3	40	Q slow	7	Grades to (medium dense), saturated, gray to brown, silty, fine SAND beds to around 3-inch thick below 6.5 feet.
			8	Bottom of Test Pit at 10.0 Feet. Completed 7/20/83.
			9	
			10	
			11	
			12	
			13	Note: Severe caving throughout depth excavated. Slow seepage below 7.5 feet.
			14	
			15	

NOTES:

- Soil descriptions are interpretive and actual changes may be gradual.
- Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-25

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 19
S-1	5	GS	0	Vegetative mat and loose, silty SAND.
S-2	8		1	(Medium dense), damp to moist, dark gray, fine to medium SAND with scattered silty interbeds (FILL).
			2	
			3	
			4	
			5	
			6	
			7	
			8	
			9	
			10	Bottom of Test Pit at 9.5 Feet. Completed 7/22/83.
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-26

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 18
S-1	4		0	(Loose), moist, dark gray, fine to medium SAND F(LL).
S-2	29		1	(Medium stiff), moist, tan SILT (FILL).
S-3	3		2	
			3	(Loose to medium dense), moist, dark gray to black, fine to medium SAND. (FILL).
			4	
			5	
			6	
S-4	40		7	
			8	(Soft to medium stiff), moist to wet, gray to brown, laminated to massive, slightly clayey SILT.
			9	Bottom of Test Pit at 8.5 Feet. Completed 7/21/83.
			10	
			11	Note: Severe caving at 8.5 feet depth.
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-27

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	16	GS	0	(Medium stiff to stiff), moist, mottled, oxidized, fine sandy SILT with scattered fine roots (FILL).
S-2	4		1	(Loose to medium dense), moist, gray, massive, fine to medium SAND. (FILL).
			2	
			3	
			4	
			5	
			6	
S-3	28		7	(Medium stiff to stiff), moist to wet, gray, massive, very fine sandy SILT, becoming clayey towards the bottom.
			8	
			9	
S-4	37		10	Bottom of Test Pit at 10.0 Feet. Completed 7/21/83.
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-28

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 15
S-1	9	GS	0	(Loose), moist, gray, gravelly SAND (Preload FILL).
			1	
S-2	25		2	(Loose), moist, black to gray, very silty, fine to medium SAND with lenses of brown SILT. (FILL).
			3	
S-3	38		4	(Medium stiff to stiff), moist, tan to brown to dark brown, massive SILT with strong fuel odor.
			5	
			6	
			7	
			8	(Medium stiff), wet to saturated, gray to black, very fine sandy SILT with strong gasoline odor.
S-4	34		9	
			10	Bottom of Test Pit at 9.5 Feet. Completed 7/21/83.
			11	
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-29

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 17
S-1	7		0	(Dense), damp to moist, brown, gravelly, fine to medium SAND (Preload FILL).
S-2	21		1	
S-3	5		2	
			3	(Loose), moist, black, silty, fine SAND with some gravel, brown sand pockets and railroad ties (FILL).
			4	
			5	
			6	
			7	(Loose), damp to moist, dark gray to black, fine to medium SAND (FILL).
			8	
			9	
S-4	43		10	(Soft to medium stiff), wet to saturated, gray to brown, very fine sandy SILT.
			11	
			12	
			13	
			14	
			15	Bottom of Test Pit at 10.0 Feet. Completed 7/21/83.

