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FORMER TESORO NORTHSTORE #11

ADEC UST Facility #1502

OCTOBER 2006 CONFIRMATION SOIL BORINGS AND MONITORING EVENT REPORT FINAL

Reviewed 4-6-07 pdt

MWH Job No. 1850914.060102

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March 2007

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

APPENDICES

ACRONYMS AND ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
bgs	below ground surface
CSB	confirmation soil boring
DRO	diesel range organics
GCL	ground water cleanup level
GRO	gasoline range organics
PID	photoionization detector
PQL	practical quantitation limit
QA	quality assurance
QC	quality control
SCL	soil cleanup level
SVE	soil vapor extraction
TAI	Test America, Inc.
UST	underground storage tank
VSC	vapor stripping and circulation

1.0 INTRODUCTION

1.1 PURPOSE AND SCOPE

The 2006 Corrective Action Work Plan for this site includes biannual ground water monitoring events, assessing the effectiveness of the on-site remediation techniques on a monthly basis, and installation of confirmation soil borings (CSBs). MWH completed the CSB and ground water monitoring event on behalf of Tesoro Refining and Marketing Company on October 3 and 4, 2006, and October 24, 2006, respectively. The purpose of the CSBs was to investigate the extent of any remaining soil contamination at the site.

The CSBs involved drilling twelve (12) soil borings, collecting soil samples, and submitting the samples to a laboratory for analytical testing. The CSBs were drilled at the locations and to the depths as specified in the work plan prepared by MWH, dated May 22, 2006, as approved by the Alaska Department of Environmental Conservation (ADEC) on October 5, 2006.

The CSBs and groundwater sampling were completed in accordance with United States Environmental Protection Agency Underground Storage Tank (UST) regulations (40 Code of Federal Regulations Part 280) and ADEC UST regulations (18 Alaska Administrative Code 78). The field procedures and methods used during this sampling event were conducted in accordance with the ADEC *Underground Storage Tank Procedures Manual – Standard Sampling Procedures* (November 7, 2002).

1.2 PROJECT ORGANIZATION

Site Owner/Operator – Tesoro Refining and Marketing Company, 3450 South 344th Way, Suite 201, Auburn, Washington.

Third Party Environmental Assessor – Kristine Ivarson, Hydrogeologist with MWH, supervised the drilling and performed the CSB sampling. Charles Larson, Engineering Associate, and Rayn Aaberg, Engineering Intern, both with MWH, completed the work for the October 2006 monitoring event.

Drilling/Well Decommissioning Contractor – Geo Tek Alaska, Inc., Anchorage, Alaska.

ADEC Certified Laboratory – Test America, Inc. (TAI), located in Anchorage, Alaska.

2.0 CONFIRMATION SOIL BORINGS

2.1 METHODS

The methods used to conduct the CSBs at this site are described below.

2.1.1 Soil Boring

Twelve soil borings (SB-1 through SB-12) were drilled in the vicinity of the former USTs and areas of previous investigations across the site on October 3 and 4, 2006 (Figure 1). The soil borings were advanced using a track mounted Geoprobe™ 6620DT with an outer coring device containing an inner Lexan™ sample sleeve. The coring device was advanced continuously, in 4-foot sections, into undisturbed soil. The inner Lexan™ sleeve was then removed from the coring device, and split along its length. The soil samples collected during the installation of the soil borings were inspected for lithology and the presence of contamination.

Each soil boring was drilled to depth of 25 feet below ground surface (bgs). Ground water was encountered at 18 to 19.5 feet bgs in Borings SB-1, SB-3, SB-4, SB-10, and SB-11. In Borings SB-7, SB-8, and SB-9, ground water was encountered 16 feet bgs. Ground water was at 22 feet bgs in Boring SB-12, and was not encountered during drilling in SB-2, SB-5, and SB-6.

A bentonite grout was used to plug each CSB upon completion. The surface was covered with surrounding surface material. Geologic logs for the CSBs are provided in Appendix A.

2.1.2 Soil Sampling

The coring device was advanced continuously, in 4-foot sections, into undisturbed soil. The inner Lexan™ sleeve was then removed from the coring device, and split along its length. A Photovac™ photoionization detector (PID) calibrated with a 100 parts per million by volume isobutylene gas standard, was used to field screen the soil samples to determine the zones most likely to have contamination present. The soil samples were placed into plastic Ziploc® bags to enhance volatilization prior to headspace screening with the PID.

A total of 25 discrete soil samples and three duplicate samples were collected for laboratory analyses from the CSBs. The sample depths are shown on the soil boring logs (Appendix A). Samples were placed in clean, laboratory-supplied, amber glass jars and preserved with methanol. The soil samples were maintained at a temperature of 4 ± 2 degrees Celsius and delivered in accordance with standard chain-of-custody procedures to TAI for laboratory analysis.

2.2 RELEASE INVESTIGATION RESULTS

The soil type, results of the soil sampling, and a Quality Assurance (QA)/Quality Control (QC) review of the laboratory analytical data are presented below.

2.2.1 Soil Type

The surface at the CSB locations consisted of a sandy-gravel fill material. Subsurface material encountered in each CSB was predominantly sandy gravel with some lenses of silt. Greater variability in the subsurface material was identified in Borings SB-4, SB-7, SB-8, SB-10, and SB-12, where more silt and/or sand was present – as described below.

In Boring SB-1, sand with silt was encountered at 12 to 14 feet bgs. The remainder of the borehole was sandy gravel or gravelly sand, with a limited amount of silt. The material was notably loose near the surface. The subsurface material in Borings SB-2, SB-3, SB-5, SB-6, SB-9, and SB-11 was also sandy gravel and gravelly sand. These borings had some variation of the amount of sand with respect to gravel, but with a limited amount of variation with depth.

No silt lens was present in either Boring SB-2 or SB-5, and the material in SB-5 was noted as soft throughout the borehole. Subsurface material in Boring SB-3 was consistent with that found in SB-2, with sandy gravel being present throughout the borehole. This boring, however, had a silt lens at 4.5 to 5 feet bgs, with sandy silt from 5 to 6.5 feet bgs. Few fines were identified below this layer.

Boring SB-6 had a silty gravel layer from 21 feet to the bottom of the borehole. This silty gravel, with some sand occasionally present in this layer, was also identified in SB-9 at 22 feet and SB-11 at between 18 and 19 feet bgs.

Borings SB-4, SB-7, SB-8, SB-10, and SB-12 had higher levels of variability in the subsurface material. Material in Boring SB-4 consisted of sandy gravel and gravelly sand to 5.5 feet bgs, with predominantly sand to 9.5 feet bgs. This was underlain by sandy gravel to 21 feet bgs. Silty sand was present from 21 to 22 feet, underlain by sand to 24 feet, and sandy gravel from 24 to 25 feet bgs.

Subsurface material in Boring SB-7 was sandy gravel to 6.5 feet, silty sand and gravel to 7.5 feet, sandy gravel to 9.5 feet, and then sand to 10.5 feet bgs. This was underlain by sandy gravel to 12 feet, where some silt was also identified. Alternating layers of silty gravel and sandy gravel dominated from 12 feet to the bottom of the borehole, with the exception of small silt and sand lenses from approximately 18.5 feet bgs to 24 feet bgs. The material identified in Boring SB-12 was similar to that of SB-7.

Boreholes SB-8 and SB-10 were predominantly sandy gravel, as with the majority of the other borings at the site. These CSBs, however, had a thicker silt layer than in other borings. Boring SB-8 had a silt layer from 20.5 to 23.5 feet, while SB-10 had silt present at 24 to 25 feet bgs.

2.2.2 Soil Sample Analytical Results

A copy of the laboratory analytical report with the executed chain-of-custody form is provided in Appendix B. The analytical results for the soil samples collected from the CSBs are summarized in Table 1.

Table 1 Soil Sample Analytical Results
Samples collected on October 3 and 4, 2006

Sample Identification	Depth (feet bgs)	Benzene[1] (mg/Kg)	Toluene[1] (mg/Kg)	Ethylbenzene[1] (mg/Kg)	Xylenes[1] (mg/Kg)	GRO (mg/Kg)	DRO (mg/Kg)	PID (ppmv)
TNS11-SB1-9	9	U (0.0141)	U (0.0354)	U (0.0354)	U (0.053)	U (3.54)	U (25)	2.4
TNS11-SB1-19	19	U (0.221)	3.62	**9.24**	35.9	**416**	**1,520**	995
TNS11-SB2-10	10	U (0.0127)	U (0.0317)	U (0.0317)	U (0.0476)	U (3.17)	U (22.6)	6.2
TNS11-SB2-18	18	U (0.0136)	U (0.034)	U (0.034)	U (0.051)	U (3.4)	U (25)	12.1
TNS11-SB3-15	15	U (0.0131)	0.0574	0.0513	0.126	U (3.27)	U (25)	NA
TNS11-SB3-19	19	0.0129	U (0.03)	0.0311	0.0451	U (3)	U (22.4)	10.5
TNS11-SB4-15	15	**0.0324**	0.165	U (0.0321)	0.346	U (3.21)	U (25)	2.9
TNS11-SB4-19	19	**0.0233**	0.0561	U (0.0298)	0.113	U (2.98)	U (25)	4.6
TNS11-SB5-15	15	U (0.013)	U (0.0326)	U (0.0326)	U (0.0489)	U (3.26)	U (25)	2.8
TNS11-SB5-25	25	0.0144	0.0325	0.0317	0.0991	U (3.09)	U (21.6)	4.6
TNS11-SB6-4	4	U (0.0124)	U (0.0311)	U (0.0311)	U (0.0466)	U (3.11)	U (25)	4.6
TNS11-SB6-19	19	**0.0233**	0.242	0.0577	0.238	47.7	U (25)	86.2
TNS11-SB6-23	23	U (0.0218)	0.171	0.801	1.07	51.3	U (25)	156
TNS11-SB7-10	10	U (0.0143)	U (0.0358)	U (0.0358)	U (0.0537)	U (3.58)	U (25)	NA
TNS11-SB7-19	19	U (0.011)	0.0377	0.0932	U (0.0411)	U (2.74)	U (25)	346
TNS11-SB8-7	7	U (0.0126)	U (0.0316)	U (0.0316)	U (0.0474)	U (3.16)	U (25)	2.8
TNS11-SB8-16	16	**0.0263**	0.108	0.0545	0.187	U (3.1)	U (25)	6.9
TNS11-SB9-14	14	**0.0282**	0.0778	U (0.0339)	0.083	U (3.39)	U (25)	7.0
TNS11-SB9-22	22	**0.33**	**8.62**	**11.2**	54.9	**389**	U (25)	2,249
TNS11-SB10-10	10	U (0.0118)	0.0517	U (0.0295)	0.152	U (2.95)	U (25)	NA
TNS11-SB10-23	23	U (0.0134)	U (0.0336)	U (0.0336)	U (0.0504)	U (3.36)	U (22.3)	4.0
TNS11-SB11-15	15	U (0.0119)	0.0505	U (0.0298)	0.157	U (2.98)	U (22.1)	4.9
TNS11-SB11-18	18	U (0.0133)	0.109	0.0951	0.367	40.1	U (22.2)	21.7

