

December 11, 1998

**Consulting Engineers
and Geoscientists**
Offices in Washington,
Oregon and Alaska

Tosco Distribution Company
5528 NW Doane Avenue
Portland, Oregon 97210

Attention: Martin Cramer

Results of Site Monitoring and Sampling
May 1998
Former Unocal Bulk Plant #0581
Petersburg, Alaska
File No. 4823-325-00

INTRODUCTION AND SCOPE

GeoEngineers is pleased to present the results of bulk plant remediation and site characterization at the former Unocal Bulk Plant #0581 in Petersburg, Alaska. Site monitoring and sampling activities were conducted from May 19 to 22, 1998. A general site vicinity map of the subject site is shown in Figure 1. The bulk plant is presently operated as a marine fueling facility and as a fuel oil distribution facility.

The purpose of this work was to evaluate the soil in the biotreatment mound for remaining contamination, monitor for ground water contamination, and characterize surficial soil petroleum impacts in the loading rack area. Figure 2 shows soil and ground water sample locations relative to the main portion of the present bulk plant facility and biotreatment mound.

BULK PLANT REMEDIATION BIOTREATMENT MOUND SAMPLING

Soil sample locations at the biotreatment mound were based on an areal grid (each grid area equal to a stockpile volume of approximately 50 cubic yards). A total of 16 field screen samples consisting of organic silt was collected from the stockpile at depths ranging from 1.5 to 5.0 feet (see Figure 2). Based on field screening results, a total of 10 laboratory samples were submitted under chain-of-custody to North Creek Analytical (NCA) in Bothell, Washington, for chemical analysis of benzene, ethylbenzene, toluene and xylene (BETX); and diesel-range organic (DRO) compounds. Based on previous site studies, DRO compounds were quantified to C₁₀-C₁₈ hydrocarbon range to reduce biogenic interferences. DRO was detected at concentrations

GeoEngineers, Inc.
4951 Eagle Street
Anchorage, AK 99503-7432
Telephone (907) 561-3478
Fax (907) 561-5123
anchorage@geoengineers.com

ranging from 156 milligrams per kilogram (mg/kg) at BPS-14 to 2,780 mg/kg at BPS-10. BETX compounds were not detected in two of ten soil samples submitted for analysis. Laboratory reports for the stockpile soil samples are included in Attachment A, and chemical analytical results are summarized in Table 1.

SYSTEM MONITORING

In addition to biotreatment mound sampling, the treatment system operations were also monitored. System monitoring consisted of: 1) removing water from the stockpile, 2) reversing the airflow (exerting a vacuum) in one of the upper manifold pipes, and 3) measuring the vacuum, airflow, and vapor emissions. Approximately 250 to 300 gallons of water were removed from the stockpile from May 19 to 21, 1998. A portable 2-horsepower pump and ¾-inch-diameter hose were used to remove water from the nine vent pipes and two drain pipes, which was then pumped to the on-site oil/water separator for treatment. The airflow on one of the three upper manifold pipes was reversed to create a vacuum of 5 to 8 inches of water to extract vapors from the stockpile. The vapor extraction line was also measured for airflow and vapor emissions, which were measured to be 65 cubic feet per minute (cfm) and 32 parts per million (ppm), respectively. A positive airflow was maintained for remaining two upper manifold pipes at a rate of 52 cfm.

GROUND WATER QUALITY

Ground water conditions were monitored for the six existing implant wells (GP-1 through GP-6) during the May 1998 site visit (see Figure 2). A ground water sample was collected from implant well GP-1 using a vacuum flask system. Ground water, however, was not encountered at the five remaining implant wells due to unseasonably dry weather reported for the past 5-6 months. The ground water sample was submitted on May 26, 1998, to NCA for chemical analysis of BETX compounds and for salinity as sodium and chloride. BETX compounds were not detected in water sample GP-1. Sodium and chloride were detected in sample GP-1 at concentrations of 90.1 milligrams per liter (mg/l) and 60.8 mg/l, respectively. Laboratory reports for the ground water sample are attached, and chemical analytical results are summarized in Table 2.

SITE CHARACTERIZATION

Surface soil conditions were characterized near the existing truck loading rack by collecting eight soil samples (SS-1 through SS-8) at depths ranging from 1.0 to 2.5 feet below grade (see Figure 2). Soil conditions consisted of approximately two feet of brown organic silt underlain by tan-gray consolidated sandy silt with gravel. Soil samples were generally collected at the base of the organic silt. Several sample locations, however, were limited at depth by coarse gravel and cobble encountered near the truck loading rack. On May 26, 1998, the surface soil samples were submitted under chain-of-custody to NCA for chemical analysis of DRO, gasoline-range organics (GRO) and BETX compounds. DRO compounds were detected at concentrations ranging from

8.13 mg/kg in sample SS-2 to 18,600 mg/kg in sample SS-6. Based on field screening results, two surface soil samples were also analyzed for GRO and BETX compounds. GRO compounds were detected in soil sample SS-4 at a concentration of 6.26 mg/kg. Additionally, an elevated reporting limit was reported for GRO in sample SS-6 due to a high concentration of extractable diesel hydrocarbons. BETX compounds were not detected in the two surface soil samples analyzed. However, elevated reporting limits were also reported for BETX compounds in sample SS-6 due to a high concentration of extractable diesel hydrocarbons. Laboratory reports for the surface soil samples are included in Attachment A and chemical analytical results are summarized in Table 3.

