Second Quarter 2006 Groundwater Monitoring Report

Former Fir Haven Shell
Miranda, California
Case No. 12748

Prepared for:

Mr. Eugene Sky

Consulting Engineers & Geologists, Inc.

812 W. Wabash Avenue
Eureka, CA 95501-2138
707/441-8855

July 2006

001032

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Reference: 001032

July 24, 2006

Mr. Mark Verhey
Humboldt County Division of Environmental Health
100 H Street, Suite 100
Eureka, CA 95501

Subject: Groundwater Monitoring Report, Second Quarter 2006, Former Fir Haven Shell, Miranda, California; Case No. 12748

Dear Mr. Verhey:

This report presents the results of the second quarter 2006 groundwater monitoring for the former Fir Haven Shell site, located at 5251 Highway 254 in Miranda, California. Site monitoring activities were conducted on May 2, 2006. SHN Consulting Engineers & Geologists, Inc. performed this work on behalf of Mr. Eugene Sky.

If you have any questions, please call me at 707/441-8855.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Erik J. Nielsen, P.G.
Project Manager

EJN/PJD:kas
Enclosure: Report
copy w/encl: Mr. Eugene Sky

Reference: 001032

Second Quarter 2006
Groundwater Monitoring Report

Former Fir Haven Shell
Miranda, California
Case No. 12748

Prepared for:

Mr. Eugene Sky

Prepared by:

Consulting Engineers & Geologists, Inc.
812 W. Wabash Avenue
Eureka, CA 95501-2138
707/441-8855

July 2006

REGISTERED GEOLOGIST
ERIK J. NIELSEN
No. 7288
EXP. 4/30/07
STATE OF CALIFORNIA

QA/QC:EJN___

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Acronyms and Abbreviations

<	denotes a value that is "less than" the method detection limit
mV	millivolts
ppm	parts per million
ug/L	micrograms per Liter
BTEX	Benzene, Toluene, Ethylbenzene, and total Xylenes
DCO_2	Dissolved Carbon Dioxide
DO	Dissolved Oxygen
EC	Electrical Conductivity
EPA	U.S. Environmental Protection Agency
HCDEH	Humboldt County Division of Environmental Health
MTBE	Methyl Tertiary-Butyl Ether
MW-#	Monitoring Well-#
NAVD	North American Vertical Datum
NM	Not Measured
ORP	Oxidation-Reduction Potential
QA/QC	Quality Assurance/Quality Control
SHN	SHN Consulting Engineers & Geologists, Inc.
TPHG	Total Petroleum Hydrocarbons as Gasoline
UST	Underground Storage Tank

1.0 Introduction

This report presents the results of groundwater-monitoring activities for the second quarter of 2006, conducted at the former Fir Haven Shell (site; Case No. 12748). The site is located at 5251 Highway 254 in Miranda, California (Figure 1). SHN Consulting Engineers & Geologists, Inc. (SHN) conducted groundwater monitoring on May 2, 2006, as requested by the Humboldt County Division of Environmental Health (HCDEH).

1.1 Organization of the Report

This report is presented in five sections. This section introduces the reader to the site. Section 2.0 discusses the scope of work completed at the site during the second quarter 2006 monitoring event. Section 3.0 presents the results of the current groundwater-monitoring event. Section 4.0 presents a discussion regarding the nature of the site and future activities. Section 5.0 presents a list of references cited.

1.2 Background

The subject site is the location of a former Shell service station (Figure 2). On March 29, 2001, two Underground Storage Tanks (USTs) previously used to store gasoline were abandoned in place under permit from HCDEH. During the UST abandonments, soil samples were collected from beneath the location of each tank to access the soil conditions. Petroleum constituents consisting of Total Petroleum Hydrocarbons as Gasoline (TPHG) and Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX) were detected in soil samples collected from the site (SHN, 2001).

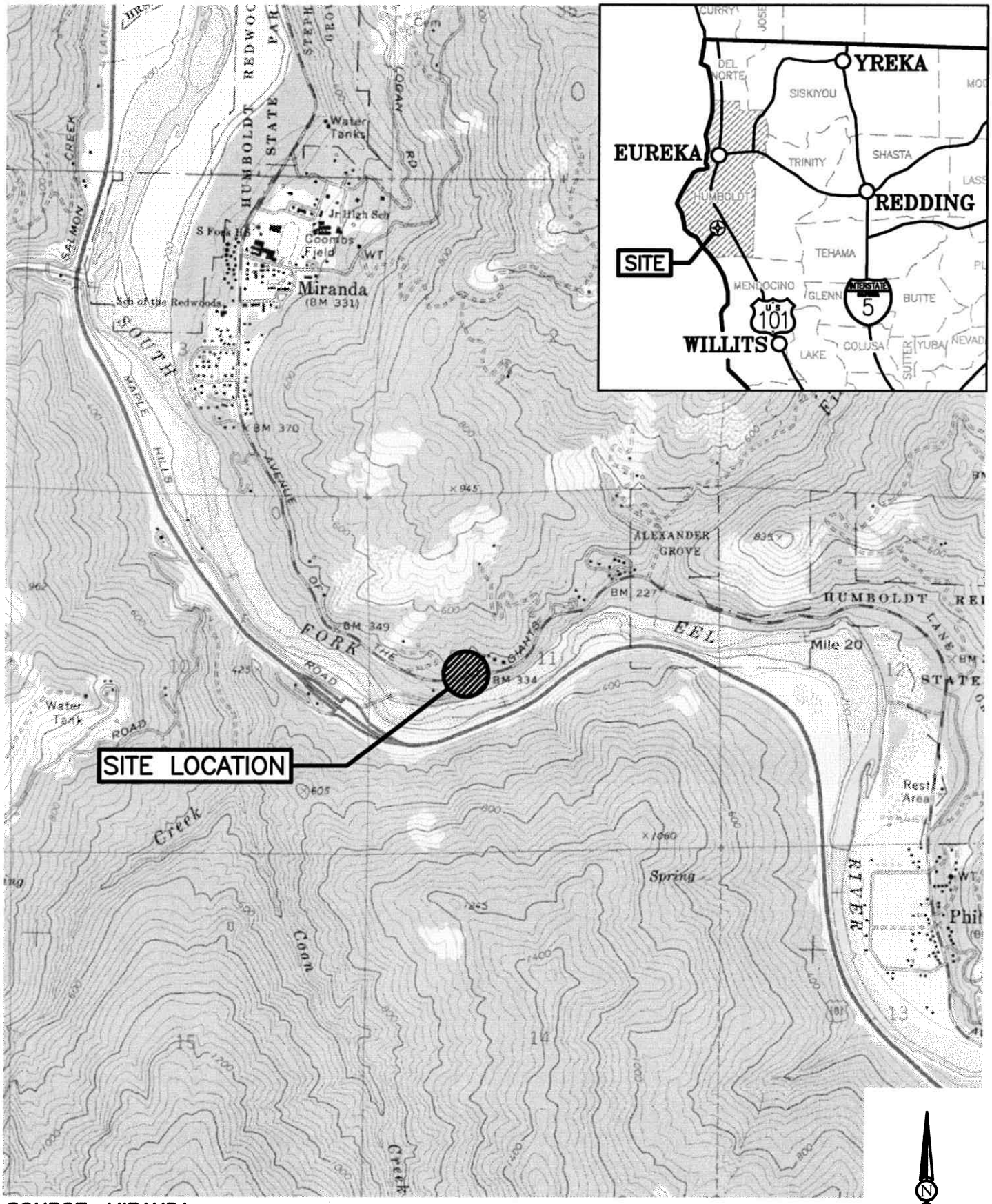
On November 24, 2003, a site investigation was completed to further define the vertical and lateral extent of petroleum hydrocarbon contamination at the site. Based on the results of this site investigation, it appeared that soil and groundwater in the area of the abandoned USTs had been impacted with petroleum hydrocarbons (SHN, 2004).