Test Pit Log TP-30

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 10
S-1	42		0	(Medium stiff), moist, massive to laminated, oxidized tan, fine sandy SILT.
			1	
			2	
			3	
		▽	4	
			5	
S-2	20	♀	6	(Loose to medium dense), wet, dark gray to black, fine to medium SAND.
			7	
S-3	43		8	(Loose to medium dense), saturated, dark gray to black, silty, fine SAND.
			9	
			10	
			11	Bottom of Test Pit at 10.0 Feet. Completed 7/21/83.
			12	Note: Seepage at 7 feet depth. Water level stabilized at 5 feet depth.
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-31

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation In Feet 11
S-1	39		0-1	(Medium stiff), moist to saturated, gray to brown, fine sandy SILT with clayey and sandy interbeds.
S-2	42		1-4	
S-3	40		4-7	
S-4	25		7-8	
			8-9	(Medium dense), saturated, dark gray to black, fine to medium SAND.
			9-10	Bottom of Test Pit at 9.5 Feet. Completed 7/21/83.
			10-15	Note: Seepage below 5 feet depth.

Test Pit Log TP-32

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation In Feet 11
S-1	36		0-1	(Medium stiff), gray, moist, very fine, sandy SILT with sandy interbeds.
S-2	45		1-4	
			4-5	2-cm clay seam at 4.5 feet depth.
S-3	33		5-7	(Loose to medium dense), saturated, dark gray to black, slightly silty, fine to medium SAND.
			7-8	
			8-10	Bottom of Test Pit at 10.0 Feet. Completed 7/21/83.
			10-15	Note: Severe caving at 10 feet depth. Seepage below 5.5 feet depth.

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-33

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 11
S-1	110		0	(Loose), moist, balck to dark brown, very silty SAND with abundant wood fragments and metal. (FILL).
S-2	44		1	
			2	
			3	
			4	(Medium stiff), moist to saturated, gray, fine sandy SILT.
			5	Clay seam (2-cm) at 4.5 feet depth.
			6	
			7	
			8	
			9	
S-3	31		10	(Medium dense), saturated, dark gray to black, fine to medium SAND.
			11	Bottom of Test Pit at 11.0 Feet. Completed 7/21/83.
			12	
			13	Note: Seepage below 8 feet depth.
			14	
			15	

Test Pit Log TP-34

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 14
S-1	13		0	(Medium dense to dense), moist, brown to rusty brown, partly cemented, slightly silty, gravelly SAND with admixed brick and wood fragments. (FILL).
S-2	40		1	
S-3	42		2	
			3	
			4	(Loose to medium dense), moist to wet, gray to black, very silty, fine to medium SAND with scattered gravel and wood. (FILL).
			5	(Soft), wet to saturated, dark gray to brown, clayey SILT.
			6	
			7	
S-4	31		8	(Loose to medium dense), saturated, black, fine to medium SAND.
			9	
			10	
			11	
			12	Bottom of Test Pit at 11.5 Feet. Completed 7/21/83.
			13	
			14	Note: Seepage below 4.5 feet depth.
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-35

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 15
			0	(Medium dense), damp, brown, gravelly SAND (FILL).
S-1	14		1	(Loose to medium dense), moist, black, fine to medium SAND with wood fragments in upper 2 feet (FILL).
			2	
			3	
			4	
			5	
S-2	37		6	(Medium stiff), moist to wet, gray, fine sandy, clayey SILT.
			7	(Loose), saturated, black, fine to medium SAND.
			8	
			9	
S-3	--	♀	10	Bottom of Test Pit at 10.0 Feet. Completed 7/21/83.
			11	Note: Seepage below 8.5 feet depth.
			12	
			13	
			14	
			15	

Test Pit Log TP-36

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 14
			0	(Medium stiff), moist, mottled gray to brown, very fine sandy SILT with scattered fine roots (FILL).
S-1	40		1	(Loose), moist to wet, black, fine to medium SAND.
			2	
			3	
S-2	63	♀	4	(Soft), wet to saturated, dark gray to brown, clayey SILT.
			5	(Loose to medium dense), wet, black, fine to medium SAND.
			6	
			7	Bottom of Test Pit at 10.0 Feet. Completed 7/21/83.
			8	
			9	
			10	
			11	
			12	Note: Seepage below 5 feet depth.
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-37