FUTURE MONITORING

We recommend that treatment monitoring be conducted at least once a month until the next site visit is conducted. Alaska Fuel Service personnel will conduct bi-monthly inspections of the condensate tank connected to the vapor extraction line to insure that a vacuum is maintained on the stockpile. The stockpile will also be dewatered on a monthly basis to increase the efficiency of vapor extraction.

LIMITATIONS

We have prepared this report for use by Tosco Distribution Company. This report may be made available to regulatory agencies and to other parties, as designated by Tosco. The report is not intended for use by others, and the information contained herein is not applicable to other sites.

Our interpretation of ground water conditions is based on field observations, our review of chemical analytical data and our review of information prepared by others.

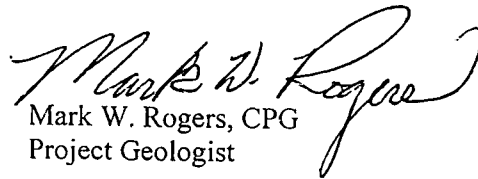
Within the limitation of scope, schedule and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, expressed or implied, should be understood.



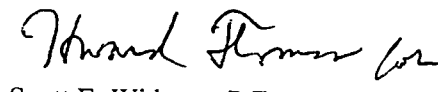
We appreciate the opportunity to be of service to Tosco Distribution Company. Please call if you have any questions concerning our report.

Yours very truly,

GeoEngineers, Inc.



Mark W. Rogers, CPG
Project Geologist



Scott E. Widness, P.E.
Principal

MWR:SEW:skl
Document ID: 482332500ltr.doc

Attachments

cc: Ted Smith (2 copies)
Alaska Fuel Service

TABLE 1 (Page 1 of 2)
 SOIL TREATMENT PILE ANALYTICAL RESULTS¹
 FORMER UNOCAL BULK PLANT 0581
 PETERSBURG, ALASKA
 GEI JOB #4823-325-00

Laboratory Sample No.	Date Sampled	Sample Depth (feet)	Field Screening Results ²		GRO ³ (mg/kg)	DRO ⁴ (mg/kg)	BETX ⁵ (EPA Methods 5030/8020) (mg/kg)				Comments
			Headspace Vapor (ppm)	Sheen			B	E	T	X	
BPC-13	09/14/96	0.5	95.0	SS-MS	--	540	--	--	--	--	Diesel appears to be present
BPC-14	09/14/96	1.0	120.0	SS	--	630	--	--	--	--	Diesel appears to be present
BPC-15	09/14/96	1.0	105.0	SS	--	1,200	--	--	--	--	Diesel appears to be present
BPC-16	09/14/96	0.5	110.0	SS	38	640	--	--	--	--	Diesel appears to be present
BPS-1	05/20/98 ⁶	4.0	56.1	MS	--	2,410	--	--	--	--	Diesel appears to be present
BPS-3	05/20/98 ⁶	2.0	81.4	SS	--	291	--	--	--	--	Diesel appears to be present
BPS-4	05/20/98 ⁶	2.5	92.0	SS	--	695	--	--	--	--	Diesel appears to be present
BPS-9	05/20/98 ⁶	3.0	78.0	SS	--	218	--	--	--	--	Diesel appears to be present
BPS-10	05/20/98 ⁶	5.0	84.1	MS	--	2,780	--	--	--	--	Diesel appears to be present
BPS-11	05/20/98 ⁶	2.0	102	SS	--	247	<0.0500	<0.0500	<0.0500	<0.100	Diesel appears to be present
BPS-12	05/20/98 ⁶	3.0	91.0	SS-MS	--	1,050	--	--	--	--	Diesel appears to be present
BPS-14	05/20/98 ⁶	2.0	68.4	SS	--	156	--	--	--	--	Diesel appears to be present
BPS-15	05/20/98 ⁶	2.5	56.2	SS	--	562	--	--	--	--	Diesel appears to be present
BPS-16	05/20/98 ⁶	3.0	106	SS-MS	--	1,280	<0.116	<0.231	<0.116	<1.16	Diesel appears to be present
ADEC Cleanup Levels ⁷					100	1,000	0.5	15 ⁸			

Notes appear on page 2 of 2.

TABLE 1 (Page 2 of 2)

Notes:

¹Chemical analyses conducted by MultiChem Analytical Services of Anchorage, Alaska, unless noted otherwise.

²See Appendix A for a description of field screening methods. SS = slight sheen, MS = moderate sheen

³GRO = Gasoline-Range Organics by EPA Test Methods 5030/8015 Modified.

⁴DRO = Diesel-Range Organics by EPA Methods 3550/8100 Modified. DRO compounds are quantified to C₁₀-C₁₈ hydrocarbon range.

⁵B = Benzene, E = Ethylbenzene, T = Toluene, X = Xylenes

⁶Chemical analysis by North Creek Analytical of Bothell, Washington

⁷Cleanup levels established in a letter from ADEC dated July 17, 1995.