On November 12 and 13, 2004, four groundwater-monitoring wells were installed at the site for the implementation of a site-monitoring program (MW-1, MW-2, MW-3, and MW-4, in Figure 2; SHN, 2005). Groundwater monitoring at Former Fir Haven Shell site occurs on a quarterly basis, as required by the HCDEH.

2.0 Field Activities

2.1 Monitoring Well Sampling

SHN conducted quarterly groundwater monitoring on May 2, 2006. As part of the monitoring program, wells MW-1, MW-2, MW-3, and MW-4 were purged and sampled. Prior to commencing purging activities, all four monitoring wells were measured for depth-to-water and checked for the presence of floating product (none was observed). Electrical Conductivity (EC), pH, and temperature were monitored periodically in site wells during purging activities using portable



SOURCE: MIRANDA USGS 7.5 MINUTE QUADRANGLE

1"=2000'±

SHN Consulting Engineers & Geologists, Inc.	Former Fir Haven Shell Miranda, California		Site Location Map SHN 001032
	June, 2006	001032-LOCATION	Figure 1

EXPLANATION

WP-1 BORING LOCATION AND DESIGNATION (SHN, NOVEMBER 2003)

MW-1 MONITORING WELL LOCATION AND DESIGNATION (SHN, NOVEMBER 2004)

NOTE: BORING LOCATIONS ARE APPROXIMATE

N

1"=20'

SHN Consulting Engineers & Geologists, Inc.	Former Fir Haven Shell Miranda, California		Site Plan SHN 001032
	June, 2006	001032-SI1-DEC-04	Figure 2

instrumentation. Each well was also monitored for Dissolved Oxygen (DO), Oxidation-Reduction Potential (ORP), and Dissolved Carbon Dioxide (DCO_2). DO and ORP were measured using portable instrumentation, and DCO_2 was measured using a field test kit.

Each of the four wells was purged of at least three casing volumes prior to sampling. A groundwater sample was then collected from monitoring wells MW-1, MW-2, MW-3, and MW-4 using disposable polyethylene bailers. The water samples were immediately placed in an ice-filled cooler and submitted to the laboratory for analyses under appropriate chain-of-custody. Field notes and water sampling data sheets from the second quarter 2006, groundwater-monitoring event are included in Appendix A.

2.2 Laboratory Analysis

Each groundwater sample was analyzed for the following:

- TPHG, in general accordance with U.S. Environmental Protection Agency (EPA) Method Nos. 5030/GCFID/8015B.
- BTEX and Methyl Tertiary-Butyl Ether (MTBE), in general accordance with EPA Method Nos. 5030/8021B.

North Coast Laboratories, Ltd., a State-certified analytical laboratory located in Arcata, California, conducted all analyses.

2.3 Equipment Decontamination Procedures

All monitoring and sampling equipment was cleaned prior to being transported to the site. All smaller equipment was initially washed in a water solution containing Liquinox® cleaner, followed by two distilled water rinses. The groundwater samples were collected using pre-cleaned, disposable bailers, and transferred into laboratory-supplied containers.

2.4 Investigation-Derived Waste Management

All rinse water used for decontaminating field-sampling equipment and the well purge water was temporarily stored in 5-gallon buckets. The water was then transported to SHN's 1,000-gallon purge water storage tank located at 812 West Wabash Avenue in Eureka, California. Approximately 25 gallons of decontamination and purge water from the May 2, 2006, groundwater-monitoring event was discharged, under permit, to the City of Eureka municipal wastewater collection system. A discharge receipt is included in Appendix A.

3.0 Groundwater Monitoring Results

3.1 Hydrology

SHN measured depth-to-groundwater in site monitoring wells on May 2, 2006. The results are summarized in Table 1.

Table 1
Groundwater Elevations, May 2, 2006
Former Fir Haven Shell, Miranda, California

Sample Location	Top of Casing Elevation[1] (feet)	Depth to Water[2] (feet)	Groundwater Elevation (feet)
MW-1	339.23	18.11	321.12
MW-2	338.77	28.14	310.63
MW-3	339.02	26.31	312.71
MW-4	340.11	16.31	323.80