Table 1 (Cont.) Soil Sample Analytical Results
Samples collected on October 3 and 4, 2006

Sample Identification	Depth (feet bgs)	Benzene[1] (mg/Kg)	Toluene[1] (mg/Kg)	Ethylbenzene[1] (mg/Kg)	Xylenes[1] (mg/Kg)	GRO (mg/Kg)	DRO (mg/Kg)	PID (ppmv)
TNS11-SB12-15	15	U (0.0137)	U (0.0343)	U (0.0343)	0.0616	U (3.43)	U (25)	3.9
TNS11-SB12-23	23	U (0.21)	1.28	1.52	1.9	**335**	93.4	1,664
TNS11-DUP (Duplicate of SB4-19)	19	**0.0579**	0.165	0.0375	0.22	U (3.28)	U (25)	4.6
TNS11-DUP 2 (Duplicate of SB8-16)	16	0.0125	0.0598	0.0309	0.121	U (2.91)	U (25)	6.9
TNS11-DUP 3 (Duplicate of SB11-18)	18	0.0128	0.0954	0.0783	0.34	33.4	U (25)	21.7
Trip Blank		U (0.0133)	U (0.0333)	U (0.0333)	U (0.0500)	U (3.33)	NA	NA
SCLs		0.02	5.4	5.5	78	300	250	NA

Key:
1 – Analyzed by United States Environmental Protection Agency Method 8021B.
AK – Alaska Test Method
bgs – below ground surface
DRO – diesel range organics, analyzed by AK102.
GRO – Gasoline range organics, analyzed by AK101.
mg/Kg – milligrams per kilogram
NA – not available/applicable
PID – photoionization detector
ppmv – parts per million by volume
SCLs – Soil cleanup levels, per Alaska Department of Environmental Conservation 18 Alaska Administrative Code 75.341, Tables A1 and B1.
U – Undetected above the values shown in parentheses.
Bold indicates the concentration exceeds the SCL.

2.2.3 Soil Sample Analyses QA/QC Review

TAI met all laboratory QA/QC criteria during the analysis of soil samples for this sampling event. Laboratory QC data are included with the laboratory reports provided in Appendix B.

Samples TNS11-DUP, TNS11-DUP 2, and TNS11-DUP 3 are duplicates of Samples SB4-19, SB8-16, and SB11-18, respectively. The duplicate sample set was collected to determine the precision of the laboratory analysis for this sampling event. Data presented in Table 2 show that the precision for the duplicate sample sets were as follows:

- **Sample Set TNS11-DUP / SB4-19.** Precision could not be calculated for ethylbenzene, gasoline range organics (GRO), and diesel range organics (DRO) because these analytes were not detected above the practical quantitation limits (PQLs) in either sample set. Precision exceeded the established QA criteria for benzene, toluene, and xylenes.

- **Sample Set TNS11-DUP 2 / SB8-16.** Precision could not be calculated for GRO and DRO because these analytes were not detected above the PQLs in this sample set. Precision exceeded the established QA criteria for benzene, toluene, ethylbenzene, and xylenes. 42.9% OK for xylenes
- **Sample Set TNS11-DUP 3 / SB11-18.** Precision was within established QA criteria for toluene, ethylbenzene, xylenes, and GRO. Precision could not be calculated for benzene and DRO because these analytes were not detected above the PQLs in one or more of the samples.

Data presented in Table 2 show the precision calculation for Sample Sets TNS11-DUP / SB4-19 and TNS11-DUP / SB8-16 were above the established QA criteria. Sample Set TNS11-DUP3 / SB11-18 was within the established QA criteria. This result is not entirely unexpected as the reported concentrations are at trace levels near the PQLs and, therefore, subject to inherent variation.

Table 2 Laboratory Quality Control Objectives

Quality Control Designation	Tolerance	Results for Sample Sets		
		TNS11-DUP / SB4-19	TNS11-DUP 2 / SB8-16	TNS11-DUP 3 / SB11-18
Holding Times				
BTEX/to analyze	28 days	11 days	11 days	12 days
GRO/to analyze	28 days	11 days	11 days	12 days
DRO/to analyze	40 days	6 days	6 days	6 days
DRO/to extract	14 days	3 days	3 days	3 days
Field Duplicates – Precision				
Benzene	± 50%	85.2	71.1	NC
Toluene	± 50%	98.5	57.4	13.3
Ethylbenzene	± 50%	NC	55.3	19.4
Xylenes	± 50%	64.3	42.9	7.6
GRO	± 50%	NC	NC	18.2
DRO	± 50%	NC	NC	NC

Key:
% – percent
± – plus or minus
BTEX – benzene, toluene, ethylbenzene, and xylenes
DRO – diesel range organics
GRO – gasoline range organics
NC – Unable to calculate precision because analytes were not detected above the practical quantitation limits.

3.0 GROUND WATER MONITORING

MW-14 & MW-15 are injection wells for the VSC extraction wells

The October 2006 monitoring event included collecting and analyzing ground water samples from Monitoring Wells MW-14, MW-15, and MW-17. Monitoring Wells MW-2 through MW-7 were not sampled during this monitoring event. per the 2006 Corrective Action Work Plan. In addition, water levels were measured in Monitoring Wells MW-1 and MW-8 to provide data for determining ground water flow direction. Locations of the monitoring wells and the soil vapor extraction (SVE) and vapor stripping and circulation (VSC) system layouts are shown on Figures 1 and 2, respectively.

3.1 METHODS

Methods that were used for this monitoring event were as specified in the 2006 Corrective Action Work Plan for this site.

3.2 GROUND WATER LEVELS

Table 3 presents ground water elevations based on the depths to static water level measured during this monitoring event.

Table 3 Ground Water Elevations
Measured on October 24, 2006

Monitoring Well Identification	Top of Casing Elevation (feet)[1]	Depth to Water (feet)	Ground Water Elevation (feet)
MW-1	NM	Dry	NA
MW-8	98.19	17.52	80.67
MW-14	99.61	18.54	81.07
MW-15	99.40	17.09	82.31
MW-17	98.38	17.64	80.74

Key:
1 – Based on a vertical control survey of June 4, 2004, using an arbitrary datum.
NA – not applicable
NM – not measured

3.3 FIELD PARAMETERS

The results of field parameter testing of the water samples collected during the October 2006 monitoring event are presented in Table 4. A typewritten copy of the sampler's field measurements and notes is included as a worksheet in Appendix C. The worksheet also notes the instruments and test methods used to analyze each parameter.

Table 4 Field Parameters
Measured on October 24, 2006

Monitoring Well Identification	Temp. (°C)	pH	Dissolved Oxygen (mg/L)	ORP (mV)
MW-14	6.1	7.95	7.92	-56.0
MW-15	9.1	7.55	5.73	-39.6
MW-17	9.2	7.88	3.63	-53.4

Key:
°C – degrees Celsius
mg/L – milligrams per liter
mV - millivolt
ORP – oxidation-reduction potential
pH – -log [H^+]

3.4 GROUND WATER SAMPLE ANALYTICAL RESULTS

All historical monitoring data for this site are tabulated in Appendix D. Laboratory analytical results for the ground water samples collected during the October 2006 monitoring event are summarized in Table 5. A copy of the laboratory report is provided in Appendix B.

Table 5 Ground Water Analytical Results
Samples collected on October 24, 2006

Sample Identification	Benzene[1] (mg/L)	Toluene[1] (mg/L)	Ethylbenzene[1] (mg/L)	Xylenes[1] (mg/L)	GRO (mg/L)	DRO (mg/L)
MW-14	**0.0146**	0.00776	0.255	0.325	**2.21**	0.648
MW-15	U (0.0005)	U (0.0005)	U (0.0005)	U (0.0015)	U (0.05)	U (0.413)
MW-17	U (0.0005)	U (0.0005)	0.0018	0.00258	0.0594	0.457
TNS 11 DUP (duplicate of MW-14)	**0.0126**	0.0046	0.192	0.23	**1.57**	0.655
Trip Blank	U (0.0005)	U (0.0005)	U (0.0005)	U (0.0015)	U (0.05)	NT
GCL	0.005	1	0.7	10	1.3	1.5

Key:
1 – Analyzed by U.S. Environmental Protection Agency Test Method 8021B.
AK – Alaska Test Method
DRO – diesel range organics, analyzed by AK102.
GCL – Ground water cleanup level, per Alaska Department of Environmental Conservation 18 Alaska Administrative Code 75.345, Table C.
GRO – gasoline range organics, analyzed by AK101.
mg/L – milligrams per liter
NT – not tested
U – Undetected above practical quantitation limits shown in parentheses.
Bold indicates the concentration exceeds the GCL.

3.5 REMEDIATION SYSTEM OPERATION

The SVE and VSC systems were off when MWH arrived at the site on October 24, 2006. Both systems were restarted. The SVE flow was at 125+ cubic feet per minute, and the vacuum reading was 52 inches of water. A PID reading of 0.3 parts per million by volume was recorded

during this monitoring event. The VSC is currently configured to circulate in Monitoring Wells MW-14 and MW-15. The system was operating normally upon departure from the site.

3.6 QUALITY ASSURANCE/QUALITY CONTROL REVIEW

TAI met all laboratory QA/QC criteria during the analysis of ground water samples for this sampling event. Laboratory QC data are included with the laboratory report in Appendix B.

Sample TNS 11 Dup is a duplicate of Sample MW-14. The duplicate sample set was collected to determine the precision of the laboratory analysis for this sampling event. Data presented in Table 6 show the precision calculation for toluene, xylenes, and GRO were above the established QA criteria. This result is not unexpected as the reported concentrations are at trace levels near the PQLs and, therefore, subject to variation. Precision for benzene, ethylbenzene, and DRO were within the established QA criteria tolerances.