⁸Sum of BETX constituents.

ppm = parts per million

mg/kg = milligrams per kilogram

EPA = U.S. Environmental Protection Agency

"-" = Not Analyzed or Not Applicable

ADEC = Alaska Department of Environmental Conservation

TABLE 2
GROUND WATER ANALYTICAL RESULTS¹
FORMER UNOCAL BULK PLANT 0581
PETERSBURG, ALASKA
GEI JOB #4823-325-00

Laboratory Sample No./ Implant Well	Date Sampled	GRO ² (µg/l)	BETX ³ (EPA Methods 5030/8020) (µg/l)				Salinity ⁴ (mg/l)	Total Dissolved Solids ⁵ (mg/l)
			B	E	T	X		
GP-1	09/09/96	<100	<1.0	<1.0	<1.0	<1.0	--	--
	05/19/98 ^{6,7}	--	<0.500	<0.500	<0.500	<1.00	--	--
GP-2	09/09/96	160	<1.0	1.3	1.4	3.6	--	--
	05/19/98 ⁸	--	--	--	--	--	--	--
GP-3	09/08/96	<100	1.3	<1.0	<1.0	<1.0	--	--
	09/08/96 [*]	<100	1.3	<1.0	<1.0	<1.0	--	--
	05/19/98 ⁸	--	--	--	--	--	--	--
GP-4	09/09/96	<100	<1.0	<1.0	<1.0	<1.0	--	--
	05/19/98 ⁸	--	--	--	--	--	--	--
GP-5	09/13/96 ⁸	--	--	--	--	--	280	275-425
	05/19/98 ⁸	--	--	--	--	--	--	--
GP-6	09/13/96	150	5.7	2.6	2.3	25	270	275-425
	05/19/98 ⁸	--	--	--	--	--	--	--
Trip Blank	09/07/96	<100	<1.0	<1.0	<1.0	<1.0	--	--
ADEC Cleanup Standards		--	5	700	1,000	10,000	--	500

Notes:

- ¹Chemical analyses conducted by MultiChem Analytical Services of Anchorage, Alaska, unless otherwise noted.
- ²GRO = Gasoline-Range Organics by EPA Test Methods 5030/8015 Modified.
- ³B = Benzene, E = Ethylbenzene, T = Toluene, X = Xylenes
- ⁴Salinity as NaCl (sodium chloride) by Standard Test Method SM2520-B.
- ⁵TDS (Total Dissolved Solids) converted from conductivity levels measured during salinity testing. TDS concentrations were reported as a range in value due to a conversion of TDS (50%-85%) to Conductivity (100%).
- ⁶Chemical analysis conducted by North Creek Analytical of Bothell, Washington.
- ⁷Sample also analyzed for chloride by EPA Method 300.0 and Sodium by EPA Method 200.7 (see laboratory report)
- ⁸Insufficient water volume in implant screen to collect a water sample.
- µg/l = micrograms per liter (parts per billion)
- EPA = U.S. Environmental Protection Agency
- mg/l = milligrams per liter (parts per million)
- "--" = Not Analyzed or Not Applicable
- "**" = Duplicate water sample
- ADEC = Alaska Department of Environmental Conservation
- Shading indicates concentrations greater than ADEC cleanup standards.

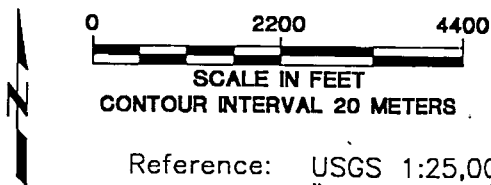
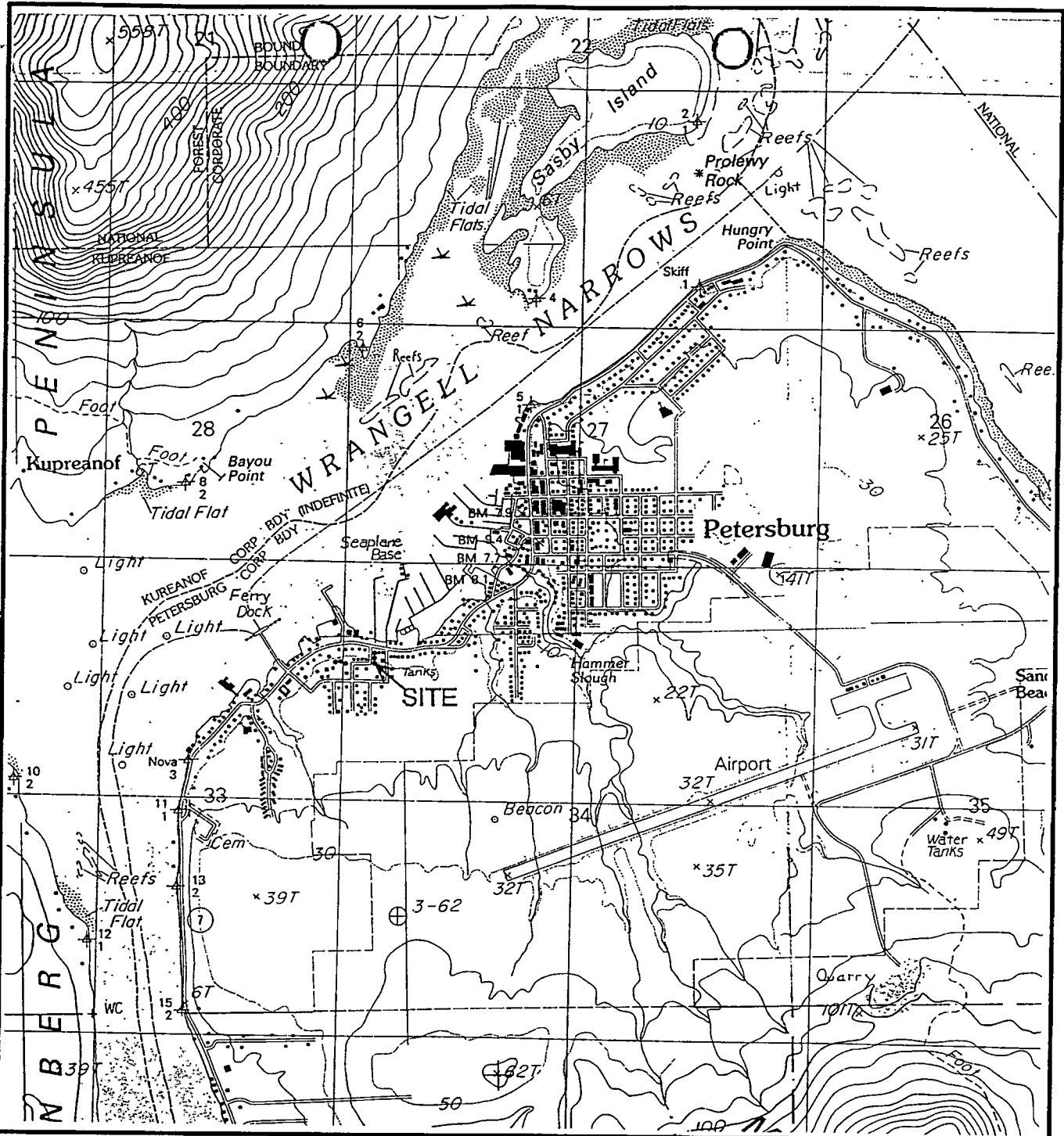
TABLE 3
 SURFACE SOIL ANALYTICAL RESULTS¹
 FORMER UNOCAL BULK PLANT 0581
 PETERSBURG, ALASKA
 GEI JOB #4823-325-00