1. Referenced to North American Vertical Datum (NAVD) 88
2. Below top of casing

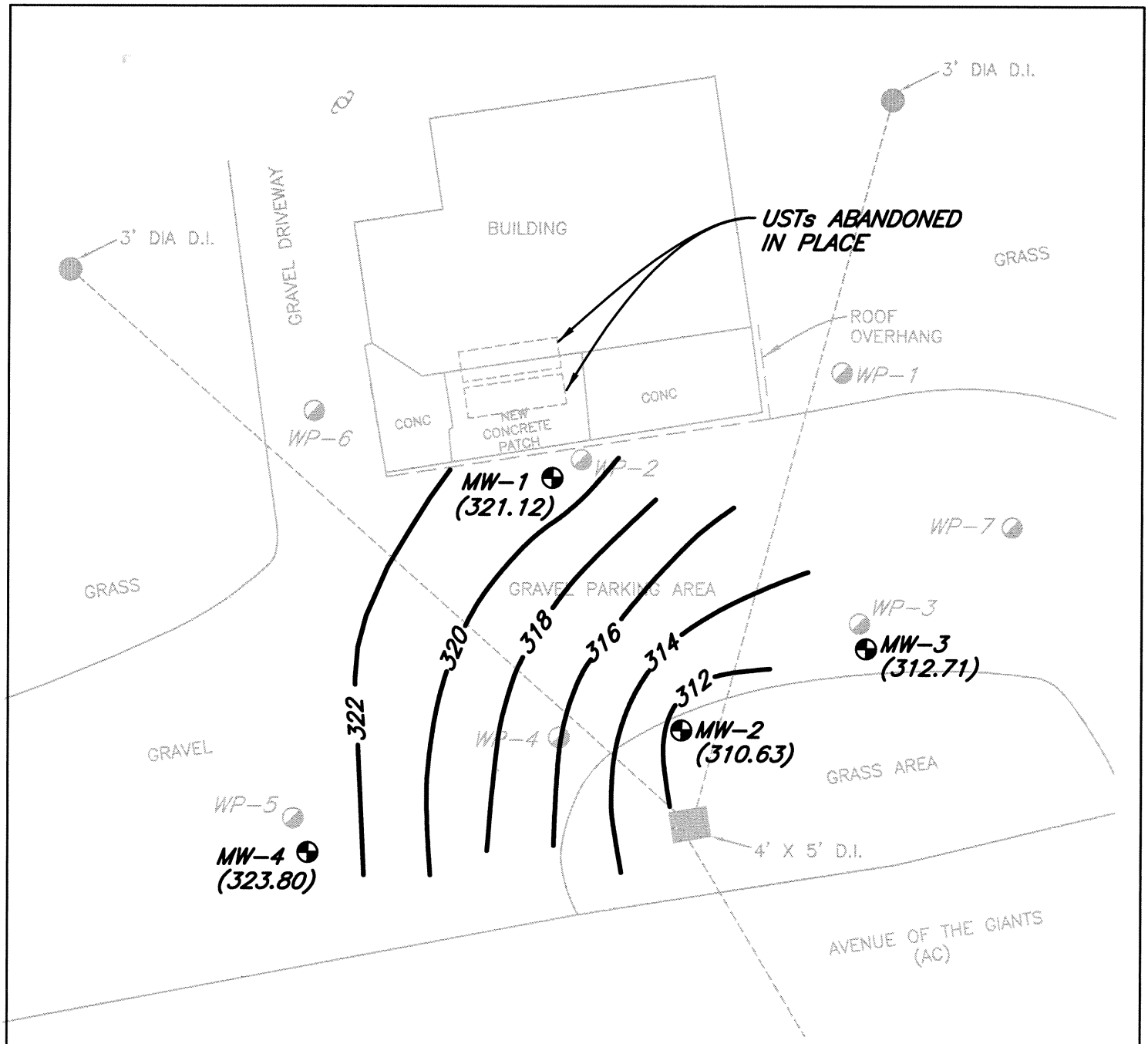
During this monitoring event, the direction of groundwater flow beneath the site was to the southeast, with an estimated gradient of 0.19. A groundwater contour map for the May 2, 2006, monitoring event is presented as Figure 3. Historic groundwater elevation data are presented in Appendix B, Table B-1.

3.2 Groundwater Analytical Results

The laboratory analytical results for the groundwater samples collected during the second quarter 2006, monitoring event are summarized in Table 2.

Elevated levels of TPHG and BTEX were detected in the groundwater sample collected from well MW-1. The groundwater samples collected from wells MW-2, MW-3, and MW-4 did not contain any detectable concentrations of either TPHG or BTEX. MTBE was not detected in any of the groundwater samples collected from site wells during the second quarter 2006, monitoring event.

The concentrations of TPHG, benzene, and MTBE detected in groundwater samples collected from site wells on May 2, 2006, are shown on Figure 4. The complete laboratory test results, Quality Assurance/Quality Control (QA/QC) data, and chain-of-custody documentation are included in Appendix C. Historic groundwater monitoring data are presented in Appendix B, Table B-2.



EXPLANATION

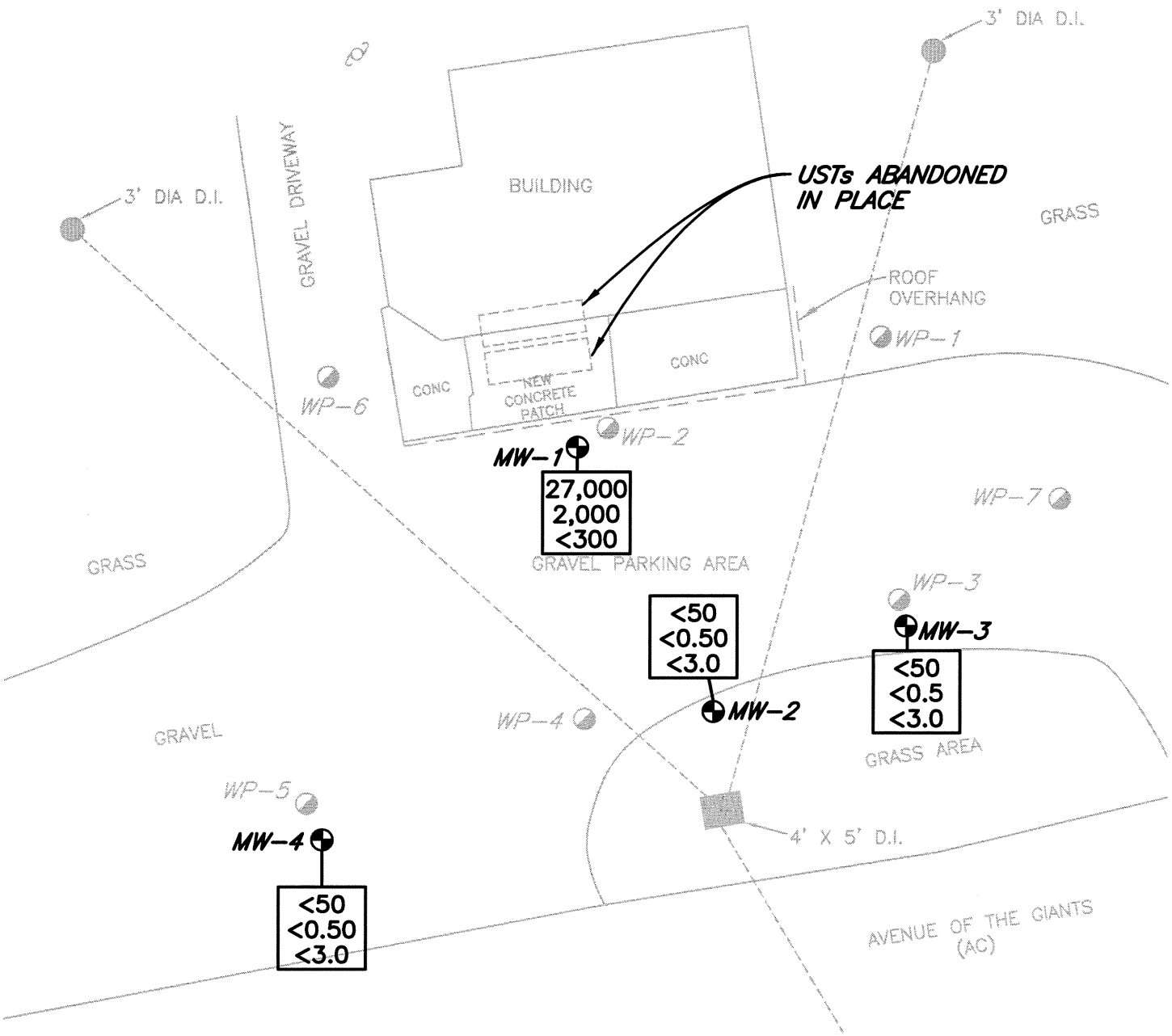
WP-1	SOIL BORING LOCATION AND DESIGNATION (SHN, NOVEMBER 2003)
MW-1	MONITORING WELL LOCATION AND DESIGNATION (SHN, NOVEMBER 2004)
(320.21)	GROUNDWATER ELEVATION IN FEET (NAVD88)
—320—	GROUNDWATER CONTOUR IN FEET (NAVD88)