Would have to disagree on this statement PDA 4-6-07

Table 6 Laboratory Quality Control Objectives

Quality Control Designation	Tolerance	Results for This Event
Holding Times		
DRO/Water/to analyze	40 days	2 days
DRO/Water/to extract	7 days	2 days
GRO/Water/to analyze	14 days	3 days
GRO/Water/to analyze	14 days	4 days
GRO/Water/to analyze	14 days	5 days
Field Duplicates – Precision		
Benzene/Water	± 30%	14.7%
Toluene/Water	± 30%	51.1%
Ethylbenzene/Water	± 30%	28.2%
Xylenes/Water	± 30%	34.2%
GRO/Water	± 30%	33.9%
DRO/Water	± 30%	1.07%

Key:
% – percent
± – plus or minus
BTEX – benzene, toluene, ethylbenzene, and xylenes
DRO – diesel range organics
GRO – gasoline range organics
NC – Unable to calculate precision because benzene, ethylbenzene, and DRO were not detected above the practical quantitation limits.

4.0 DISCUSSION OF FINDINGS

4.1 SOIL CONDITIONS

Benzene was detected above the ADEC soil cleanup level (SCL) in the samples collected from Borings SB-4, SB-6, SB-8, and SB-9. The reported concentrations for benzene were slightly above the SCL, with the exception of the sample collected from the 22-foot interval from Boring SB-9. This result was an order of magnitude greater than the SCL. Ethylbenzene was detected slightly above the SCL in Borings SB-1 and SB-9. Xylenes were detected above the PQL, but below the SCL, in one or more samples from each CSB, except for Boring SB-2 where xylenes were below the PQL in both samples.

GRO was detected above the SCL in the samples collected from Borings SB-1, SB-9, and SB-12. The reported concentrations for GRO were slightly above the SCL in these three CSBs. DRO was also detected above the SCL in Boring SB-1.

4.2 GROUND WATER HYDRAULIC CHARACTERISTICS

The ground water elevations presented in Table 1 were plotted using triangulation with linear interpolation. The ground water flow direction on October 24, 2006, was found to be toward the southeast, with a bearing of 122 degrees and at a gradient of approximately 0.0258 feet per foot. These findings are similar to those of previous monitoring events, as shown in the ground water flow summary on Figure 2.

4.3 GROUND WATER QUALITY

Benzene and GRO was detected in Monitoring Well MW-14 at levels above the ADEC ground water cleanup level (GCL). The reported concentrations are consistent with historical results for Monitoring Well MW-14. The remaining wells did not contain contaminant concentrations above the GCLs.

Graphs of contaminant concentrations and ground water elevations with respect to time for Monitoring Wells MW-3, MW-8, MW-14, MW-15, MW-16, and MW-17 are presented on Figure 4. The remaining monitoring wells are not graphed due to low contaminant concentrations. The data presented on Figure 4 show that contaminant concentrations have remained at a level below the GCLs in ground water from all monitoring wells at this site, except for recent increases in Monitoring Well MW-14 which exceeded the clean up level.

4.4 REMEDIATION SYSTEM

The SVE and VSC systems are currently operating on a 24-hour basis. Laboratory results for groundwater samples collected during the past 36 months of treatment indicate a significant decrease in petroleum contamination in the ground water at this site. Benzene, GRO, and DRO concentrations in ground water have decreased to levels at or below the GCLs. The results of the October 2006 monitoring event indicate that the on-site remediation systems are providing effective ground water and vadose zone treatment at this site.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Petroleum related contamination was encountered in several soil borings during the site assessment. Benzene concentrations were highest in the area near Boring SB-9. DRO was detected above the GCL only in a sample from Boring SB-1. The findings of this report are consistent with previous site assessments and correlated to ground water contaminant characteristics.

MWH recommends further evaluation of the soil boring data and preparation of a work plan to address the remaining contamination issues at the site for the coming year.

6.0 LIMITATIONS

MWH conducted the October 2006 CSB and monitoring event in accordance with the Corrective Action Work Plan approved by ADEC, and in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions. All sampling activities were completed in accordance with the ADEC *Underground Storage Tanks Procedures Manual – Standard Sampling Procedures* (November 7, 2002). No other warranty, expressed or implied, is made. Data and recommendations made herein were prepared for the Former Tesoro Northstore #11 and Tesoro Refining and Marketing Company. Information herein is for use at this site in accordance with the purpose of the report described.

Report prepared by:

MA Zidek Jr. 3/14/7

Andrea Sandefur
Associate Civil Engineer

Date

Report reviewed by:

MA Zidek 3/14/7

Michael Zidek, PMP
Project Manager

Date

FIGURES

SB–11		
Depth	15′	18′
Benzene	U(0.0119)	U(0.0133)
GRO	U(2.98)	40.1
DRO	U(22.1)	U(22.2)

SB–10		
Depth	10′	23′
Benzene	U(0.0118)	U(0.0134)
GRO	U(2.95)	U(3.36)
DRO	U(25)	U(22.3)

SB–9		
Depth	14′	22′
Benzene	**0.0282**	**0.33**
GRO	U(3.39)	**389**
DRO	U(25)	U(25)

SB–4		
Depth	15′	19′
Benzene	**0.0324**	**0.0233**
GRO	U(3.21)	U(2.98)
DRO	U(25)	U(25)

SB–1		
Depth	9′	19′
Benzene	U(0.0141)	U(0.221)
GRO	U(3.54)	**416**
DRO	U(25)	**1520**

LOT 1

JERSEY BARRIERS

10th & M SEAFOODS
301 MULDOON ROAD
ANCHORAGE, AK 99504

SVE BLOWER UNIT

VSC AIR COMPRESSOR BOX

16

15

20′ ALLEY (PUBLIC)

MULDOON ROAD

SVE–5

MW–14

VSC–2

MANIFOLD SUMP

VSC–3

MW–15

SVE–3

LOT 2

SVE–4

SVE–1

VSC–1

SVE–2

EAST THIRD AVENUE

SB–8		
Depth	7′	16′
Benzene	U(0.0126)	**0.0263**
GRO	U(3.16)	U(3.1)
DRO	U(25)	U(25)

SB–12		
Depth	15′	23′
Benzene	U(0.0137)	U(0.21)
GRO	U(3.43)	**335**
DRO	U(25)	93.4

SB–7		
Depth	10′	19′
Benzene	U(0.0143)	U(0.011)
GRO	U(3.58)	U(2.74)
DRO	U(25)	U(25)

SB–5		
Depth	15′	25′
Benzene	U(0.013)	0.0144
GRO	U(3.26)	U(3.09)
DRO	U(25)	U(21.6)

SB–6			
Depth	4′	19′	23′
Benzene	U(0.0124)	**0.0233**	U(0.0218)
GRO	U(3.11)	47.7	51.3
DRO	U(25)	U(25)	U(25)

SB–3		
Depth	15′	19′
Benzene	U(0.0131)	0.0129
GRO	U(3.27)	U(3)
DRO	U(25)	U(22.4)

SB–2		
Depth	10′	18′
Benzene	U(0.0127)	U(0.0136)
GRO	U(3.17)	U(3.4)
DRO	U(22.6)	U(25)

NORTH

APPROXIMATE SCALE IN FEET

0 10 20

Exceed SCL's
PDG 4-6-07

LEGEND:

- PROPERTY LINE
- CONFIRMATION SOIL BORING
- SOIL VAPOR EXTRACTION WELL
- VAPOR STRIPPING AND CIRCULATION WELL
- MONITORING WELL

NOTES:

1. RESULTS ARE FOR SAMPLES COLLECTED ON OCTOBER 3 AND 4, 2006.
2. RESULTS ARE IN MILLIGRAMS PER KILOGRAM.
3. BOLD/RED TEXT INDICATES CONTAMINANT CONCENTRATION ABOVE THE CLEANUP LEVEL FOR THIS SITE.

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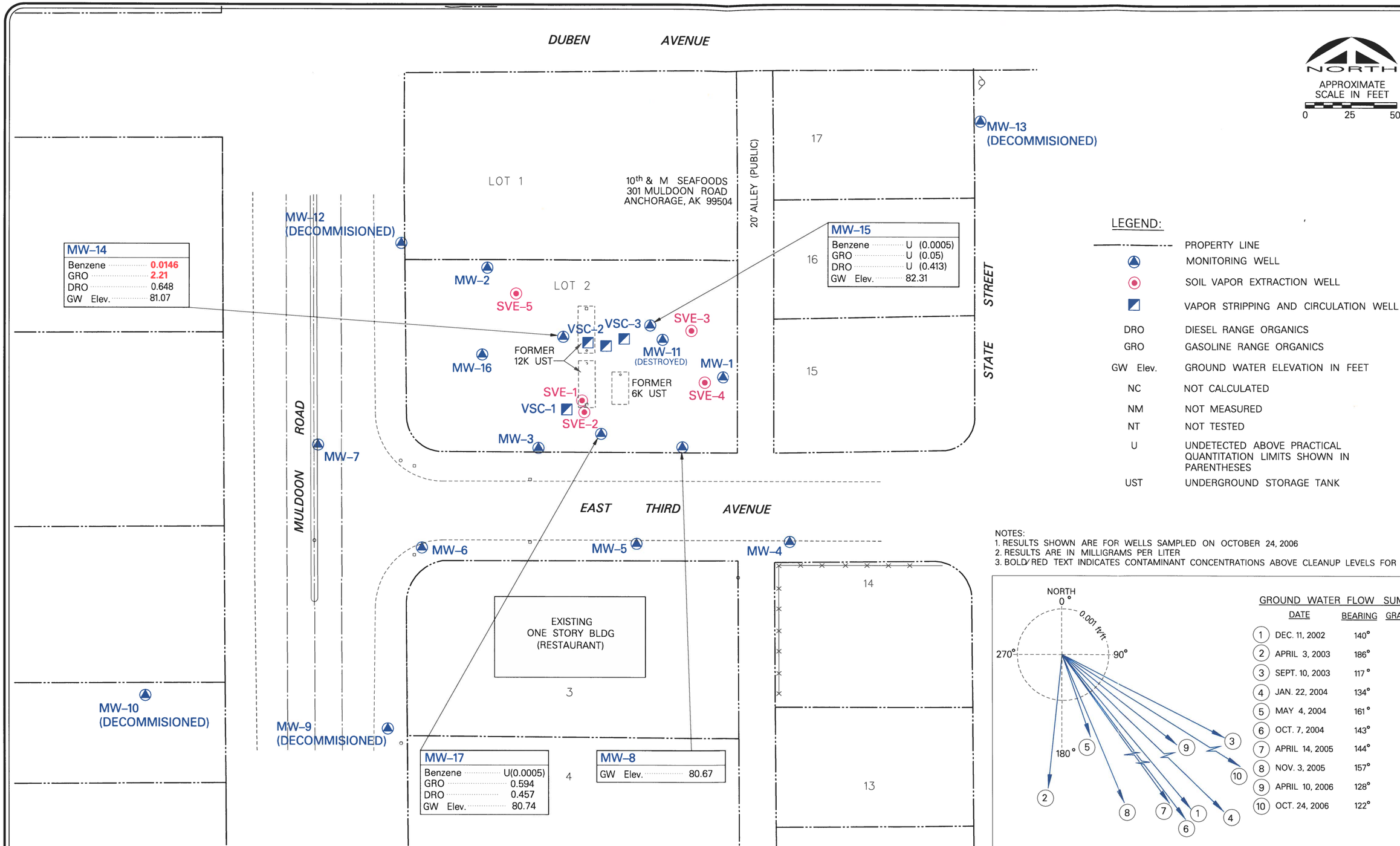
FIGURE 1