Laboratory Sample No.	Date Sampled	Sample Depth (feet)	Field Screening Results ²		GRO ³ (mg/kg)	DRO ⁴ (mg/kg)	BETX ⁵ (EPA Methods 5030/8020) (mg/kg)				Comments
			Headspace Vapor (ppm)	Sheen			B	E	T	X	
			SS-1	05/19/98			2.0	28.9	SS	--	
SS-2	05/19/98	2.5	15.9	SS	--	8.13	--	--	--	--	Background interference
SS-3	05/19/98	1.5	38.4	SS-MS	--	6,920	--	--	--	--	Diesel appears to be present
SS-4	05/19/98	1.0	102	SS-MS	6.26	297	<0.0500	<0.0500	<0.0500	<0.100	Diesel appears to be present
SS-5	05/19/98	1.0	13.2	SS-MS	--	1,040	--	--	--	--	Diesel appears to be present
SS-6	05/19/98	1.5	150	MS	<125	18,600	<1.25	<1.25	<1.25	<2.50	Diesel appears to be present
SS-7	05/19/98	2.5	25.5	SS	--	19.3	--	--	--	--	Background interference
SS-8	05/19/98	1.5	14.3	SS	--	85.8	--	--	--	--	Diesel appears to be present
ADEC Cleanup Levels ⁶					100	1,000	0.5	15 ⁷			

Notes:

- ¹Chemical analyses conducted by North Creek Analytical of Bothell, Washington.
 - ²See Appendix A for a description of field screening methods. SS = slight sheen, MS = moderate sheen
 - ³GRO = Gasoline-Range Organics by EPA Test Methods 5030/8015 Modified.
 - ⁴DRO = Diesel-Range Organics by EPA Methods 3550/8100 Modified. DRO compounds are quantified to C₁₀-C₁₈ hydrocarbon range.
 - ⁵B = Benzene, E = Ethylbenzene, T = Toluene, X = Xylenes
 - ⁶Cleanup levels established in a letter from ADEC dated July 17, 1995.
 - ⁷Sum of BETX constituents.
- ppm = parts per million
 mg/kg = milligrams per kilogram
 EPA = U.S. Environmental Protection Agency
 "--" = Not Analyzed or Not Applicable
 ADEC = Alaska Department of Environmental Conservation

4823-325-00MWR:DWB 04/01/98 DWG FILE: 4823-325-VM-A.DWG



FORMER UNOCAL BULK PLANT 0581
MITKOF HIGHWAY
PETERSBURG, ALASKA

Reference: USGS 1:25,000 - Scale Series Topographic Quadrangle Map,
"Petersburg (D-3) SW, AK" Dated 1992