N

1"=20'

0 20

SHN Consulting Engineers & Geologists, Inc.	Former Fir Haven Shell Miranda, California	Groundwater Contours May 2, 2006 SHN 001032	
	June, 2006	001032-GWC-MAY-2006	Figure 3



EXPLANATION

WP-1	SOIL BORING LOCATION AND DESIGNATION (SHN, NOVEMBER 2003)
MW-1	MONITORING WELL LOCATION AND DESIGNATION (SHN, NOVEMBER 2004)
<50 <0.50 <3.0	TPHG BENZENE MTBE RESULTS IN ug/L
(NS)	NOT SAMPLED

1"=20'

SHN Consulting Engineers & Geologists, Inc.	Former Fir Haven Shell Miranda, California	Petroleum Hydrocarbon Concentrations in Groundwater, May 2, 2006 SHN 001032
	June, 2006	001032-PHC-MAY-2006	Figure 4

Table 2 Groundwater Analytical Results, May 2, 2006 Former Fir Haven Shell, Miranda, California (in ug/L)[1]						
Sample Location	**TPHG[2]**	**Benzene[3]**	**Toluene[3]**	**Ethylbenzene[3]**	**Total Xylenes[3]**	**MTBE[3]**
MW-1	**27,000[4]**	**2,000**	**2,000**	**760**	**3,800**	<300[5,6]
MW-2	<50	<0.50	<0.50	<0.50	<1.0	<3.0
MW-3	<50	<0.50	<0.50	<0.50	<1.0	<3.0
MW-4	<50	<0.50	<0.50	<0.50	<1.0	<3.0

1. ug/L: micrograms per Liter
2. Total Petroleum Hydrocarbons as Gasoline (TPHG), analyzed in general accordance with U.S. Environmental Protection Agency (EPA) Method No. 5030/GCFID/8015B
3. Benzene, Toluene, Ethylbenzene, total Xylenes, and Methyl Tertiary-Butyl Ether (MTBE), analyzed in general accordance with EPA Method No. 5030/8021B
4. Sample appears to be similar to gasoline, but certain peak ratios are not that of a fresh gasoline standard. The reported result represents the amount of material in the gasoline range.
5. <: Denotes a value that is "less than" the laboratory method detection limit.
6. Reporting limit was raised due to matrix interference

3.3 Natural Attenuation Monitoring

Natural attenuation parameters DO, DCO_2, and ORP were measured in all four groundwater-monitoring wells on May 2, 2006, prior to sampling, and are summarized in Table 3.

Table 3 DO, DCO_2, and ORP Measurement Results, May 2, 2006 Former Fir Haven Shell, Miranda, California			
Sample Location	**DO[1] (ppm)[2]**	**DCO_2[3] (ppm)**	**ORP[4] (mV)[5]**
MW-1	1.91	150	-148
MW-2	6.58	50	185
MW-3	3.72	45	180
MW-4	2.69	55	196

1. DO: Dissolved Oxygen
2. ppm: parts per million
3. DCO_2: Dissolved Carbon Dioxide, field measured using a field test kit
4. ORP: Oxidation-Reduction Potential; field measurement using portable instrumentation
5. mV: millivolts
6. NM: Not Measured

During this monitoring event, DO concentrations appear to be sufficient to support biodegradation, and DCO_2 concentrations indicate that biodegradation may be occurring in the vicinity of well MW-

1. ORP measurements indicate that oxidizing conditions exist in site groundwater away from the source area and reducing conditions exist in the source area. Historic DO, DCO_2, and ORP measurements are presented in Appendix A, Table A-3.

4.0 Discussion and Recommendations

During the second quarter 2006 monitoring event, the groundwater sample collected from monitoring well MW-1 contained elevated concentrations of TPHG and BTEX constituents. The groundwater samples collected from wells MW-2, MW-3, and MW-4 did not contain detectable concentrations of either TPHG or BTEX.

Based on the results of this and the previous groundwater-monitoring events, it does not appear that the petroleum hydrocarbon plume present in the source area is migrating. However, the continued elevated petroleum hydrocarbon constituents found in groundwater samples collected from well MW-1 indicate that petroleum hydrocarbon contamination persists in the source area.

As required by the HCDEH, SHN will continue quarterly groundwater monitoring at the site. The next groundwater-monitoring event is scheduled for August 2006. In the First Quarter 2006 Monitoring Report, SHN recommended the preparation of an additional site investigation work plan to further define the extent of petroleum hydrocarbon contamination near the source area. The intent of this additional site investigation would be to identify the limit of the contaminant plume. SHN will prepare a work plan upon receiving approval from the HCDEH.

5.0 References Cited

SHN Consulting Engineers & Geologists, Inc. (June 19, 2001). "Site Investigation Work Plan, Former Fir Haven Shell, 5251 Highway 254, Miranda, California, HCDEH LOP No. 12748." Eureka: SHN.

---. (January 2004). *Well point Investigation Report of Findings, Former Fir Haven Shell, Miranda, California; Case No. 12748.* Eureka: SHN.

---. (January 2005). *Groundwater Monitoring Well Installation Report of Findings, Former Fir Haven Shell, Miranda, California; Case No. 12748.* Eureka: SHN.

Appendix A

Field Notes

CONSULTING ENGINEERS & GEOLOGISTS, INC.
480 Hemsted Drive • Redding, CA 96002• Tel: 530.221.5424 • FAX: 530.221.0135 •E-mail: shninfo@shn-redding.com
812 W. Wabash • Eureka, CA 95501 • Tel: 707.441.8855 • FAX: 707.441.8877 •E-mail: shninfo@shn-engr.com

DAILY FIELD REPORT

JOB NO 001032
Page of

PROJECT NAME: Former Fir Haven Shell	CLIENT/OWNER: Eugene Sky	DAILY FIELD REPORT SEQUENCE NO
GENERAL LOCATION OF WORK: Miranda, CA	OWNER/CLIENT REPRESENTATIVE	DATE: 5/2/06 — DAY OF WEEK: Tue.
TYPE OF WORK: Sampling	WEATHER	PROJECT ENGINEER/ SUPERVISOR: Erik Nielsen
SOURCE & DESCRIPTION OF FILL MATERIAL	KEY PERSONS CONTACTED	TECHNICIAN: Dustin Tibbets

DESCRIBE EQUIPMENT USED FOR HAULING, SPREADING, WATERING, CONDITIONING, & COMPACTING

1030 On site. Open up all wells, Taking water leves and DO readings.
1125 Purging MW-3 with a dispossable bailer. All purge water was caught in 5 gal. buckets.
1130 Sampled MW-3 with it's bailer. Locked up well. MW-3
1155 Purging MW-2 with a dispossable bailer. All purge water was caught in 5 gal. buckets.
1240 Sampled MW-2 with it's bailer. Locked up well. MW-2
1256 Purging MW-4 with a dispossable bailer. All purged water was caught in 5 gal. buckets.
1320 Sampled MW-4 with it's bailer. Locked up well. MW-4
1330 Purging MW-1 with a dispossable bailer. All purge water was caught in 5 gal. buckets.
1355 Sampled MW-1 with it's bailer. Locked up well. MW-1
1400 Cleaned and loaded up.
1405 Off site.