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 11
S-1	32	PP=1.0 TV=0.1 - 0.15	0	SOD over (soft), moist, grayish-brown mottled, fine sandy SILT with scattered root fragments.
S-2	22		1	(Loose), wet, gray, silty, fine SAND with scattered root fragments and scattered discontinuous SILT laminations.
			2	
			3	
		flowing	4	(Loose), saturated, dark gray, fine to medium SAND with scattered fine sand interbeds.
		○	5	
S-3	31		6	Bottom of Test Pit at 7.0 Feet. Completed 7/21/83.
			7	Note: Caving below 5 feet depth, severe caving at 7 feet depth. Rapid seepage below 5 feet depth.
			8	
			9	
			10	
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-38

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 11
S-1	44		0	SOD over (soft), wet, brown, slightly clayey SILT with numerous small roots and organics.
S-2	50		1	(Loose), wet, brown and gray, fine sandy SILT with numerous wood and root fragments, and discontinuous layers of organics.
S-3	43		2	(Very loose to loose), wet to saturated, light gray, laminated fine sandy, clayey SILT.
			3	
			4	
		PP=0.4 TV=0	5	(Loose), saturated, dark gray, fine to medium SAND with trace wood and shell fragments.
S-4	24		6	
			7	Bottom of Test Pit at 7.0 Feet. Completed 7/21/83.
			8	Note: Caving below 2 feet depth, severe caving at 6 feet depth. Seepage below 4 feet depth.
			9	
			10	
			11	
			12	
			13	
			14	
			15	

NOTES:

- Soil descriptions are interpretive and actual changes may be gradual.
- Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-39

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 11.3
S-1	29	GS	0	SOD over (loose), moist to wet, light gray, silty, fine SAND with scattered root fragments and fine sandy SILT interbeds.
			1	
			2	
			3	
			4	
S-2	43	⊕	5	(Soft), saturated, dark gray, massive, fine sandy SILT.
			6	
S-3	32		7	(Loose), saturated, dark gray, massive, fine to medium SAND.
			8	
			9	Bottom of Test Pit at 8.0 Feet. Completed 7/21/83.
			10	
			11	Note: Caving below 4.5 feet depth; severe caving at 7 feet depth. Seepage below 4.5 feet depth.
			12	
			13	
			14	
			15	

Test Pit Log TP-40

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 15
S-1	7	BS-1	0	(Medium dense), damp, brown, slightly silty, gravelly SAND (FILL).
		GS, CBR	1	
S-2	21		2	(Loose), moist, dark brown, silty, fine SAND with substantial fine roots.
			3	(Loose), moist, grayish brown, silty, fine SAND.
S-3	5		4	(Loose), damp, dark gray, fine to medium SAND (FILL).
			5	
S-4	35		6	(Loose), saturated, gray mottled, fine sandy SILT with (soft) clayey SILT interbeds to around 1-inch thick.
			7	
		rapid ⊕	8	
			9	(Loose), saturated, dark gray, fine to medium SAND.
			10	
			11	Bottom of Test Pit at 10.5 Feet. Completed 7/22/83.
			12	
			13	Note: Rapid seepage and severe caving below 9.0 feet. Moderate caving in upper 9 feet.
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
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J-1280

August

1983

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Figure A-41

Test Pit Log TP-41

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet 16
S-1	5		0	(Loose), damp, dark gray, fine to medium SAND with substantial fine roots in upper 0.3 feet. (FILL).
S-2	5		1	
			2	
			3	
			4	Bottom of Test Pit at 4.5 Feet. Completed 7/22/83.
			5	
			6	
			7	
			8	
			9	
			10	
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-42