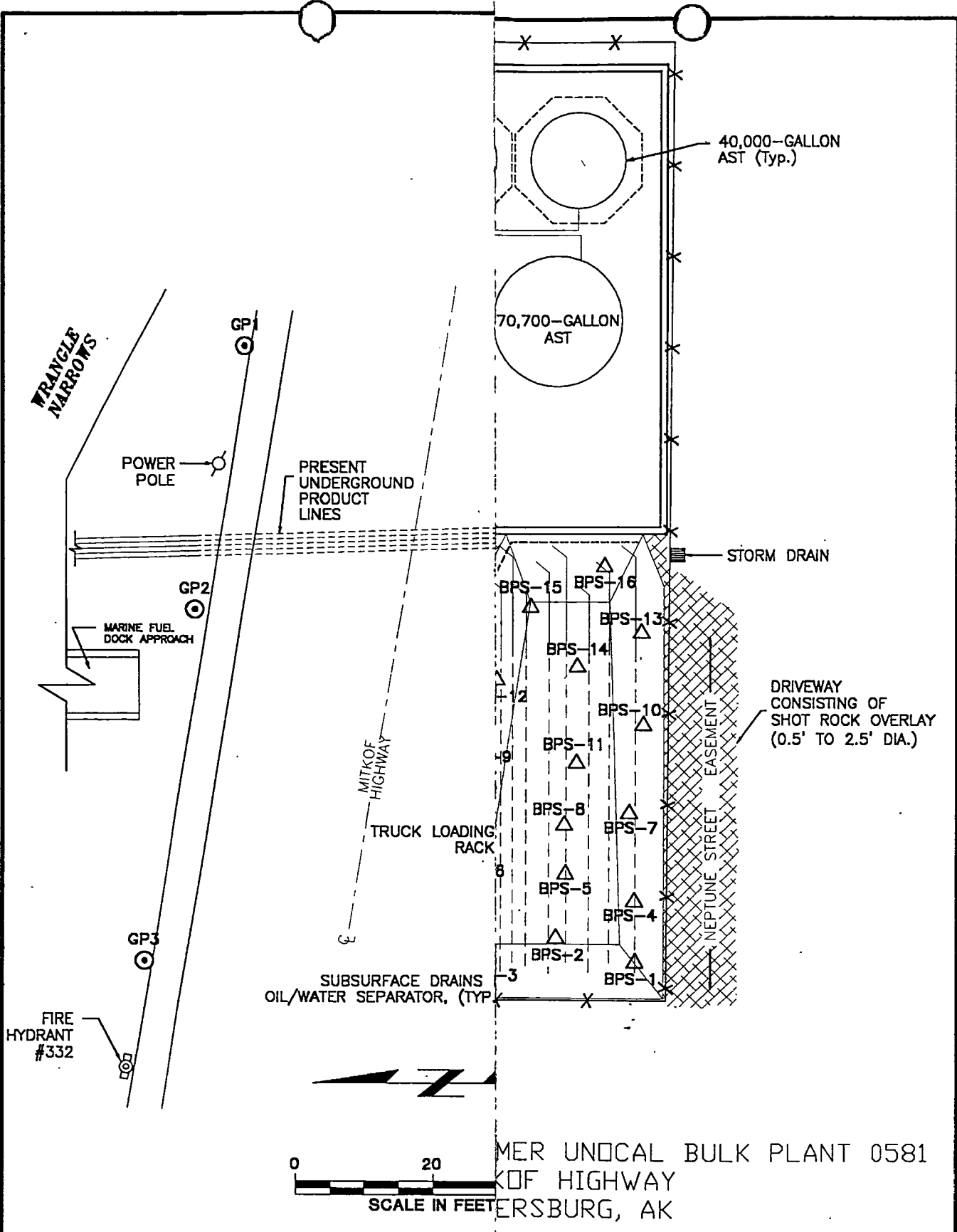
Note: The locations of all features shown are approximate.



VICINITY MAP

FIGURE 1

4823-325-00MWR-DWB 06/11/98 DWG FILE: 4823-325-F2-B.DWG



References: Drawing entitled "Bulk Plant Modifications Petersburg Bulk Plant, Petersburg, Alaska and an untitled and undated drawing by Charles A. Grove & Associates, Inc.

Field sketch by Geoengineers, dated 09/

Note: The locations of all features shown are app

SITE PLAN

FIGURE 2

ATTACHMENT A



**NORTH
CREEK
ANALYTICAL**
Environmental Laboratory Services

GeoEngineers
ANCHORAGE

BOTHELL ■ (425) 420-9200 ■ FAX 420-9210
SPOKANE ■ (509) 924-9200 ■ FAX 924-9290
PORTLAND ■ (503) 906-9200 ■ FAX 906-9210

Tuesday, November 03, 1998

NOV 16 1998

Mark Rogers
Geo Engineers - Alaska
4951 Eagle Street
Anchorage, AK 99503-7432

Routing... MWR SEW
.....
File... 4823-32500....

Dear Mark;

I wish to inform you about a laboratory event that may have a modest impact on some of the analytical results previously reported to you by North Creek Analytical, Inc. (NCA). During a system audit of analytical procedures in the Bothell laboratory, the Quality Assurance staff discovered an error in the way one specific analyst was entering weight data for the Total Solids determinations. Total Solids is an unrequested, addendum procedure performed in recognition of generally accepted practices for Washington environmental laboratories. Since NCA-Bothell reports test data for soil samples on a dry weight basis, any erroneous data from the Total Solids determinations would affect the final report values.