TESORO ALASKA COMPANY – FORMER TESORO NORTHSTORE #11
OCTOBER 2006 – CSB/MONITORING EVENT REPORT

LOCATIONS OF CONFIRMATION SOIL BORINGS AND ANALYTICAL RESULTS

JOB No. 1850914.070102 TIME: 15-FEB-2007 10:53 FILE: C:\Proj\Tesoro\NrthStr011\CSBworkplan\Oct2006\Final\FIG01.dgn



LEGEND:

----------	PROPERTY LINE
▲	MONITORING WELL
◉	SOIL VAPOR EXTRACTION WELL
◪	VAPOR STRIPPING AND CIRCULATION WELL
DRO	DIESEL RANGE ORGANICS
GRO	GASOLINE RANGE ORGANICS
GW Elev.	GROUND WATER ELEVATION IN FEET
NC	NOT CALCULATED
NM	NOT MEASURED
NT	NOT TESTED
U	UNDETECTED ABOVE PRACTICAL QUANTITATION LIMITS SHOWN IN PARENTHESES
UST	UNDERGROUND STORAGE TANK

NOTES:
1. RESULTS SHOWN ARE FOR WELLS SAMPLED ON OCTOBER 24, 2006
2. RESULTS ARE IN MILLIGRAMS PER LITER
3. BOLD/RED TEXT INDICATES CONTAMINANT CONCENTRATIONS ABOVE CLEANUP LEVELS FOR THIS SITE

GROUND WATER FLOW SUMMARY

	DATE	BEARING	GRADIENT (ft/ft)
1	DEC. 11, 2002	140°	0.0044
2	APRIL 3, 2003	186°	0.00293
3	SEPT. 10, 2003	117°	0.004
4	JAN. 22, 2004	134°	0.0099
5	MAY 4, 2004	161°	0.0019
6	OCT. 7, 2004	143°	0.0056
7	APRIL 14, 2005	144°	0.0055
8	NOV. 3, 2005	157°	0.0035
9	APRIL 10, 2006	128°	0.0032
10	OCT. 24, 2006	122°	0.0258

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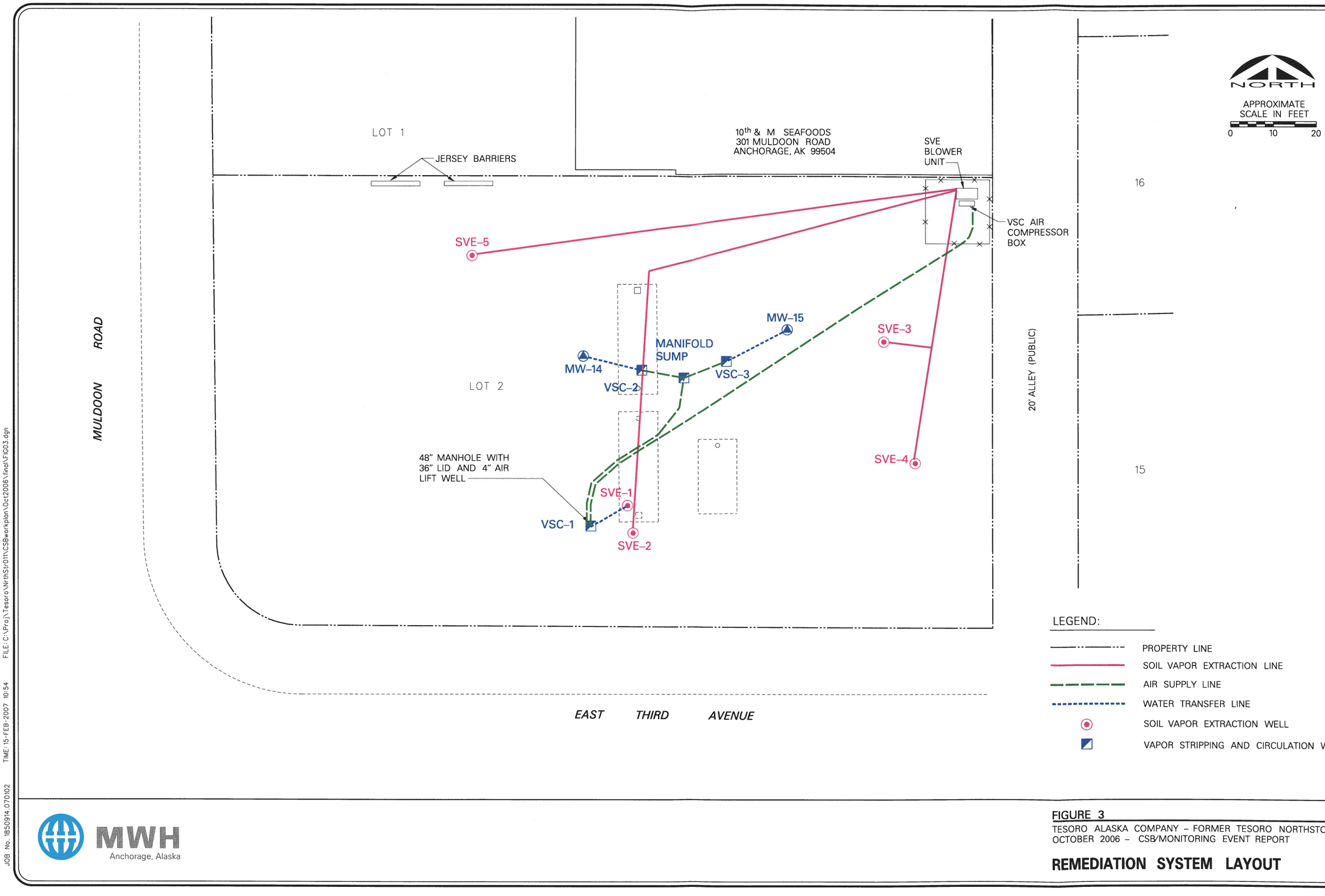
FIGURE 2

TESORO ALASKA COMPANY – FORMER TESORO NORTHSTORE #11
OCTOBER 2006 – CSB/MONITORING EVENT REPORT

SITE PLAN WITH GROUND WATER ANALYTICAL RESULTS

JOB No. 1850914.070102 TIME: 15-FEB-2007 10:54 FILE: C:\Proj\Tesoro\NrthStr011\CSBworkplan\Oct2006\final\FIG02.dgn



JOB No. 1850914.070102 TIME: 15-FEB-2007 10:54 FILE: C:\Proj\Tesoro\NrthStr011\CSBworkplan\Oct2006\final\FIG03.dgn