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet
			0	(Medium dense), moist, brown, gravelly, silty SAND (FILL).
S-1	24		1	(Medium stiff), moist, brown to gray, slightly clayey, slightly sandy to sandy SILT (FILL).
			2	(Loose), wet, dark brown, organic-rich silty SAND with wood fragments (FILL).
S-2	33		3	
			4	(Medium dense), moist, dark gray, silty to slightly silty, fine to medium SAND (FILL).
S-3	20		5	
			6	(Medium dense), moist, dark gray, fine to medium SAND.
			7	
			8	
			9	
			10	Bottom of Test Pit at 9.5 Feet. Completed 7/22/83.
			11	Note: Moderate caving below 5.5 feet depth.
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-43

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet
			0	Vegetative mat and organic-rich, silty, fine SAND.
S-1	10		1	(Medium dense), moist, brown, silty SAND with scattered GRAVEL and fine roots (FILL).
S-2	83		2	
S-3	9		3	(Loose), moist, black, organic-rich, silty, fine SAND and cinders (FILL).
			4	(Medium dense), damp, dark gray, slightly silty, fine SAND.
			5	(Medium dense), moist, fine to medium SAND with strong fuel oil odor.
			6	
			7	
			8	
			9	
			10	Bottom of Test Pit at 10.0 Feet. Completed 7/22/83.
			11	
			12	
			13	Note: Moderate caving below 5 feet.
			14	
			15	

Test Pit Log TP-44

Sample	Water Content in %	Other Tests	Depth in Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet
			0	Vegetative mat and (loose), moist, brown, organic-rich, silty SAND.
S-1	11		1	(Medium dense), moist, brown, interbedded silty SAND with scattered gravel and (stiff), moist, brown, sandy SILT with scattered fine roots to 1.5 feet depth.
			2	
S-2	14		3	(Loose), moist, dark brown, silty, fine SAND.
S-3	13		4	(Medium dense), moist, grayish-brown, slightly silty, fine SAND.
			5	(Medium dense), moist, dark gray, fine to medium SAND.
			6	
			7	
			8	
			9	-Wet below 9.0 feet.
			10	Bottom of Test Pit at 10.0 Feet. Completed 7/22/83.
			11	
			12	
			13	
			14	
			15	

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.

Test Pit Log TP-45

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet
			0	Vegetative mat and (loose), damp, dark brown, organic-rich, silty SAND.
S-1	7		1	(Medium dense), moist, gray to brown, silty, slightly gravelly, fine SAND with abundant beds of (stiff), moist, gray, fine sandy SILT (FILL) and substantial fine roots to 1.0 foot depth.
S-2	13		2	
S-3	26		3	(Medium stiff), moist to wet, mottled gray, slightly fine sandy SILT with scattered SAND layers (FILL).
			4	
			5	(Medium dense), wet, dark gray, fine to medium SAND.
			6	
S-4	31	TV=0.3	7	(Soft to medium stiff), wet, gray massive, clayey SILT.
			8	(Medium dense), wet, dark gray, fine to medium SAND.
			9	
			10	Bottom of Test Pit at 10.5 Feet. Completed 7/22/83.
			11	
			12	
			13	
			14	
			15	

Test Pit Log TP-46

Sample	Water Content In %	Other Tests	Depth In Feet	SOIL INTERPRETATION Approximate Ground Surface Elevation in Feet
			0	Vegetative mat
S-1	30		1	(Very loose), damp, dark brown, silty SAND with substantial amounts of wood chips and fine roots.
			2	Sawdust and wood chips.
			3	(Medium dense), moist, gray, fine sandy SILT (FILL).
S-2	14		4	Bottom of Test Pit at 5.5 Feet. Completed 7/22/83.
			5	
			6	
			7	
			8	

- S-1 Grab Sample Location and Number
- BS-1 Bag Sample Location and Number
- GS Grain Size Classification
- CBR California Bearing Ratio
- PP Pocket Penetrometer - Approximate Unconfined Compressive Strength in TSF
- TV Torvane - Approximate Shear Strength in TSF
- Seepage
- Water Level

NOTES:

1. Soil descriptions are interpretive and actual changes may be gradual.
2. Groundwater conditions, if indicated, are for the date specified and may vary with the time of year.