We performed a query of the database, and we believe the work orders on the following page may have been affected. Our query was designed with a conservative bias, therefore, the list may be over-inclusive. It is possible that some of the samples were not affected. Due to the nature of the event, we are unable to state with absolute confidence that every single Total Solids value listed was performed incorrectly. Our findings cast doubt on the validity of some of the Total Solids results, and hence, we are notifying you of that possibility. We are confident that any other non-listed projects you may have sent to NCA are not involved in this event. Our audit has discovered several key findings, including:

- ◆ This event has absolutely no impact on any soil data where the analyte is less than the method reporting limit (reported as N.D.). In all cases, any amendment to the % solids value will cause any reported analyte concentration to decrease.
- ◆ The suspected variance between original and amended Total Solids determinations ranges from 7% to 28% higher. For example, a Total Solids value originally reported as 70.1%, may actually be as high as 89.7% Solids.
- ◆ In almost all cases, the change of the Total Solids result due to the suspect weighing procedure is less than the inherent imprecision of the analytical method. USEPA SW-846, Final Update III (Dec. 96), multi-laboratory performance evaluation studies and NCA's own QC control charts verify, that in most cases, the reproducibility (method precision) as measured by percent standard deviation within the analytical procedure, is greater than the possible change due to the Total Solids deviation.

Corrective actions have already been instituted to preclude recurrence of this event. These actions include amending our information system data fields, broadening the scope of our training and monitoring procedures, and incorporating additional quality control samples to the solids procedure.

NCA is proud of our Quality Assurance Program. We apologize for any inconvenience this may have caused. NCA is one of just a few laboratories to have a QAP audited to ISO Guide 25 requirements. It is our dedication to quality principles that causes me to inform you of an event such as this. If you need revised reports with recalculated Total Solids values for comparison, please contact your Project Manager. If you have additional questions regarding this matter, please call me directly or speak to any of the senior technical managers at 425.420.9200. Thank you for your support.

Sincerely,
NORTH CREEK ANALYTICAL, Inc.

Scot Cocanour
President



**NORTH
CREEK
ANALYTICAL**
Environmental Laboratory Services

BOTHELL ▪ (425) 420-9200 ▪ FAX 420-9210
SPOKANE ▪ (509) 924-9200 ▪ FAX 924-9290
PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Geo Engineers - Alaska 4951 Eagle Street Anchorage, AK 99503-7432	Project: TOSCO BP #0581 Project Number: 4823-325-00 Project Manager: Mark Rogers	Sampled: 5/19/98 to 5/20/98 Received: 5/27/98 Reported: 11/5/98 11:26
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ANALYTICAL REPORT FOR SAMPLES:

Sample Description	Laboratory Sample Number	Sample Matrix	Date Sampled
GP-1	B805545-00	Water	5/19/98
SS-1	B805545-01	Soil	5/19/98
SS-2	B805545-02	Soil	5/19/98
SS-3	B805545-03	Soil	5/19/98
SS-4	B805545-04	Soil	5/19/98
SS-5	B805545-05	Soil	5/19/98
SS-6	B805545-06	Soil	5/19/98
SS-7	B805545-07	Soil	5/19/98
SS-8	B805545-08	Soil	5/19/98
BPS-1	B805545-09	Soil	5/20/98
BPS-3	B805545-10	Soil	5/20/98
BPS-4	B805545-11	Soil	5/20/98
BPS-9	B805545-12	Soil	5/20/98
BPS-10	B805545-13	Soil	5/20/98
BPS-11	B805545-14	Soil	5/20/98
BPS-12	B805545-15	Soil	5/20/98
BPS-14	B805545-16	Soil	5/20/98
BPS-15	B805545-17	Soil	5/20/98
BPS-16	B805545-18	Soil	5/20/98

North Creek Analytical - Bothell

*The results in this report apply to the samples analyzed in accordance with the chain of custody document
This analytical report must be reproduced in its entirety*

Stan Dan

Joy B Chang, Project Manager

3939 20th Avenue N.E., Suite 101, Bothell, WA 98011-9508
East 115 Montgomery, Suite B, Spokane, WA 99206-4776



NORTH CREEK ANALYTICAL

Environmental Laboratory Services

BOTHELL ■ (425) 420-9200 ■ FAX 420-9210
 SPOKANE ■ (509) 924-9200 ■ FAX 924-9290
 PORTLAND ■ (503) 906-9200 ■ FAX 906-9210

Geo Engineers - Alaska 4951 Eagle Street Anchorage, AK 99503-7432	Project: TOSCO BP #0581 Project Number: 4823-325-00 Project Manager: Mark Rogers	Sampled: 5/19/98 to 5/20/98 Received: 5/27/98 Reported: 11/5/98 11:26
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Diesel Hydrocarbons (C10-C28) by EPA Method 8100 (modified) North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
SS-1								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-01</u>	4.00	50.0	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		96.4	%	
SS-2								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-02</u>	4.00	8.13	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		109	%	
SS-3								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-03</u>	44.0	6920	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		130	%	
SS-4								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-04</u>	4.00	297	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		121	%	
SS-5								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-05</u>	20.0	1040	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		86.5	%	
SS-6								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-06</u>	164	18600	Soil mg/kg dry	1
Surrogate: Octacosane	"	"	"	50.0-150		106	%	2
SS-7								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-07</u>	4.00	19.3	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		104	%	
SS-8								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-08</u>	4.00	85.8	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		102	%	
BPS-1								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-09</u>	67.7	2410	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		110	%	
BPS-3								
Diesel Range Hydrocarbons	0680025	6/1/98	6/10/98	<u>B805545-10</u>	20.0	291	Soil mg/kg dry	1
Surrogate: 2-FBP	"	"	"	50.0-150		98.3	%	

North Creek Analytical - Bothell

*Refer to end of report for text of notes and definitions.