Note: All purge and decon water was transported to SHN's P.W.S.T located at 812 W. Wabash Ave. Eureka CA
25 gal. total.

	Purged	Sampled
MW-1	Yes	Yes
MW-2	↓	↓
MW-3		
MW-4		

COPY GIVEN TO:

REPORTED BY: Dustin Tibbets

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EQUIPMENT CALIBRATION SHEET

Name: Dustin Tibbets

Project Name: Former Fir Haven Shell

Reference No.: 001032

Date: 5/2/06

Equipment: [X] pH & EC [ ] PID [ ] $GTCO_2$ [ ] GTLEL
[ ] Turbidity [X] Other Dissolved Oxygen meter

Description of Calibration Procedure and Results:

pH & EC meter calibrated using a 2 buffer method with a pH 7.00 and 4.01, meter was set exactly to 7.00 and 4.01 and conductivity was set at 700 umhos.

DO meter is self calibrating with the Altimeter set at 3.

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Groundwater Elevations

Job No.: 001032 Name: Dustin Tibbets
Client: Eugene Sky Date: 5/2/06
Location: Miranda Ca Weather: Clear

Sample Location	Time of Reading	Top of Casing Elevation (feet)	Depth To Water (feet)	Water Surface Elevation (feet)
MW-1	~~1058~~ 1100	339.23	~~16.34~~ 18.11	321.12
MW-2	1055	338.77	28.14	310.63
MW-3	1050	339.02	26.31	312.71
MW-4	1058	340.11	16.31	323.80

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Water Sampling Data Sheet

Project Name: Former Fir Haven Shell
Date/Time: 5/2/06
Project No.: 001032
Sampler Name: Dustin Tibbets
Location: Miranda CA
Sample Type: Water
Well #: MW-3
Weather: Sun
Hydrocarbon Thickness/Depth (feet):
Key Needed: Dolphin

Total Well Depth (feet)	-	Initial Depth to Water (feet)	=	Height of Water Column (feet)	x	0.163 gal/ft (2-inch well) / ~~0.653 gal/ft (4-inch well)~~	=	1 Casing Volume (gal)
29.35	-	26.31	=	3.04	x		=	.49X3= 1.46

Time	DO (ppm)	CO_2 (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1130	3.22						0 gal.	
1130		45	180				.25 gal.	
1132				427	53°	6.19	.50 gal.	
1135	No flow			408	52.6°	6.22	1 gal.	
1138	Thru cell			400	52.8°	6.18	1.25 gal.	empty

Purge Method: Bailer
Total Volume Removed: 1.25 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-3	3-40ml VOAs	HCL	NCL	TPHG/BTEX/MTBE

Well Condition:
Remarks:
Recharged to 28.26 at sample time.* 1150

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Water Sampling Data Sheet

Project Name:	Former Fir Haven Shell	Date/Time:	5/2/06
Project No.:	001032	Sampler Name:	Dustin Tibbets
Location:	Miranda CA	Sample Type:	Water
Well #:	MW-2	Weather	Sun
Hydrocarbon Thickness/Depth (feet):		Key Needed:	Dolphin

Total Well Depth (feet)	-	Initial Depth to Water (feet)	=	Height of Water Column (feet)	x	0.163 gal/ft (2-inch well) / ~~0.653 gal/ft (4-inch well)~~	=	1 Casing Volume (gal)
50.17	-	28.14	=	22.03	x		=	3.52 X 3 = 10.57

Time	DO (ppm)	CO_2 (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1200	6.58						0 gal.	
1200		50	185				.25 gal.	
1209				159	57.1°	6.37	3.75 gal.	
1219	No flow			173	57.2°	6.36	7.5 gal.	
1229	Thru cell			177	57.5°	6.37	10.75 gal.	

Purge Method: Bailer

Total Volume Removed: 10.75 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-2	3-40ml VOAs	HCL	NCL	TPHG/BTEX/MTBE

Well Condition:

Remarks:

Recharged to 33.79 at sample time. - 1240

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Water Sampling Data Sheet

Project Name: Former Fir Haven Shell
Date/Time: 5/2/06
Project No.: 001032
Sampler Name: Dustin Tibbets
Location: Miranda CA
Sample Type: Water
Well #: MW-4
Weather: Sun
Hydrocarbon Thickness/Depth (feet):
Key Needed: Dolphin

Total Well Depth (feet)	-	Initial Depth to Water (feet)	=	Height of Water Column (feet)	x	0.163 gal/ft (2-inch well) / ~~0.653 gal/ft (4-inch well)~~	=	1 Casing Volume (gal)
29.32	-	16.31	=	13.01	x		=	2.08 X3 = 6.24

Time	DO (ppm)	CO_2 (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1116	2.69						0 gal.	
1259		55	196				.25 gal.	
1303				670	60.1°	6.35	2.25 gal.	
1307	No flow			622	60.3°	6.40	4.25 gal.	
1312	Thru cell			627	60.2°	6.44	6.25 gal.	

Purge Method: Bailer
Total Volume Removed: 6.25 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-4	3-40ml VOAs	HCL	NCL	TPHG/BTEX/MTBE

Well Condition:
Remarks:
Recharged to 23.24 at sample time. - 1320

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Water Sampling Data Sheet

Project Name: Former Fir Haven Shell
Date/Time: 5/2/06
Project No.: 001032
Sampler Name: Dustin Tibbets
Location: Miranda CA
Sample Type: Water
Well #: MW-1
Weather: Sun
Hydrocarbon Thickness/Depth (feet):
Key Needed: Dolphin

Total Well Depth (feet)	-	Initial Depth to Water (feet)	=	Height of Water Column (feet)	x	0.163 gal/ft (2-inch well) / ~~0.653 gal/ft (4-inch well)~~	=	1 Casing Volume (gal)
30.05	-	18.11	=	11.94	x		=	1.91 X3= 5.73

Time	DO (ppm)	CO_2 (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1122	1.91						0 gal.	
1332		150	-148				.25 gal.	
1335				506	57.6°	6.68	2 gal.	
1340	No flow			554	58°	6.74	4 gal.	
1344	Thru cell			522	58.6°	6.74	5.75 gal.	