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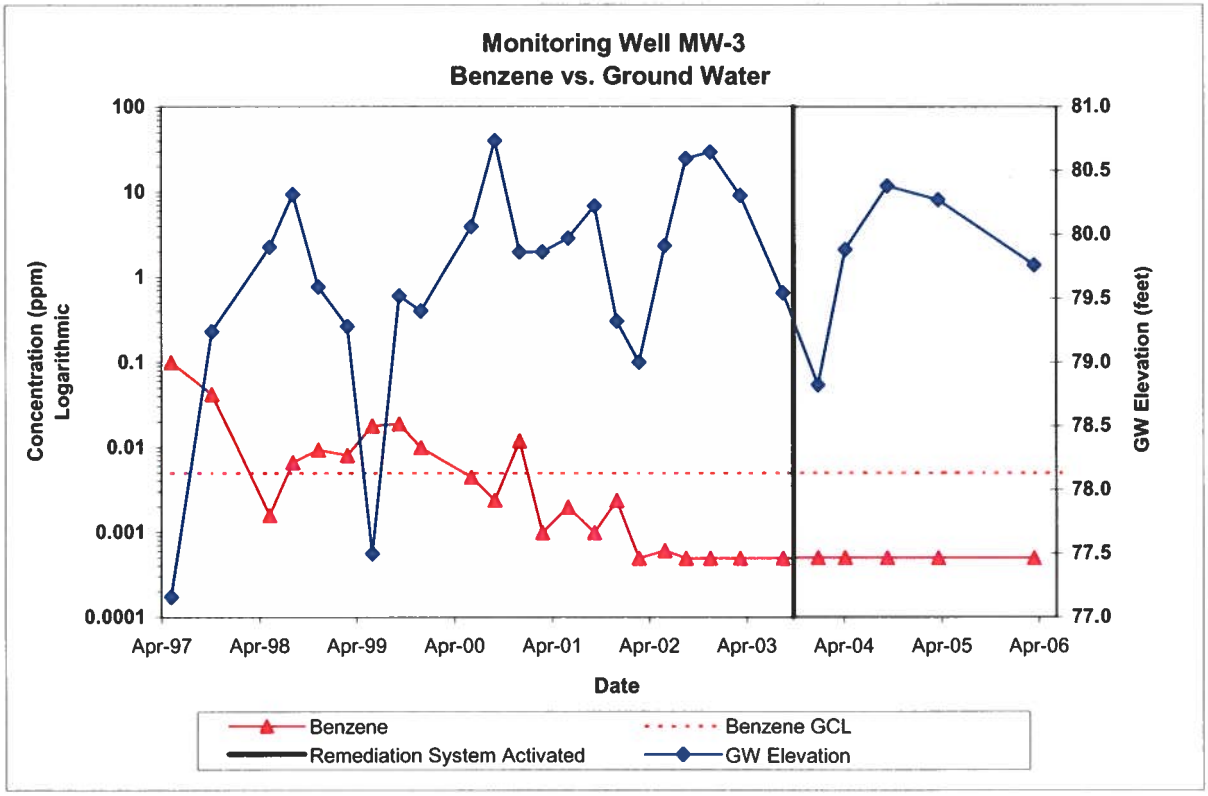
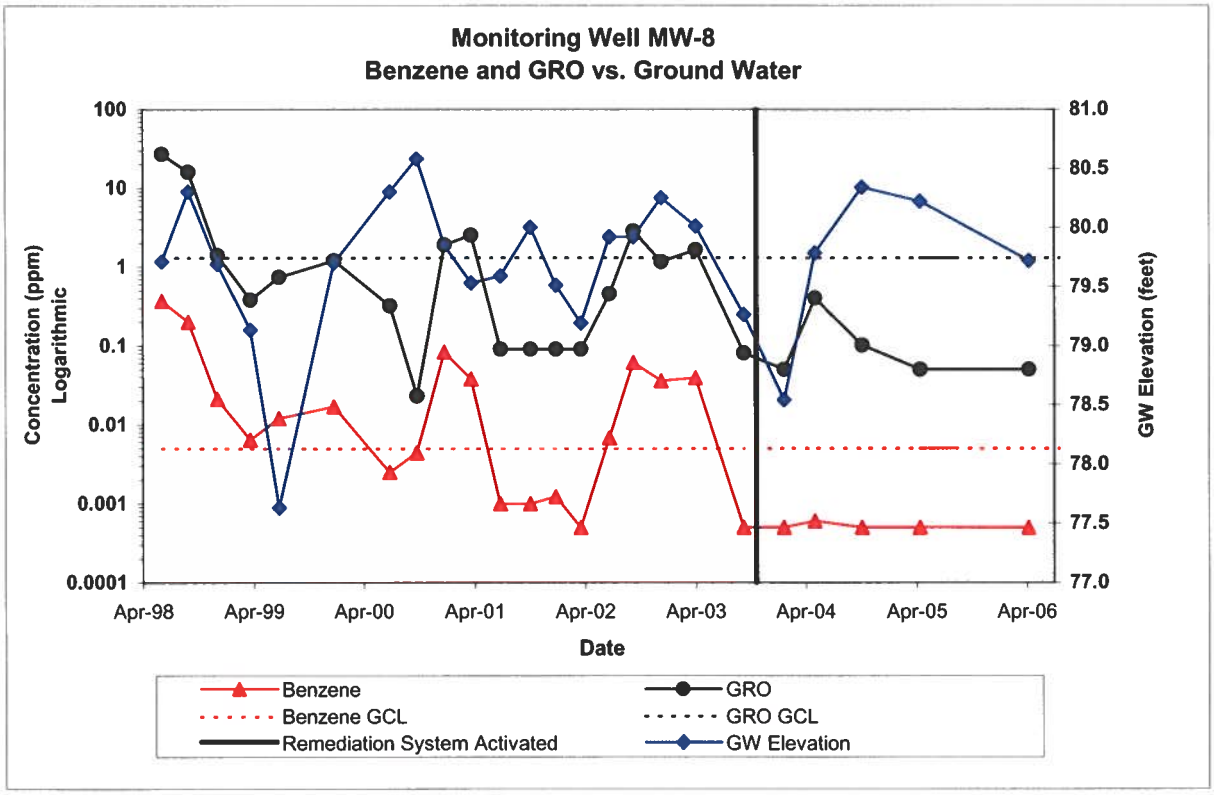
FIGURE 3
TESORO ALASKA COMPANY – FORMER TESORO NORTHSTORE #11
OCTOBER 2006 – CSB/MONITORING EVENT REPORT

REMEDIATION SYSTEM LAYOUT

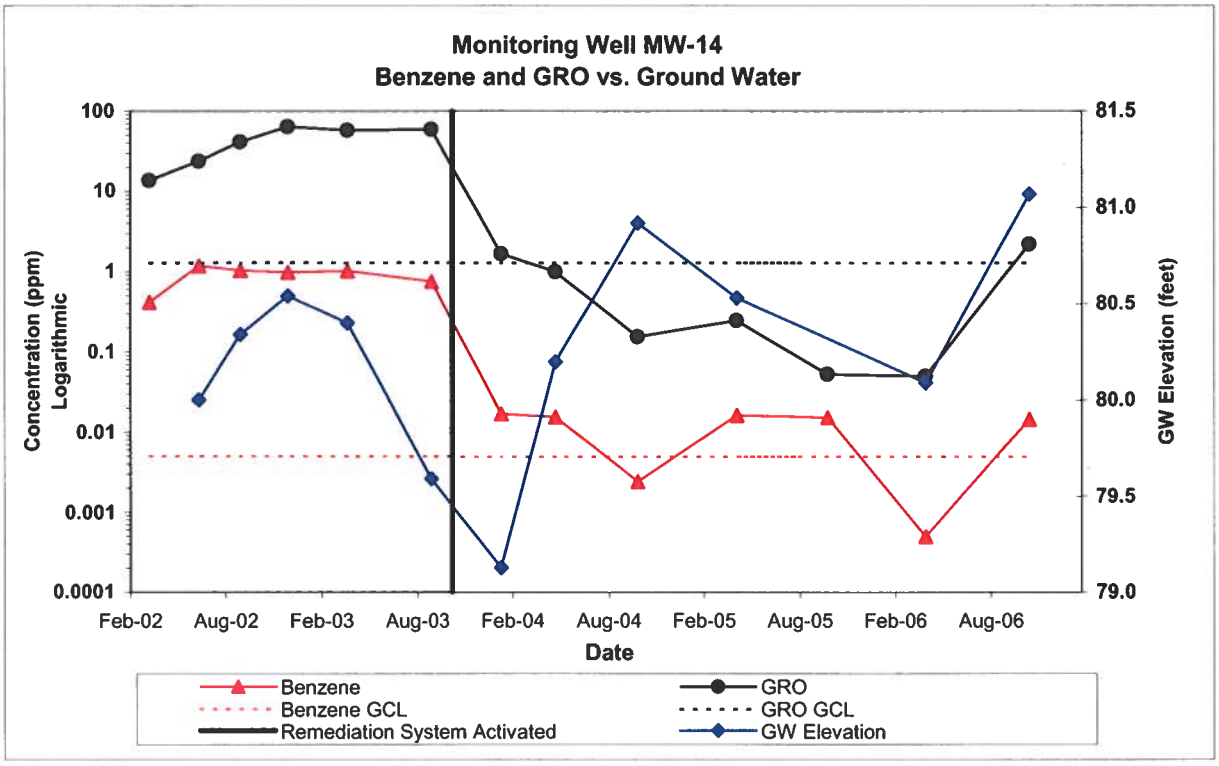
Figure 4
Graphs of Contamination Concentrations and Ground Water Elevations