Stedman

Joy B Chang, Project Manager

18939 120th Avenue N E., Suite 101, Bothell, WA 98011-9508
 East 11115 Montgomery, Suite B, Spokane WA 99206-4776



NORTH CREEK ANALYTICAL

Environmental Laboratory Services

BOTHELL ■ (425) 420-9200 ■ FAX 420-9210
 SPOKANE ■ (509) 924-9200 ■ FAX 924-9290
 PORTLAND ■ (503) 906-9200 ■ FAX 906-9210

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BTEX by EPA Method 8021B North Creek Analytical - Bothell

Analyte	Batch Number	Date Prepared	Date Analyzed	Surrogate Limits	Reporting Limit	Result	Units	Notes*
GP-1				B805545-00			Water	
Benzene	0680061	6/2/98	6/2/98		0.500	ND	ug/l	
Toluene	"	"	"		0.500	ND	"	
Ethylbenzene	"	"	"		0.500	ND	"	
Xylenes (total)	"	"	"		1.00	ND	"	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		95.2	%	
BPS-11				B805545-14			Soil	
Benzene	0580859	5/27/98	5/28/98		0.0500	ND	mg/kg dry	
Toluene	"	"	"		0.0500	ND	"	
Ethylbenzene	"	"	"		0.0500	ND	"	
Xylenes (total)	"	"	"		0.100	ND	"	
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		72.1	%	
BPS-16				B805545-18			Soil	
Benzene	0580859	5/27/98	5/28/98		0.116	ND	mg/kg dry	
Toluene	"	"	"		0.116	ND	"	
Ethylbenzene	"	"	"		0.231	ND	"	4
Xylenes (total)	"	"	"		1.16	ND	"	4
Surrogate: 4-BFB (PID)	"	"	"	50.0-150		50.2	%	



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PORTLAND ▪ (503) 906-9200 ▪ FAX 906-9210

Geo Engineers - Alaska 4951 Eagle Street Anchorage, AK 99503-7432	Project: TOSCO BP #0581 Project Number: 4823-325-00 Project Manager: Mark Rogers	Sampled: 5/19/98 to 5/20/98 Received: 5/27/98 Reported: 11/5/98 11:26
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**Anions by EPA Method 300.0
North Creek Analytical - Bothell**

Analyte	Batch Number	Date Prepared	Date Analyzed	Specific Method	Reporting Limit	Result	Units	Notes*
<u>GP-1</u> Chloride	0680320	6/9/98	6/9/98	<u>B805545-00</u> EPA 300.0	2.00	60.8	<u>Water</u> mg/l	

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Gasoline Hydrocarbons (2-Methylpentane to 1,2,4-Trimethylbenzene) and BTEX by EPA 8015M and 8021B/Quality Control North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Reporting Limit Units	Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0680044		Date Prepared: 6/2/98		Extraction Method: EPA 5030B (MeOH)						
Blank										
0680044-BLK1										
Gasoline Range Hydrocarbons	6/2/98			ND	mg/kg dry	5.00				
Benzene	"			ND	"	0.0500				
Toluene	"			ND	"	0.0500				
Ethylbenzene	"			ND	"	0.0500				
Xylenes (total)	"			ND	"	0.100				
Surrogate: 4-BFB (FID)	"	4.00		3.85	"	50.0-150	96.2			
Surrogate: 4-BFB (PID)	"	4.00		3.83	"	50.0-150	95.7			
LCS										
0680044-BS1										
Gasoline Range Hydrocarbons	6/2/98	25.0		19.9	mg/kg dry	70.0-130	79.6			
Surrogate: 4-BFB (FID)	"	4.00		4.23	"	50.0-150	106			
Duplicate										
0680044-DUP1 B805585-01										
Gasoline Range Hydrocarbons	6/2/98		ND	ND	mg/kg dry				50.0	
Surrogate: 4-BFB (FID)	"	4.38		4.22	"	50.0-150	96.3			
Matrix Spike										
0680044-MS1 B805585-00										
Benzene	6/2/98	0.542	ND	0.438	mg/kg dry	60.0-140	80.8			
Toluene	"	0.542	ND	0.447	"	60.0-140	82.5			
Ethylbenzene	"	0.542	ND	0.473	"	60.0-140	87.3			
Xylenes (total)	"	1.63	ND	1.42	"	60.0-140	87.1			
Surrogate: 4-BFB (PID)	"	4.34		4.19	"	50.0-150	96.5			
Matrix Spike Dup										
0680044-MSD1 B805585-00										
Benzene	6/2/98	0.542	ND	0.495	mg/kg dry	60.0-140	91.3	20.0	12.2	
Toluene	"	0.542	ND	0.484	"	60.0-140	89.3	20.0	7.92	
Ethylbenzene	"	0.542	ND	0.507	"	60.0-140	93.5	20.0	6.86	
Xylenes (total)	"	1.63	ND	1.52	"	60.0-140	93.3	20.0	6.87	
Surrogate: 4-BFB (PID)	"	4.34		4.31	"	50.0-150	99.3			

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Geo Engineers - Alaska 4951 Eagle Street Anchorage, AK 99503-7432	Project: TOSCO BP #0581 Project Number: 4823-325-00 Project Manager: Mark Rogers	Sampled: 5/19/98 to 5/20/98 Received: 5/27/98 Reported: 11/5/98 11:26
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BTEX by EPA Method 8021B/Quality Control North Creek Analytical - Bothell

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
Batch: 0580859			Date Prepared: 5/27/98		Extraction Method: EPA 5030B (MeOH)					
Blank			0580859-BLK1							
Benzene	5/28/98			ND	mg/kg dry	0.0500				
Toluene	"			ND	"	0.0500				
Ethylbenzene	"			ND	"	0.0500				
Xylenes (total)	"			ND	"	0.100				
Surrogate: 4-BFB (PID)	"	4.00		4.03	"	50.0-150	101			
Matrix Spike			0580859-MS1 B805545-14							
Benzene	5/28/98	0.779	ND	0.578	mg/kg dry	60.0-140	74.2			
Toluene	"	0.779	ND	0.556	"	60.0-140	71.4			
Ethylbenzene	"	0.779	ND	0.576	"	60.0-140	73.9			
Xylenes (total)	"	2.34	ND	1.72	"	60.0-140	73.5			
Surrogate: 4-BFB (PID)	"	6.23		4.82	"	50.0-150	77.4			
Matrix Spike Dup			0580859-MSD1 B805545-14							
Benzene	5/28/98	0.779	ND	0.525	mg/kg dry	60.0-140	67.4	20.0	9.60	
Toluene	"	0.779	ND	0.502	"	60.0-140	64.4	20.0	10.3	
Ethylbenzene	"	0.779	ND	0.506	"	60.0-140	65.0	20.0	12.8	
Xylenes (total)	"	2.34	ND	1.52	"	60.0-140	65.0	20.0	12.3	
Surrogate: 4-BFB (PID)	"	6.23		4.50	"	50.0-150	72.2			
Batch: 0680061			Date Prepared: 6/2/98		Extraction Method: EPA 5030B (P/T)					
Blank			0680061-BLK1							
Benzene	6/2/98			ND	ug/l	0.500				
Toluene	"			ND	"	0.500				
Ethylbenzene	"			ND	"	0.500				
Xylenes (total)	"			ND	"	1.00				
Surrogate: 4-BFB (PID)	"	48.0		42.1	"	50.0-150	87.7			
LCS			0680061-BS2							
Benzene	6/2/98	10.0		10.0	ug/l	70.0-130	100			
Toluene	"	10.0		9.72	"	70.0-130	97.2			
Ethylbenzene	"	10.0		9.38	"	70.0-130	93.8			
Xylenes (total)	"	30.0		29.1	"	70.0-130	97.0			
Surrogate: 4-BFB (PID)	"	48.0		45.3	"	50.0-150	94.4			
Matrix Spike			0680061-MS1 B805632-02							
Benzene	6/2/98	10.0	ND	10.6	ug/l	70.0-130	106			

North Creek Analytical - Bothell

*Refer to end of report for text of notes and definitions

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**Total Metals by EPA 200 Series Methods/Quality Control
North Creek Analytical - Bothell**

Analyte	Date Analyzed	Spike Level	Sample Result	QC Result	Units	Reporting Limit Recov. Limits	Recov. %	RPD Limit	RPD %	Notes*
<u>Batch: 0680112</u>		<u>Date Prepared: 6/3/98</u>			<u>Extraction Method: EPA 3010A</u>					
<u>Blank</u>		<u>0680112-BLK1</u>								
Sodium	6/5/98			ND	mg/l	0.500				
<u>LCS</u>		<u>0680112-BS1</u>								
Sodium	6/5/98	2.00		2.05	mg/l	80.0-120	102			
<u>Matrix Spike</u>		<u>0680112-MS1</u>		<u>B805487-00</u>						
Sodium	6/5/98	2.00	75.6	77.3	mg/l	80.0-120	85.0			
<u>Matrix Spike Dup</u>		<u>0680112-MSD1</u>		<u>B805487-00</u>						
Sodium	6/5/98	2.00	75.6	77.9	mg/l	80.0-120	115	20.0	30.0	5

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Geo Engineers - Alaska 4951 Eagle Street Anchorage, AK 99503-7432	Project: TOSCO BP #0581 Project Number: 4823-325-00 Project Manager: Mark Rogers	Sampled: 5/19/98 to 5/20/98 Received: 5/27/98 Reported: 11/5/98 11:26
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Notes and Definitions

#	Note
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- 1 Samples quantitated using a n-C10 through n-C18 range.
- 2 Due to interference from coeluting organic compounds with the primary surrogate, results of the secondary surrogate have been used to control the analysis.
- 3 The dry-weight corrected result for this analyte is based upon a total solids value which has been amended from previously reported data.
- 4 The reporting limit for this analyte has been raised to account for a low dry weight.
- 5 Analyses are not controlled on matrix spike RPD and/or percent recoveries when the sample concentration is significantly higher than the spike level.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- Recov. Recovery
- RPD Relative Percent Difference

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