Purge Method: Bailer
Total Volume Removed: 5.75 (gal)

Laboratory Information

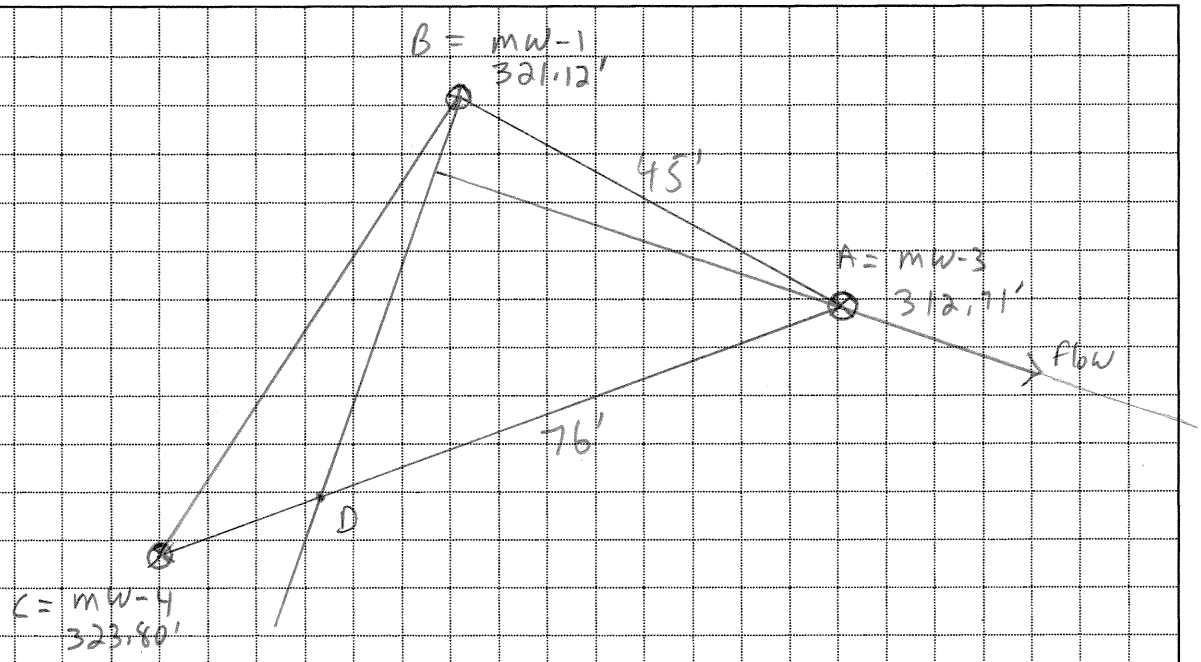
Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-1	3-40ml VOAs	HCL	NCL	TPHG/BTEX/MTBE

Well Condition:

Remarks: Sheen on top of purge water.
Recharged to 23.98 at sample time. 1355

ENGINEERS & GEOLOGISTS
812 W. Wabash Ave. Tel. 707 / 441-8855
Eureka, CA 95501-2138 Fax: 707 / 441-8877

JOB 00103.1 Former Fir Haven Shell
SHEET NO. 1 OF 1
CALCULATED BY Peter Dunn DATE 6-21-06
CHECKED BY DATE
SCALE 1" = 20'



$$AD = AC\left(\frac{\Delta Z_{AB}}{\Delta Z_{AC}}\right)$$

$$= 76\left(\frac{321.12 - 312.71}{323.80 - 312.71}\right)$$

$$= 76\left(\frac{8.41}{11.09}\right)$$

$$= 57.6$$

$AE = 45$

$$\text{gradient} = \frac{\Delta Z_{AB}}{AE}$$

$$= \frac{8.41}{45}$$

$$= 0.186$$

$$\approx \boxed{0.19}$$

Independent Business Forms Inc.
(530) 365-0367, FAX (530) 365-0334, (800) 729-3700

Client Name: **FORMER FIR HAVEN SHELL**

The water from your site: **5251 Highway 254, Miranda, CA**

LOP #12748

SHN ref # **001032** Collected On: **5/2/2006**

Has been tested and certified as acceptable to be discharged into the City of Eureka municipal sewer system.

Amount Discharged: **25 GALLONS**

Date Discharged: **5/12/2006**

Certified by: **AARON MELODY**

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.

City of Eureka Wastewater Discharge Permit #65

Appendix B

Historic Data

Table B-1
Historic Groundwater Elevations
Former Fir Haven Shell, Miranda, California

Sample Location	Sample Date	Top of Casing Elevation (feet)[1]	Depth to Water[2] (feet)	Groundwater Elevation (feet)
MW-1	11/20/04	339.23	19.95	319.28
	1/21/05		18.13	321.10
	5/11/05		17.73	321.50
	8/2/05		19.02	320.21
	11/2/05		19.07	320.16
	2/2/06		16.56	322.67
	5/2/06		18.11	321.12
MW-2	11/20/04	338.77	32.78	305.99
	1/21/05		29.55	309.22
	5/11/05		27.73	311.04
	8/2/05		32.70	306.07
	11/2/05		31.80	306.97
	2/2/06		24.48	314.29
	5/2/06		28.14	310.63
MW-3	11/20/04	339.02	DRY[3]	--
	1/21/05		27.44	311.58
	5/11/05		26.70	312.32
	8/2/05		28.80	310.22
	11/2/05		28.89	310.16
	2/2/06		24.41	314.61
	5/2/06		26.31	312.71
MW-4	11/20/04	340.11	22.68	317.43
	1/21/05		18.09	322.02
	5/11/05		16.82	323.29
	8/2/05		19.15	320.96
	11/2/05		21.28	318.83
	2/2/06		14.53	325.58
	5/2/06		16.31	323.80

1. Referenced to North American Vertical Datum (NAVD) 88
2. Below top of casing
3. Well was dry on November 20, 2004. As such, a depth to water measurement could not be collected.

Table B-2
Historic Groundwater Monitoring Well Analytical Results
Former Fir Haven Shell, Miranda, California
(in ug/L)[1]

Sample Location	Sample Date	TPHG[2]	B[3]	T[3]	E[3]	X[3]	MTBE[3]
MW-1	11/20/04	**53,000[4]**	**4,300**	**5,900**	**1,600**	**8,600**	<600[5,6]
	1/21/05	**26,000**	**3,200**	**2,500**	**870**	**3,900**	<300[6]
	5/11/05	**35,000[4]**	**2,800**	**4,000**	**980**	**5,200**	<300[6]
	8/2/05	**53,000[4]**	**3,100**	**6,500**	**1,500**	**8,500**	<300[6]
	11/2/05	**46,000**	**2,700**	**4,800**	**1,400**	**7,800**	<300[6]
	2/2/06	**24,000**	**2,100**	**1,500**	**610**	**2,590**	<300[6]
	5/2/06	**27,000**	**2,000**	**2,000**	**760**	**3,800**	<300[6]
MW-2	11/20/04	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	1/21/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/11/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	8/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	11/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	2/2/06	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/2/06	<50	<0.50	<0.50	<0.50	<1.0	<3.0
MW-3	11/20/04	NS[7]	NS	NS	NS	NS	NS
	1/21/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/11/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	8/2/05	NS	NS	NS	NS	NS	NS
	11/2/05	NS	NS	NS	NS	NS	NS
	2/2/06	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/2/06	<50	<0.50	<0.50	<0.50	<1.0	<3.0
MW-4	11/20/04	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	1/21/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/11/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	8/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	11/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	2/2/06	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/2/06	<50	<0.50	<0.50	<0.50	<1.0	<3.0