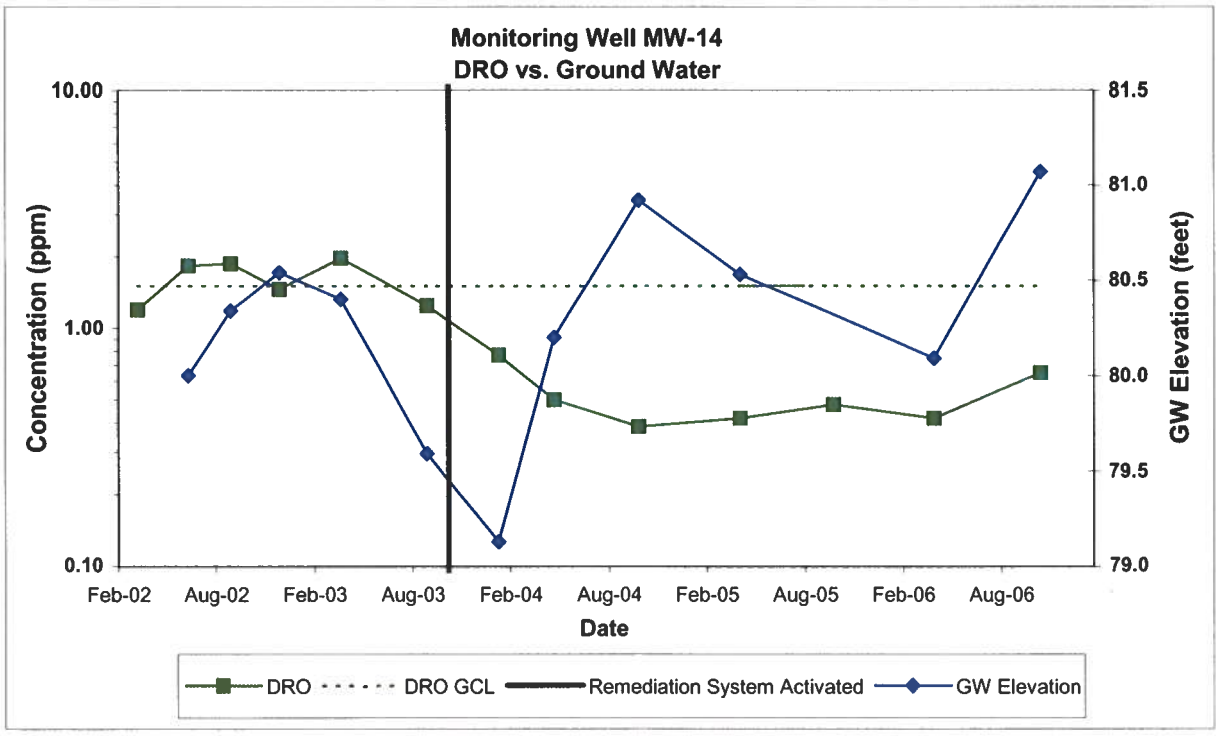




GW Treatment System Injection Well since 2003

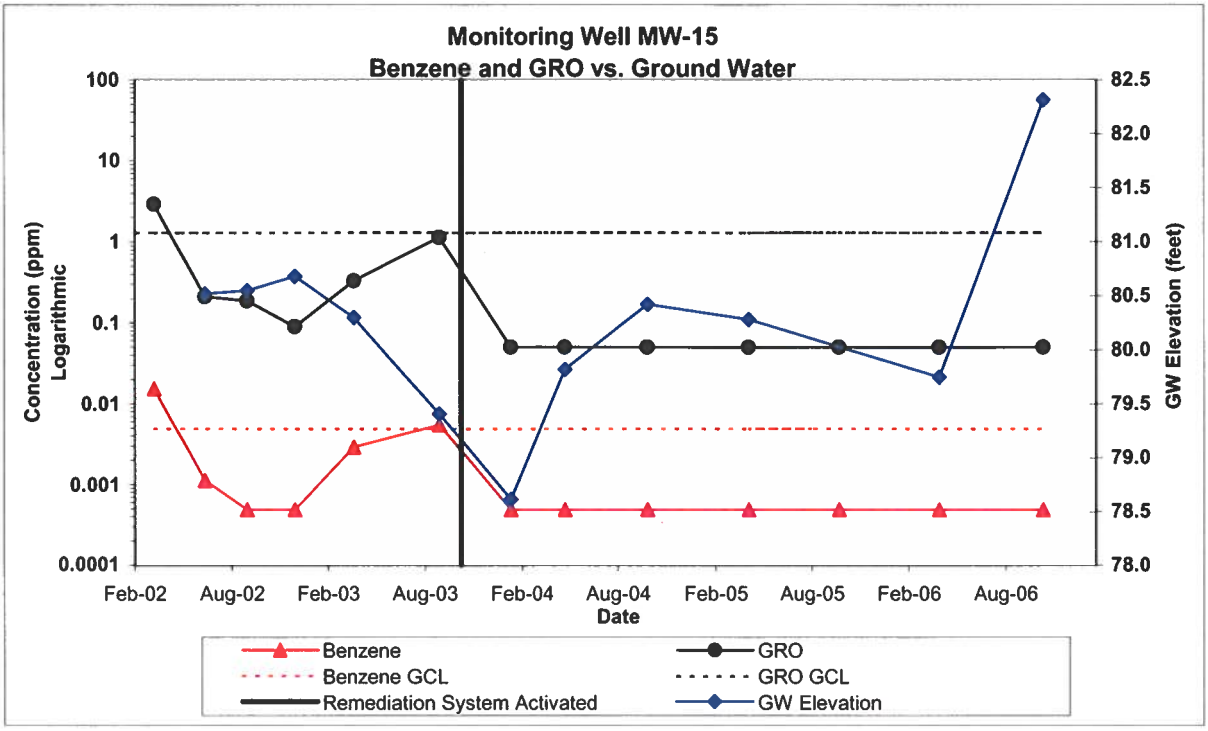
Figure 4
Graphs of Contamination Concentrations and Ground Water Elevations





GW Treatment System Injection Well Since 2003

Figure 4
Graphs of Contamination Concentrations and Ground Water Elevations



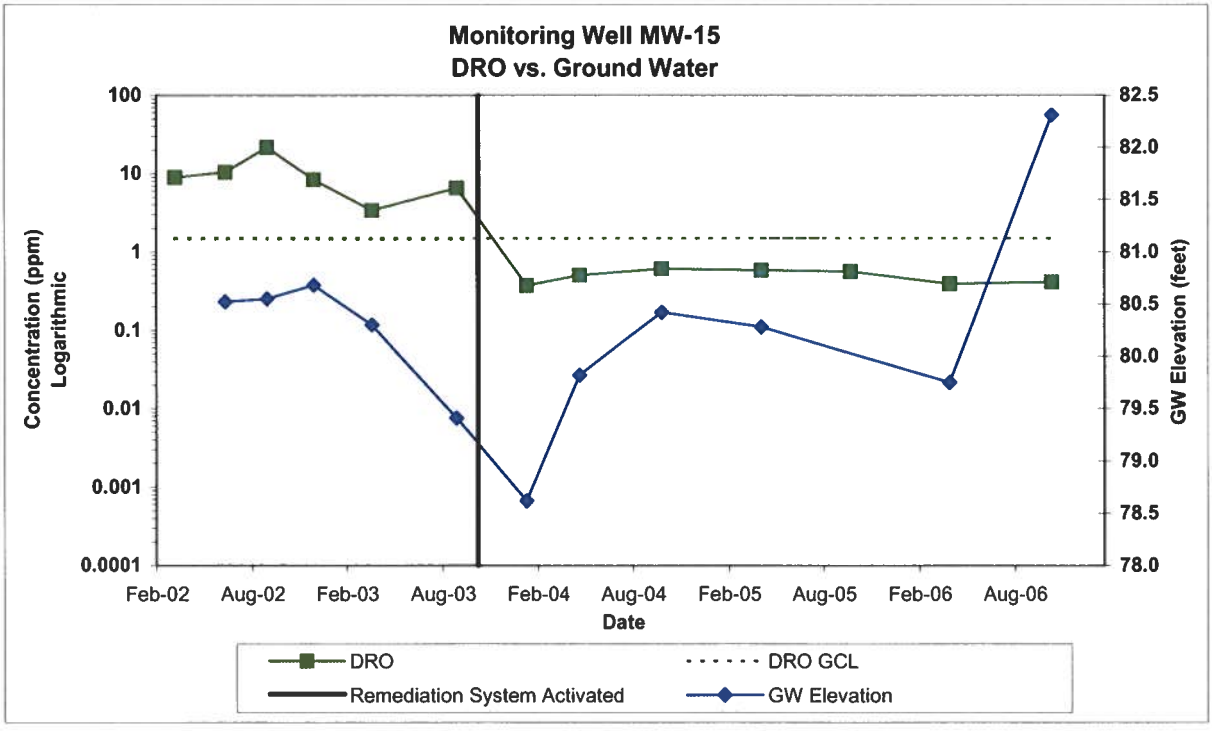
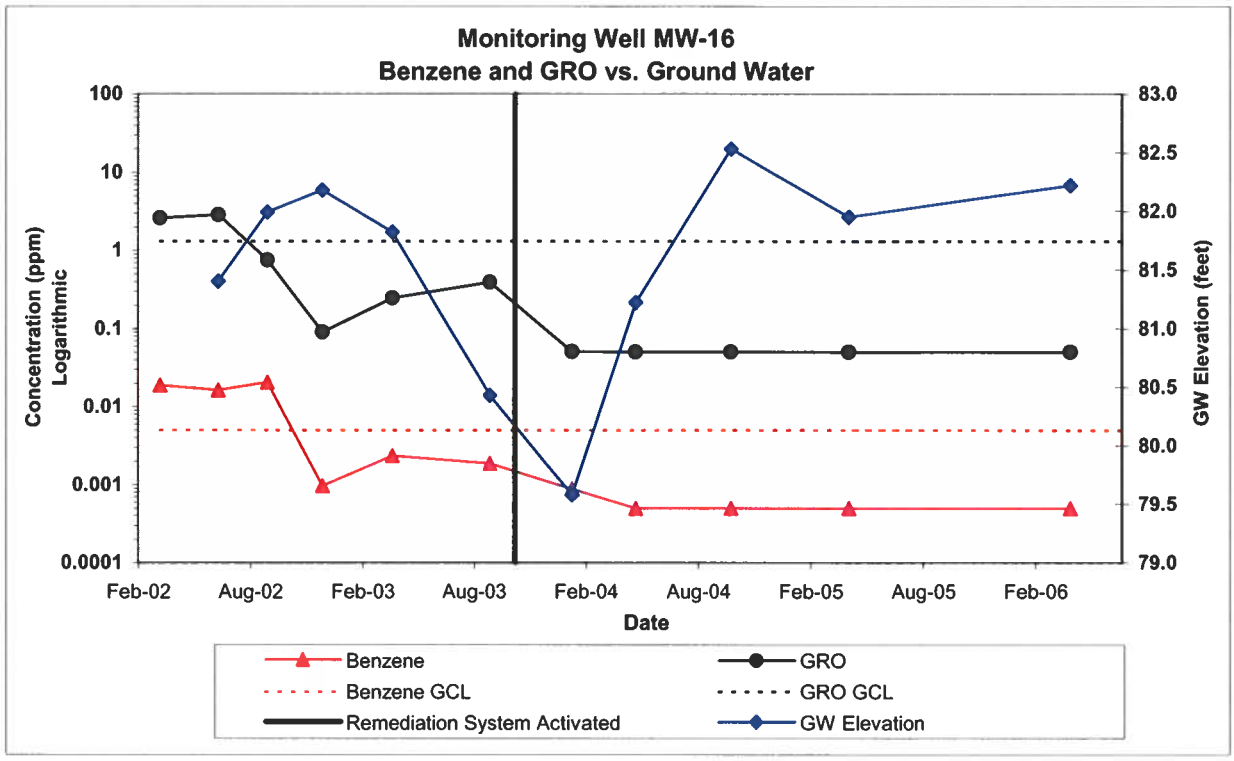


Figure 4
Graphs of Contamination Concentrations and Ground Water Elevations



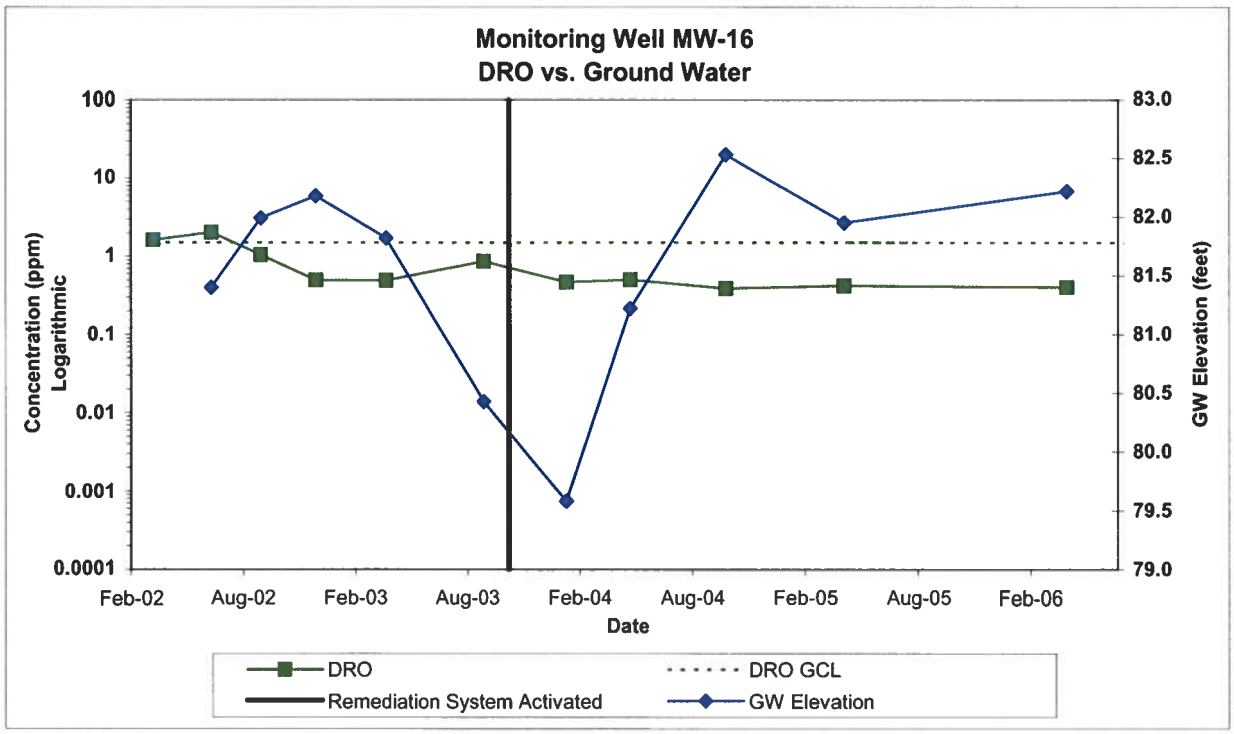
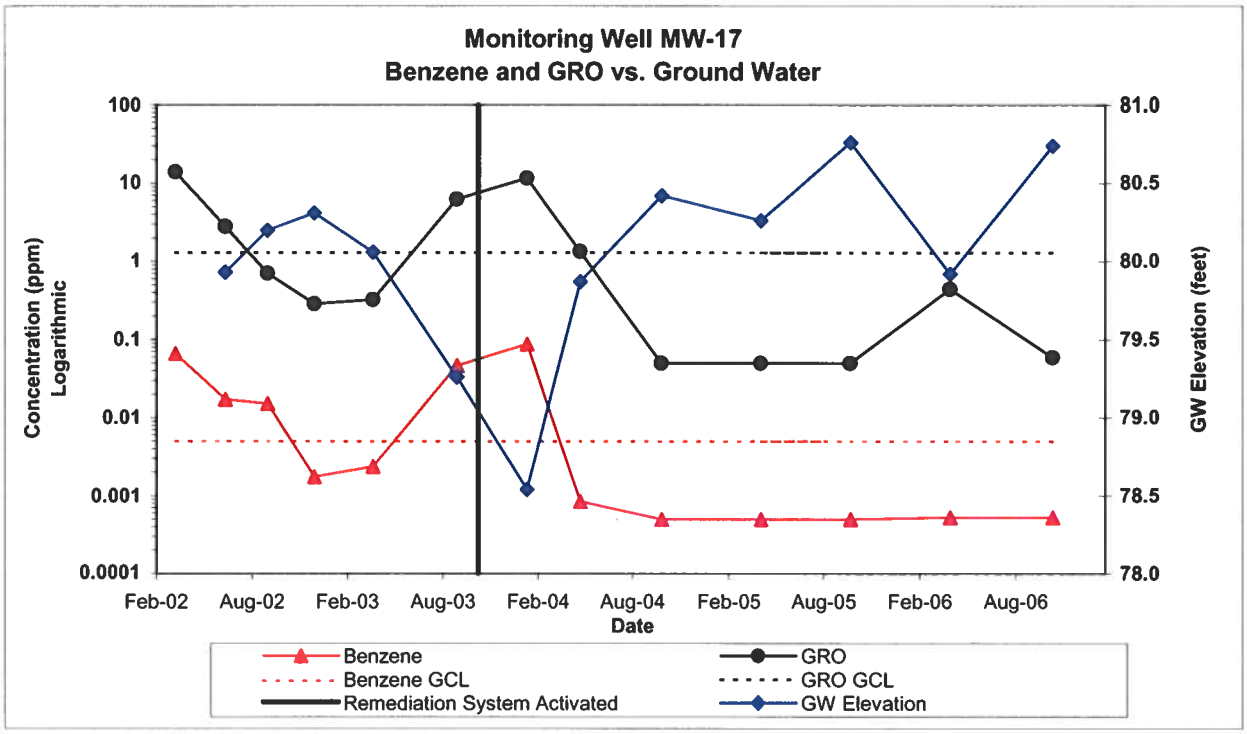
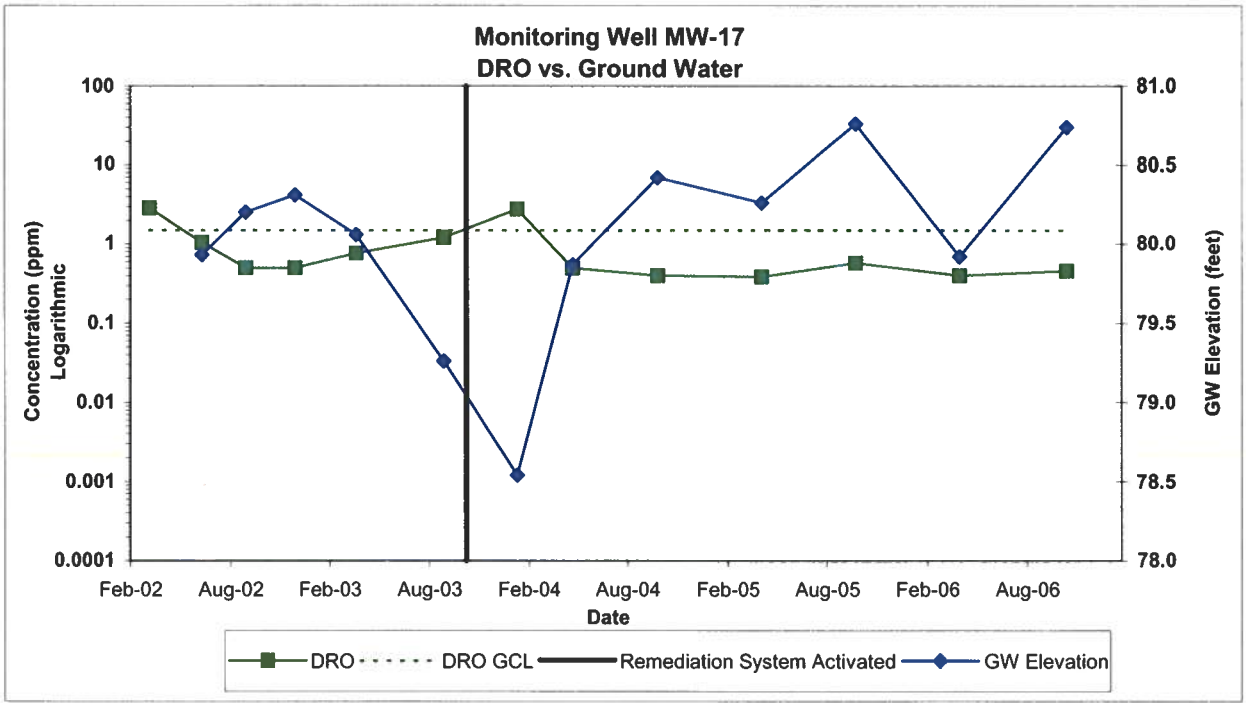


Figure 4
Graphs of Contamination Concentrations and Ground Water Elevations





APPENDIX A

Geologic Logs

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BORING NUMBER SB 1

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 COMPLETED 10/3/06
GROUND ELEVATION HOLE SIZE 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ AT TIME OF DRILLING 19.0 ft
LOGGED BY KAI CHECKED BY KAI
AT END OF DRILLING —
NOTES Weather: Cloudy Temp: 55F Wind: Light
AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Gravel	
					1.0 sandy Gravel with some Silt, brown, dry to damp, loose, fill	
	SS		4.3		3.5	
					4.0 same as above with wood pieces	
5					sandy Gravel with some Silt, brown, dry to damp, loose, fill 5.0	
					same as above	
	TNS 11-SB1-9		2.4			
10					10.0 same as above	
					12.0 Sand with Silt, damp	Bentonite Plug
	SS		3.0		14.0	
15					Sandy Gravel with silt 15.0	
					same as above 16.0	
					Gravelly Sand, damp 17.0	
					Sandy Gravel with Silt, grey, wet at 19 feet bgs, strong odor from 18 to 19 feet bgs	
	TNS 11-SB1-19		995		19.0 ▽	
20					same as above, wet, strong odor 20.0	
					same as above, brown at 21 to 22 feet bgs, less odor	
	SS		72.8		23.0	
					Sand with Gravel, grey, coarse, wet 24.0	
	SS		385		Sandy Gravel, grey, brown at 24.5 to 25 feet bgs, coarse, wet, strong odor decreases after 24.5 feet bgs	
25					25.0 Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 2

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 **COMPLETED** 10/3/06
GROUND ELEVATION _____ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
AT TIME OF DRILLING ---
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING ---
NOTES Weather: Cloudy Temp: 55F Wind: Light
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Gravel	
					1.0 Sandy Gravel with Silt,	
					2.5 Sand with Gravel, damp	
	SS		9.4		3.5 Sandy Gravel with Silt, brown, dry, some cobbles, no odor	
5					5.0 same as above	
					7.0 Gravelly Sand	
					8.0 Gravel with Sand, no odor	
10	TNS 11-SB2-10		6.2		10.5 Sandy Gravel with Silt	
					12.0 Gravelly Sand, brown, coarse, dry	Bentonite Plug
	SS		29.8		14.9	
15	SS		412		15.0 Sandy Gravel, grey at 15 feet bgs, odor at grey, not enough to sample less than 1 inch thick	
					Sandy Gravel, no odor	
					17.5	
					18.0 Sandy Gravel with Silt, 6 inch lense	
	TNS 11-SB2-18		12.1		Sandy Gravel, gravel to 2 inches in diameter	
	SS		4.2			
20					20.0 Sandy Gravel	
					25.0	
25					Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 3

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 **COMPLETED** 10/3/06
GROUND ELEVATION ____ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ **AT TIME OF DRILLING** 19.0 ft
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING —
NOTES Weather: Cloudy Temp: 55F Wind: Light
AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sandy Gravel	
					3.5 Sand with Silt and Gravel	
	SS		6.3		4.5 Silt	
5					5.0 Sand with Silt	
					6.5 Sandy Gravel, brown, dry, no odor	
	SS		9.9			
10					10.0 same as above	
						Bentonite Plug
15					15.0	
	TNS 11-SB3-15		NA		same as above, increasing size of gravel with depth, minimal recovery	
					19.0 ▽	
	TNS 11-SB3-19		10.5		Sandy Gravel, saturated at 19 feet bgs, few fines	
20					20.0 same as above, gravel to 4 inches in diameter	
25					25.0	
					Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 4