1. ug/L: micrograms per Liter
2. TPHG: Total Petroleum Hydrocarbons as Gasoline, analyzed in general accordance with U.S. Environmental Protection Agency (EPA) Method Nos. 3510/GCFID/8015B or 5030/GCFID/8015B
3. Benzene (B), Toluene (T), Ethylbenzene (E), m,p-Xylene, o-Xylene, and Methyl Tertiary-Butyl Ether (MTBE), analyzed in general accordance with EPA Method Nos. 5030/8021B
4. Sample appears to be similar to gasoline, but certain peak ratios are not that of a fresh gasoline standard. The reported result represents the amount of material in the gasoline range.
5. <: Denotes a value that is "less than" the method detection limit
6. Reporting limit raised due to matrix interference
7. NS: Not Sampled

Table B-3
Historic DO, DCO_2, and ORP Measurement Results
Former Fir Haven Shell, Miranda, California

Sample Location	Sample Date	DO[1] (ppm)[2]	DCO_2[3] (ppm)	ORP[4] (mV)[5]
MW-1	1/21/05	2.09	180	-67
	5/11/05	0.05	150	-90
	8/2/05	1.15	120	-84
	11/2/05	0.09	120	-132
	2/2/06	NM[6]	100	23
	5/2/06	1.91	150	-148
MW-2	1/21/05	4.96	30	93
	5/11/05	4.00	30	208
	8/2/05	1.77	20	128
	11/2/05	1.60	20	118
	11/2/05	NM[6]	30	108
	5/2/06	6.58	50	185
MW-3	1/21/05	5.26	60	116
	5/11/05	1.83	60	145
	8/2/05	2.95	60	135
	11/2/05	0.50	40	148
	11/2/05	NM[6]	55	152
	5/2/06	3.72	45	180
MW-4	1/21/05	2.04	40	104
	5/11/05	0.05	40	175
	8/2/05	1.26	40	131
	11/2/05	0.06	40	111
	11/2/05	NM[6]	50	38
	5/2/06	2.69	55	196

1. DO: Dissolved Oxygen, field measured using portable instrumentation
2. ppm: parts per million
3. DCO_2: Dissolved Carbon Dioxide, field measured using a field test kit
4. ORP: Oxidation-Reduction Potential; field measurement using portable instrumentation
5. mV: millivolts
6. NM: not measured for parameter

Appendix C

Laboratory Analytical Report

NORTH COAST LABORATORIES LTD.

May 11, 2006

SHN Consulting Engineers and Geologists
812 West Wabash Avenue
Eureka, CA 95501

Attn: Erik Nielsen

RE: 001032/Fir Haven Shell

Order No.: 0605076
Invoice No.: 58054
PO No.:

ELAP No. 1247-Expires July 2006

SAMPLE IDENTIFICATION

Fraction	Client Sample Description
01A	MW-3
02A	MW-2
03A	MW-4
04A	MW-1

ND = Not Detected at the Reporting Limit

Limit = Reporting Limit

All solid results are expressed on a wet-weight basis unless otherwise noted.

REPORT CERTIFIED BY

Laboratory Supervisor(s) | QA Unit | Jesse G. Chaney, Jr. Laboratory Director

5680 West End Road Arcata California 95521-9202 707-822-4649 FAX 707-822-6831

Printed on Recycled Paper

CASE NARRATIVE

BTEX:
MTBE for sample MW-1 was reported as ND with a dilution due to matrix interference.

The surrogate recovery for the method blank was below the lower acceptance limit. The surrogate recoveries of the laboratory control sample/laboratory control sample duplicate (LCS/LCSD) were above the upper acceptance limit. The surrogate recoveries of the samples were within the acceptance limits; therefore, the data were accepted.

The laboratory control sample duplicate (LCSD) recovery was above the upper acceptance limit for MTBE. This recovery indicates that the sample results may be erroneously high. There were no detectable levels of the analyte in the samples; therefore, the data were accepted.

TPH as Gasoline:
Sample MW-1 appears to be similar to gasoline but certain peak ratios are not that of a fresh gasoline standard. The reported result represents the amount of material in the gasoline range.

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831

Date: 11-May-06
WorkOrder: 0605076

ANALYTICAL REPORT

Client Sample ID: MW-3 **Received:** 5/3/06 **Collected:** 5/2/06 11:50
Lab ID: 0605076-01A

Test Name: BTEX **Reference:** EPA 5030/EPA 8021B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
MTBE	ND	3.0	µg/L	1.0		5/8/06
Benzene	ND	0.50	µg/L	1.0		5/8/06
Toluene	ND	0.50	µg/L	1.0		5/8/06
Ethylbenzene	ND	0.50	µg/L	1.0		5/8/06
m,p-Xylene	ND	0.50	µg/L	1.0		5/8/06
o-Xylene	ND	0.50	µg/L	1.0		5/8/06
Surrogate: Cis-1,2-Dichloroethylene	92.0	85-115	% Rec	1.0		5/8/06

Test Name: TPH as Gasoline **Reference:** EPA 5030/GCFID(LUFT)/EPA 8015B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
TPHC Gas (C6-C14)	ND	50	µg/L	1.0		5/8/06

Client Sample ID: MW-2 **Received:** 5/3/06 **Collected:** 5/2/06 12:40
Lab ID: 0605076-02A

Test Name: BTEX **Reference:** EPA 5030/EPA 8021B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
MTBE	ND	3.0	µg/L	1.0		5/8/06
Benzene	ND	0.50	µg/L	1.0		5/8/06
Toluene	ND	0.50	µg/L	1.0		5/8/06
Ethylbenzene	ND	0.50	µg/L	1.0		5/8/06
m,p-Xylene	ND	0.50	µg/L	1.0		5/8/06
o-Xylene	ND	0.50	µg/L	1.0		5/8/06
Surrogate: Cis-1,2-Dichloroethylene	93.5	85-115	% Rec	1.0		5/8/06

Test Name: TPH as Gasoline **Reference:** EPA 5030/GCFID(LUFT)/EPA 8015B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
TPHC Gas (C6-C14)	ND	50	µg/L	1.0		5/8/06

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831

Date: 11-May-06
WorkOrder: 0605076

ANALYTICAL REPORT

Client Sample ID: MW-4 **Received:** 5/3/06 **Collected:** 5/2/06 13:20
Lab ID: 0605076-03A

Test Name: BTEX **Reference:** EPA 5030/EPA 8021B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
MTBE	ND	3.0	µg/L	1.0		5/8/06
Benzene	ND	0.50	µg/L	1.0		5/8/06
Toluene	ND	0.50	µg/L	1.0		5/8/06
Ethylbenzene	ND	0.50	µg/L	1.0		5/8/06
m,p-Xylene	ND	0.50	µg/L	1.0		5/8/06
o-Xylene	ND	0.50	µg/L	1.0		5/8/06
Surrogate: Cis-1,2-Dichloroethylene	92.1	85-115	% Rec	1.0		5/8/06