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 **COMPLETED** 10/3/06
GROUND ELEVATION ____ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ **AT TIME OF DRILLING** 19.5 ft
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING —
NOTES Weather: Cloudy, showers Temp 50F Wind: 5-10
AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sandy Gravel	
					2.0 Gravelly Sand	
5	SS		3.9		5.0 5.5 Sand with Gravel, brown, coarse, dry, no odor	
					Sand, coarse, minimal recovery	
					8.0 Silty Sand with Gravel, dark brown	
10					9.5 Sand with Gravel, brown	
	SS		3.7		10.5 Sandy Gravel, brown, no odor	Bentonite Plug
15					15.0	
	TNS 11-SB4-15		2.9		same as above	
					17.5 Sand, coarse, damp	
					18.0 Sandy Gravel, brown, no odor, saturated at 19.5 feet bgs	
	TNS 11-SB4-19 DUP		4.6		▽ 20.0 same as above	
20					21.0 Silty Sand, grey, saturated	
					22.0 Sand, brown, coarse	
	SS		5.2		24.0 Sandy Gravel, brown, saturated	
25					25.0 Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 5

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 COMPLETED 10/3/06
GROUND ELEVATION ____ HOLE SIZE 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
AT TIME OF DRILLING ---
LOGGED BY KAI CHECKED BY KAI
AT END OF DRILLING ---
NOTES Weather: Cloudy, showers Temp 55F Wind: 0-5
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sand, coarse to medium, few fines	
					2.0	
	SS		2.5		Sandy Gravel with Silt, damp, Rock at 4 feet bgs	
					4.0	
					Sand with Gravel	
5					5.0	
					same as above, soft, poor recovery	
					7.0	
					same as above, dark brown	
10					10.0	
	SS		2.3		same as above, soft, poor recovery	
					13.0	Bentonite Plug
					Sand with Gravel, brown, coarse to medium sand, dry, no odor	
15					15.0	
	TNS 11-SB5-15		2.8		same as above	
					17.0	
					Sand	
					18.0	
					Rock at 18 feet bgs	
					19.5	
20					Sand with some Gravel, brown, medium to fine	
	SS		NA		22.0	
					Gravelly Sand, grey	
					24.0	
	TNS 11-SB5-25		4.6		Sandy Gravel, grey	
25					25.0	
					Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 6

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 **COMPLETED** 10/3/06
GROUND ELEVATION ___ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
AT TIME OF DRILLING ---
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING ---
NOTES Weather: Cloudy, showers Temp 55F Wind: 0-5
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sandy Gravel, fill	
					2.0 Sand with some gravel, brown, dry	
5	TNS 11-SB6-4		4.6		5.0 same as above	
					7.0 Sandy Gravel, gravel to 4 inches in diameter	
10	SS		15.2		10.0 same as above, high moisture, no odor	
					13.0 same as above	Bentonite Plug
15	SS		5.8		15.0 same as above	
					16.0 Gravelly Sand	
					17.0 Sandy Gravel, gravel to 2 inches in diameter	
20	TNS 11-SB6-19		86.2		20.0 same as above	
					21.0 Silty Gravel, some sand, stain and odor at 22 to 23.5 feet bgs	
	TNS 11-SB6-23		156		24.0 Gravel with Silt	
25					25.0 Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 7

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/3/06 **COMPLETED** 10/3/06
GROUND ELEVATION ___ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ **AT TIME OF DRILLING** 16.0 ft
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING ---
NOTES Weather: Light rain Temp: 50F Wind: 0-5
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sandy Gravel, fill	
					1.5 Sand with Gravel, brown, medium to coarse sand sizes, dry	
5	SS		2.9		5.0 same as above	
					6.5 Silty Sandy Gravel, wet	
					7.5 Sandy Gravel, greyish brown, gravel diameter to 2 inches, dry	
10	TNS 11-SB7-10		NA		9.5 Sand	
					10.5 Sandy Gravel	
					11.0 Rock, well fractured	
	SS		3.2		12.0 Sandy Gravel with Silt	Bentonite Plug
15					15.5	
					16.0 ▽ Silty Gravel, grey	
					16.5 same as above, brown, saturated at 16 feet bgs	
					Sandy Gravel with Silt, damp	
					17.5 Silty Sandy Gravel, wet	
					18.5 Sand, grey, saturated	
20	TNS 11-SB7-19		346		20.0	
					20.5 same as above	
					21.0 Silt, grey	
					Sandy Gravel, grey, saturated	
	SS		2.9		23.0 Sand, brown, wet	
					24.0	
25	SS		3.7		Sandy Gravel	
					25.0 Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 8

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/4/06 **COMPLETED** 10/4/06
GROUND ELEVATION ____ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS.
DRILLING METHOD Geoprobe
▽ **AT TIME OF DRILLING** 16.0 ft
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING —
NOTES Weather: Cloudy Temp: 50F Wind 5-10
AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Gravelly Sand	
1.0					Sandy Gravel, gravel diameter to 2 inches	
	SS		1.5			
4.5					Gravelly Sand	
5						
6.0					Silty sand, wet	
	TNS 11-SB8-7		2.8			
7.5					Sandy Gravel	
10						
10.0					same as above,gravel diameter to 2 inches, no odor	
13.0						Bentonite Plug
	SS		4.1		same as above	
15						
15.0					same as above	
16.0 ▽						
	TNS 11-SB8-16 DUP2		6.9		Sandy Gravel, gravel diameter to 1 inch, saturated	
17.0			NA		same as above, gravel diameter to 2 inches, damp	
18.0					same as above, wet	
20						
20.5					Silt, brown, tight, wet, no odor	
23.5					Sandy Gravel, grey, wet	
24.0					Sand, grey, wet, not saturated	
25						
25.0	SS		3.8		Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 9

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/4/06 **COMPLETED** 10/4/06
GROUND ELEVATION ____ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ **AT TIME OF DRILLING** 16.0 ft
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING ---
NOTES Weather: Partly cloudy Temp: 55F Wind: 0-5
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sandy Gravel	
					3.0	
					Sand, medium grained	
5	SS		3.5			
					6.0	
					Gravelly Sand	
	SS		3.2			
					8.0	
					Sandy Gravel, dry, no odor, gravel diameter to 1 inch	
					9.5	
10					Gravelly Sand, gravel diameter at 1 inch	
					13.0	Bentonite Plug
					Sandy Gravel	
	TNS 11-SB9-14		7.0			
15					15.0	
					same as above	
					16.0 ▽	
					Gravelly Sand, saturated at 16 feet bgs	
					17.0	
	SS		4.1		Sandy Gravel	
					19.0	
					same as above, some odor	
20					22.0	
	TNS 11-SB9-22		2249		Sandy Gravel with Silt, strong odor	
					25.0	
25					Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

MWH
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Albany NY 12205
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BORING NUMBER SB 10

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/4/06 **COMPLETED** 10/4/06
GROUND ELEVATION ___ **HOLE SIZE** 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ **AT TIME OF DRILLING** 18.0 ft
LOGGED BY KAI **CHECKED BY** KAI
AT END OF DRILLING ---
NOTES Weather: Partly cloudy Temp: 50F Wind: 0-5
AFTER DRILLING ---

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					0.5 Sandy Gravel Sand with some Gravel, no odor	
	SS		5.7		3.5	
5					Sandy Gravel 6.0	
					Gravel with Sand, gravel diameter to 2 inches 7.0	
					Sandy Gravel 9.5	
10					Sand, no odor 10.5	
	TNS 11-SB10-10		NA		Sandy Gravel, brown, dry, gravel diameter to 2 inches, thin silt lense at 12 feet bgs 13.0	Bentonite Plug
					same as above 15.0	
15	SS		3.8		same as above 17.0	
					Sand, brown/grey, with thin silt lense 18.0 ▽	
	SS		5.9		Sandy Gravel, grey, saturated at 18 feet bgs 20.0	
20					same as above	
	TNS 11-SB10-23		4.0		24.0	
					Silt, brown at 24.5 feet bgs, wet 25.0	
25					Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 11

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/4/06 COMPLETED 10/4/06
GROUND ELEVATION ____ HOLE SIZE 2 inchees
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ AT TIME OF DRILLING 18.0 ft
LOGGED BY KAI CHECKED BY KAI
AT END OF DRILLING —
NOTES Weather: Partly cloudy Temp: 55F Wind: 0-5
AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sand, medium grain size	
	SS		3.9			
					3.5 Sandy Gravel, gravel diameter to 2 inches	
5					5.0 same as above	
					7.5 same as above, high moisture, no odor	
	SS		8.6			
10					10.0 same as above	
						Bentonite Plug
15					15.0	
	TNS 11-SB11-15		4.9		same as above	
					18.0 ▽	
	TNS 11-SB11-18 DUP3		21.7		Sandy Gravel with Silt, wet, odor 19.0	
20					Sandy Gravel, grey 20.0	
					same as above, wet, odor	
	SS		39.7			
25					25.0	
					Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06

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BORING NUMBER SB 12

CLIENT Tesoro Alaska
PROJECT NAME TNS 11
PROJECT NUMBER 1850914
PROJECT LOCATION Anchorage, AK
DATE STARTED 10/4/06 COMPLETED 10/4/06
GROUND ELEVATION ____ HOLE SIZE 2 inches
DRILLING CONTRACTOR GeoTek
GROUND WATER LEVELS:
DRILLING METHOD Geoprobe
▽ AT TIME OF DRILLING 22.0 ft
LOGGED BY KAI CHECKED BY KAI
AT END OF DRILLING —
NOTES Weather: Cloudy Temp: 55F
AFTER DRILLING —

DEPTH (ft)	SAMPLE TYPE NUMBER	BLOW COUNTS (N VALUE)	PID (ppm)	GRAPHIC LOG	MATERIAL DESCRIPTION	WELL DIAGRAM
0					Sand	
					1.0 Sandy Gravel with Silt	
					3.0 Sandy Silt, brown	
	SS		2.8		4.5 Sand, medium - fine grain size	
5					6.0 Gravelly Sand	
					7.0	
	SS		2.6		Sandy Gravel	
10					11.0 Gravelly Sand	
					12.0 Sandy Gravel, brown, dry	Bentonite Plug
					14.0 Sandy Gravel with Silt	
15					15.0	
	TNS 11-SB12-15		3.9		same as above	
					18.0 Rock	
					19.0 Sandy Gravel, brown	
20						
	SS		5.4		20.5 Sand, medium-fine grain size	
					22.0 ▽ Sandy Gravel, grey, wet at 22 feet bgs, odor	
	TNS 11-SB12-23		1664		24.0 Sandy Gravel and Silt, less odor	
25					25.0 Bottom of hole at 25.0 feet.	

ENVIRONMENTAL BH TNS 11.GPJ GINT US.GDT 11/22/06