Test Name: TPH as Gasoline **Reference:** EPA 5030/GCFID(LUFT)/EPA 8015B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
TPHC Gas (C6-C14)	ND	50	µg/L	1.0		5/8/06

Client Sample ID: MW-1 **Received:** 5/3/06 **Collected:** 5/2/06 13:55
Lab ID: 0605076-04A

Test Name: BTEX **Reference:** EPA 5030/EPA 8021B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
MTBE	ND	300	µg/L	100		5/8/06
Benzene	2,000	500	µg/L	1,000		5/8/06
Toluene	2,000	500	µg/L	1,000		5/8/06
Ethylbenzene	760	500	µg/L	1,000		5/8/06
m,p-Xylene	2,700	500	µg/L	1,000		5/8/06
o-Xylene	1,100	500	µg/L	1,000		5/8/06
Surrogate: Cis-1,2-Dichloroethylene	101	85-115	% Rec	1,000		5/8/06

Test Name: TPH as Gasoline **Reference:** EPA 5030/GCFID(LUFT)/EPA 8015B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
TPHC Gas (C6-C14)	27,000	5,000	µg/L	100		5/8/06

NORTH COAST LABORATORIES
5680 West End Road • Arcata, California 95521-9202 • 707-822-4649 • FAX 707-822-6831

North Coast Laboratories, Ltd.

Date: 11-May-06

CLIENT: SHN Consulting Engineers and Geologists
Work Order: 0605076
Project: 001032/Fir Haven Shell

QC SUMMARY REPORT

Method Blank

Sample ID **MB-5/8/06** Batch ID: **R41181** Test Code: **BTXEW** Units: **µg/L** Analysis Date **5/8/06 3:01:52 PM** Prep Date
Client ID: Run ID: **ORGC8_060508B** SeqNo: **591127**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MTBE	ND	3.0									
Benzene	ND	0.50									
Toluene	ND	0.50									
Ethylbenzene	ND	0.50									
m,p-Xylene	0.1971	0.50									J
o-Xylene	ND	0.50									
Cis-1,2-Dichloroethylene	0.145	0.10	1.00	0	14.5%	85	115	0			S

Sample ID **MB-5/8/06** Batch ID: **R41180** Test Code: **TPHCGW** Units: **µg/L** Analysis Date **5/8/06 3:01:52 PM** Prep Date
Client ID: Run ID: **ORGC8_060508A** SeqNo: **591109**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gas (C6-C14)	ND	50									

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

North Coast Laboratories, Ltd.

Date: 11-May-06

CLIENT: SHN Consulting Engineers and Geologists
Work Order: 0605076
Project: 001032/Fir Haven Shell

QC SUMMARY REPORT

Laboratory Control Spike

Sample ID **LCS-06276** Batch ID: **R41181** Test Code: **BTXEW** Units: **µg/L** Analysis Date **5/8/06 11:59:55 AM** Prep Date
Client ID: Run ID: **ORGC8_060508B** SeqNo: **591125**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MTBE	45.34	3.0	40.0	0	113%	85	115	0			
Benzene	5.064	0.50	5.00	0	101%	85	115	0			
Toluene	5.184	0.50	5.00	0	104%	85	115	0			
Ethylbenzene	5.167	0.50	5.00	0	103%	85	115	0			
m,p-Xylene	10.38	0.50	10.0	0	104%	85	115	0			
o-Xylene	5.202	0.50	5.00	0	104%	85	115	0			
Cis-1,2-Dichloroethylene	1.20	0.10	1.00	0	120%	85	115	0			S

Sample ID **LCSD-06276** Batch ID: **R41181** Test Code: **BTXEW** Units: **µg/L** Analysis Date **5/8/06 12:36:18 PM** Prep Date
Client ID: Run ID: **ORGC8_060508B** SeqNo: **591126**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MTBE	46.27	3.0	40.0	0	116%	85	115	45.3	2.02%	15	S
Benzene	5.083	0.50	5.00	0	102%	85	115	5.06	0.379%	15	
Toluene	5.164	0.50	5.00	0	103%	85	115	5.18	0.402%	15	
Ethylbenzene	5.135	0.50	5.00	0	103%	85	115	5.17	0.634%	15	
m,p-Xylene	10.34	0.50	10.0	0	103%	85	115	10.4	0.432%	15	
o-Xylene	5.143	0.50	5.00	0	103%	85	115	5.20	1.13%	15	
Cis-1,2-Dichloroethylene	1.23	0.10	1.00	0	123%	85	115	1.20	2.85%	15	S

Sample ID **LCS-06277** Batch ID: **R41180** Test Code: **TPHCGW** Units: **µg/L** Analysis Date **5/8/06 1:12:16 PM** Prep Date
Client ID: Run ID: **ORGC8_060508A** SeqNo: **591107**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gas (C6-C14)	538.3	50	500	0	108%	85	115	0			

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

CLIENT: SHN Consulting Engineers and Geologists
Work Order: 0605076
Project: 001032/Fir Haven Shell

QC SUMMARY REPORT

Laboratory Control Spike Duplicate

Sample ID **LCSD-06277** Batch ID: **R41180** Test Code: **TPHCGW** Units: **µg/L** Analysis Date **5/8/06 1:48:29 PM** Prep Date

Client ID: Run ID: **ORGC8_060508A** SeqNo: **591108**

Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gas (C6-C14)	523.8	50	500	0	105%	85	115	538	2.72%	15	

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
B - Analyte detected in the associated Method Blank

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

#0605046

LABORATORY NUMBER:

Attention: Erik Nielsen
Results & Invoice to: SHN
Address: 812 West Wabash Avenue
Eureka, CA 95501
Phone: 441-8855
Copies of Report to:
Sampler (Sign & Print): [illegible]

TAT: ☐ 24 Hr ☐ 48 Hr ☐ 5 Day ☐ 5–7 Day
☒ STD (2–3 Wk) ☐ Other:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES

REPORTING REQUIREMENTS: State Forms ☐
Preliminary: FAX ☐ Verbal ☐ By: __/__/__
Final Report: FAX ☐ Verbal ☐ By: __/__/__

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L cg; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other

PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

PROJECT INFORMATION

Project Number: 001032
Project Name: Ex Haven Shell
Purchase Order Number:

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*
	MW-3	5/2/06	1150	GW
	MW-2	↓	1240	↓
	MW-4	↓	1320	↓
	MW-1	↓	1355	↓

ANALYSIS	CONTAINER	PRESERVATIVE
TPHG/BTEX/MTBE	9	6

SAMPLE CONDITION/SPECIAL INSTRUCTIONS

EDF

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME
[illegible]	5/2/06	[illegible]	5/3/06 300

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA [illegible]
SHIPPED VIA: UPS Air-Ex Fed-Ex Bus Hand

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT