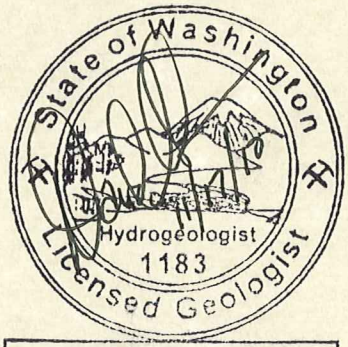
Soil Treatment Cell Sampling Report

Comet Trailer Facility – Site ID #503
501 South First Street,
Selah, WA

Prepared For:

Owens Family Partnership
P.O. Box 129
Selah, WA 98942

Prepared By:



DAVID L. GREEN

SAGE
Earth Sciences, Inc.

1705 S. 24th Ave.
Yakima, WA 98902

November 17, 2010

FS

Executive Summary

The Comet Trailer facility is located at 501 South First Street, Selah, WA. To remove petroleum impacted soil that was in contact with groundwater, approximately 5280 cubic yards of diesel impacted soil was excavated from the site on January 2 - February 24, 2010. These soil remediation activities are documented in Sage's *Independent Remedial Action Report, April 9, 2010.*

The Client chose to independently treat petroleum impacted soil, generated during soil remediation activities, on the northwestern portion of the property using the "landfarming" method. Sage observed that the impacted soil stockpile has been spread to a thickness of approximately one and one-half (1.5) feet in depth. The client informed Sage that they had spread the soil during the summer. They were aerating the soil using a caterpillar ripper and watering it using a water truck.

To evaluate the adequacy of soil treatment activities, Sage collected seventeen (17) soil samples from soil currently undergoing treatment on the northwestern portion of the property. Sage submitted the samples to Friedman & Bruya, Inc. (FBI) for analysis using method NWTPH-Dx. The FBI analyses found:

- Diesel range petroleum hydrocarbons at concentrations ranging from 450 mg/Kg up to 4,400 mg/Kg and
- No detectable (less than 250 mg/Kg) motor oil range petroleum hydrocarbons.

To determine if the treated soil meets the Cleanup Standard for Diesel range petroleum hydrocarbons, which is 2,000 mg/Kg, Sage utilized the *Statistical Guidance for Petroleum Contaminated Soil Cleanup Level Determinations*, found as Appendix E of the Guidance for Remediation of Releases from Underground Storage Tanks.

Using this method of evaluation, Sage found the statistical concentration of diesel range petroleum hydrocarbons to be 1,836 mg/Kg, which is less than the cleanup standard for Diesel of 2,000 mg/kg as established in WAC 173-340-740. Sage recommends that use of the treated soil be limited to uses protective of human health and/or the environment. If the soil is used to backfill the remedial excavation, Sage recommends placing clean, imported fill to a depth above the maximum groundwater table. This will prevent residual petroleum hydrocarbons from contacting groundwater.

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1.0 Introduction

1.1 Purpose

The purpose of this report is to describe findings and actions taken associated with sampling and analysis of soil samples from a soil treatment cell at the former Comet Trailer facility located in Selah, Washington. The limited soil treatment cell sampling project was performed to comply with regulatory requirements established by the Washington State Department of Ecology (WSDOE).

1.2 Scope of Work

Sage Earth Sciences, Inc. (Sage) provided soil sampling services after the Client had performed soil treatment activities using the "landfarming" method. Soil samples were submitted to Friedman and Bruya, Inc. (FBI), Seattle, WA for independent laboratory analysis.

2.0 Background Information

2.1 Site Location

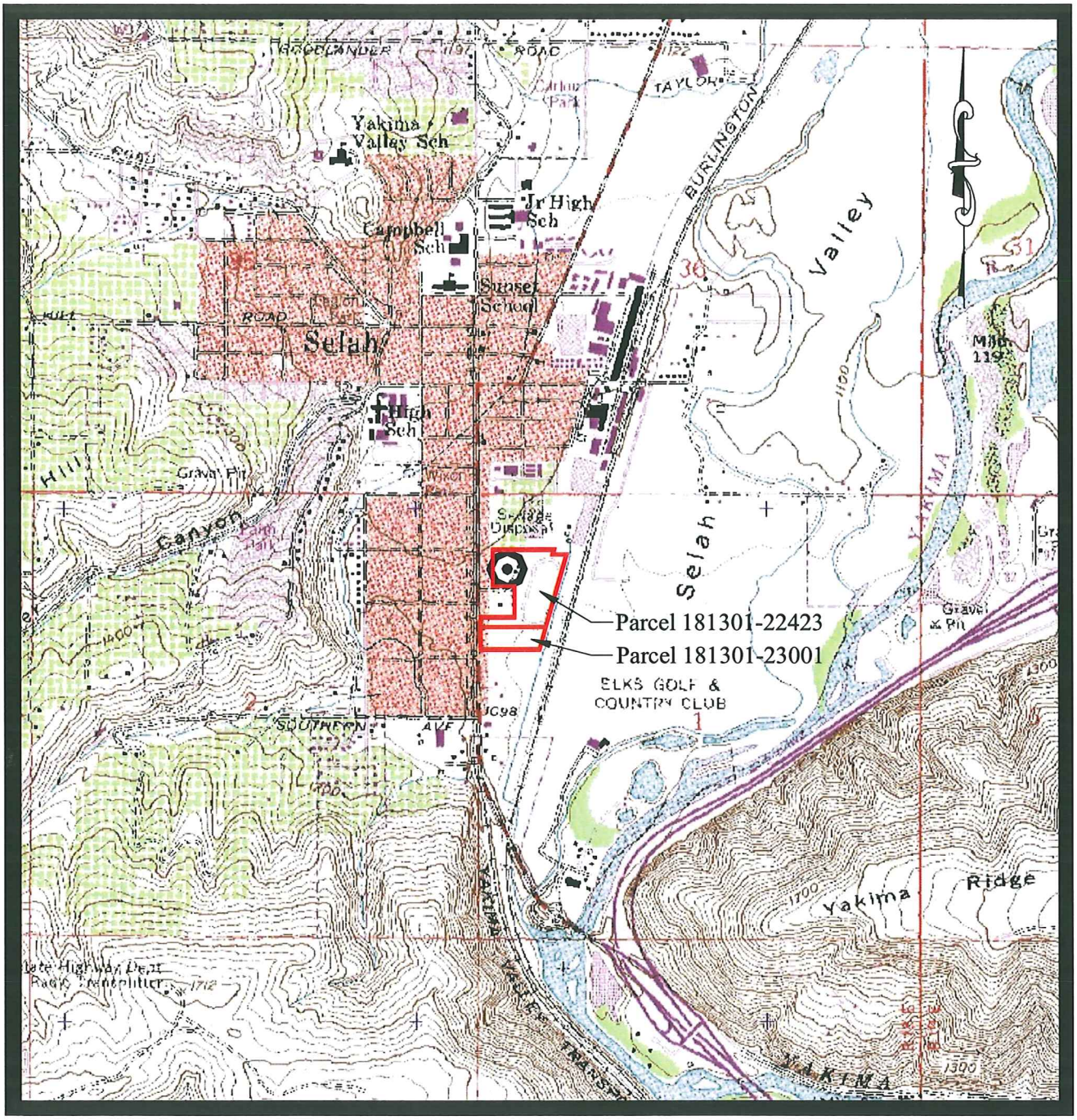
The former Comet Trailer facility is located at 501 South First Street, Selah, WA. It is situated within the W 1/2 of the NW 1/4, Section 01, Township 13 North, Range 18 East, Willamette Meridian. Project activities were conducted on Yakima Tax Parcel Numbers: 181301-22423 & 181301-23001. The approximate site latitude is 46° 38' 46.1" and the approximate longitude is 120° 31' 42.9". Figure 1 shows the location of the site.

2.2 Site Description & Adjacent Land Use

The facility is owned by:

Bud Owens Family Limited Partnership
P.O. Box 129
Selah, WA 98942
(509) 697-7264

The authorized site contact is Mrs. Terra Rudick.



Graphic Scale

Contour Interval - 20 Feet

⊙ = Site Location

Figure 1. Site Location Map

The eastern portion of Parcel Number 181301-22423 is occupied by the former Comet Trailer manufacturing building, which currently houses the following commercial businesses: Tree Top & Ross Plant Ingredient Division Warehouse, Graham Packaging and Yakama Juice. The area surrounding the building is covered by asphalt surface. The northwestern portion of this parcel is occupied by a gravel parking lot. The southwestern portion of this parcel is occupied by a storage buildings and a residential dwelling. These western areas are separated from the asphalted area by fencing.

The eastern portion of Parcel Number 181301-23001 is occupied by an asphalt parking, equipment storage area and a forklift repair business. The western portion of this parcel is occupied by a strip mall, an apartment complex and a residential dwelling. Goodwill Industries and small commercial businesses lie west of the northern portion of Parcel Number 181301-22423. South First Street lies immediately west of the Parcel Number 181301-23001 and the southern portion of Parcel Number 181301-22423.

The local topography slopes gently southeast. A drainage ditch, which discharges effluent from the municipal sewer treatment plant, lies immediately east of the subject parcels. The drainage ditch discharges into the Yakima River, which lies approximately three-tenths of a mile southeast of the site.

2.2 Previous Work

During the course of Environmental Site Assessment activities, Kleinfelder, Inc. directed installation of five (5) groundwater monitoring wells (MW-1 through MW-5) on the subject site during March of 1995. The wells were installed by Cascade Drilling, Inc. Monitoring well locations are shown by Figure 2.

During soil and groundwater investigations conducted during August 2004, Technico Environmental Services of Kennewick, WA discovered approximately four (4) inches of Diesel #2 floating on groundwater within MW-3.

Sage performed limited site characterization activities as documented in Sage's *Limited Free Product Removal & Site Characterization Report, February 26, 2006.* Field observations and FBI analytical results for soil and groundwater samples collected from exploratory test pits indicated that diesel range impacted soil and/or groundwater, requiring remedial action, was limited to an aerial extent of approximately 26,750 square feet.

Sage collected a sample of the petroleum product on July 30, 2008 and submitted it to FBI for forensic evaluation. The FBI analyses found medium boiling compounds indicative of diesel fuel No. 2 or heating oil, which has undergone substantial biological degradation. Additional analysis indicated that if the product was used as road fuel, it was produced prior to October 1, 1993, when the EPA mandated the limit of sulfur to 0.05 percent.

Sage conducted groundwater gradient monitoring activities from November 22, 2005 until August 27, 2009, which indicated that the groundwater gradient averaged 0.002 ft/ft and the groundwater flow direction azimuth varied from 101° to 126°. MW-3, which often contained petroleum product, was often "blinded", as the groundwater surface was greater in elevation than the top of the well screen.

To remove petroleum impacted soil that was in contact with groundwater, approximately 5,280 cubic yards of diesel impacted soil was excavated from the site on January 2 - February 24, 2010. To facilitate complete removal of impacted soil, MW3 and MW5 were removed completely by excavation. Analysis of final remedial excavation characterization soil samples found no detectable diesel or motor oil range petroleum hydrocarbons, which indicated that residual diesel/motor oil concentrations comply with the *Method A Soil Cleanup Levels of WAC 173-340-740* in the remedial excavation. However, analysis of a post remediation sample of groundwater exposed within the remedial excavation found diesel range petroleum hydrocarbons at a concentration of 52,000 µg/L and motor oil range petroleum hydrocarbons at a concentration of 2,600 µg/L. Although the free product was removed, residual diesel/motor oil range petroleum hydrocarbons concentrations remained in excess of the *Method A Groundwater Cleanup Levels of WAC 173-340-720.* Soil remediation activities are documented in Sage's *Independent Remedial Action Report, April 9, 2010.*

The Client chose to independently treat petroleum impacted soil, generated during soil remediation activities, on the northwestern portion of the property using the "landfarming" method. The client informed Sage that they had spread the soil during the summer. They were aerating the soil using a caterpillar ripper and watering it using a water truck.

3.0 Soil Treatment Cell Sampling & Analysis

Sage collected seventeen (17) samples of soil (CT-0310-SP109 through CT-0310-SP125) from the soil treatment cell at locations shown by Figure 2. Soil sampling methods are described in Appendix A. Sample descriptions are included on the *Daily Field Sampling Log* (Appendix B). Sage submitted the samples to Friedman & Bruya, Inc. (FBI) for analysis using method NWTPH-Dx. The FBI analyses found:

- Diesel range petroleum hydrocarbons at concentrations ranging from 450 mg/Kg up to 4,400 mg/Kg and
- No detectable (less than 250 mg/Kg) motor oil range petroleum hydrocarbons.

The FBI analytical data reports are included as Appendix C. To determine if the treated soil meets the Cleanup Standard for Diesel range petroleum hydrocarbons, which is 2,000 mg/Kg (see Appendix D), Sage utilized the *Statistical Guidance for Petroleum Contaminated Soil Cleanup Level Determinations*, found as Appendix E of the Guidance for Remediation of Releases from Underground Storage Tanks. This guidance is included in this report as Appendix E). The statistical evaluation follows below.

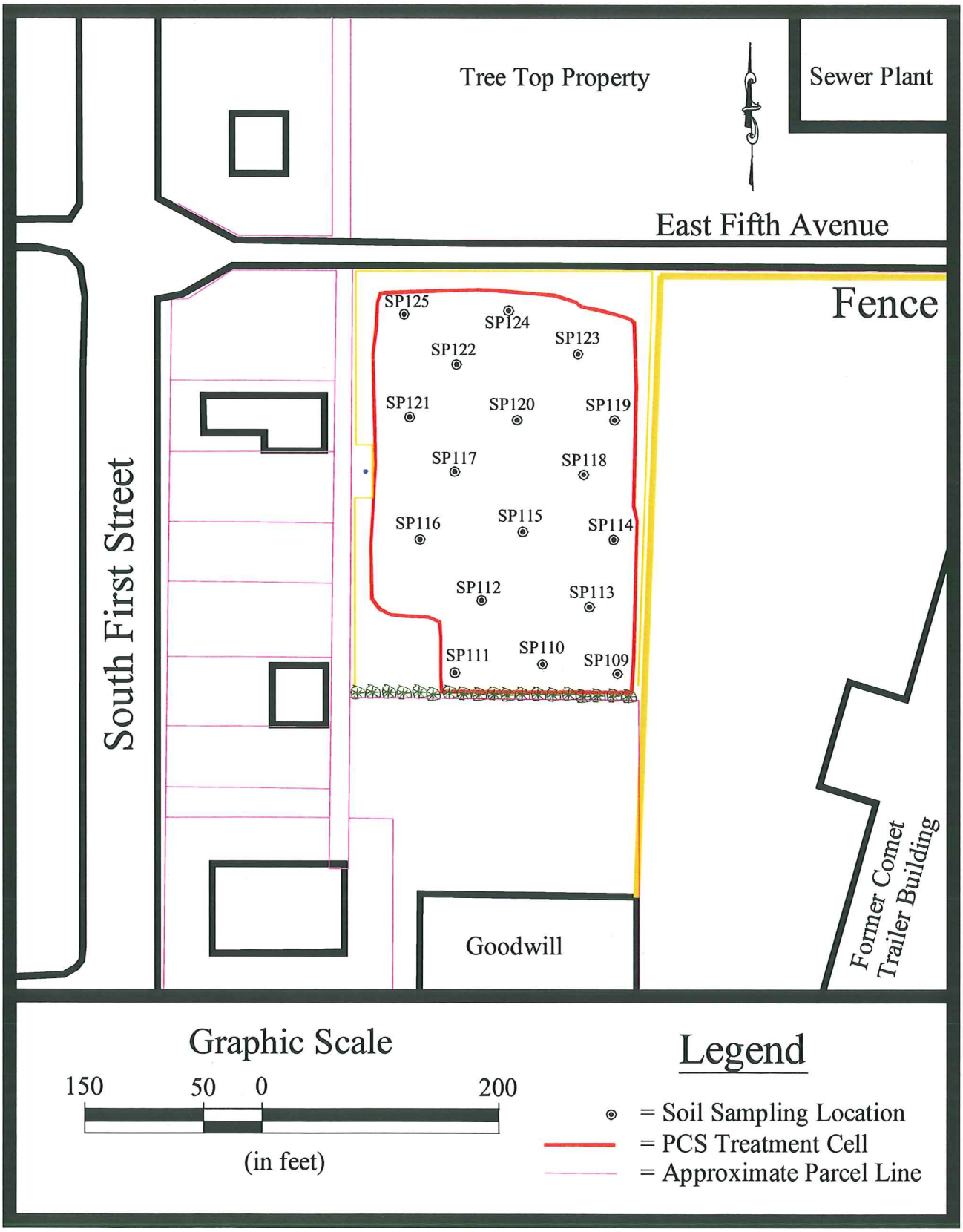


Figure 2. Soil Treatment Cell Sampling Locations

Step 1: Calculate the mean (average) and the standard deviation for the seventeen (17) soil samples.

Mean ($\bar{x}$) = (2,000 + 930 + 710 + 2,400 + 3,900 + 910 + 1,200 + 610 + 1,200 + 1,500 + 1,200 + 800 + 1,400 + 450 + 490 + 4,400 + 850) / 17 = 24,950/17

Mean ($\bar{x}$) = 1,468

Standard Deviation (s) = $\sqrt{\frac{\Sigma (x-\bar{x})^2}{N-1}}$

$$\sqrt{(532)^2 + (-538)^2 + (-758)^2 + (932)^2 + (2432)^2 + (-558)^2 + (-268)^2 + (-858)^2 + (-268)^2 + (32)^2 + (-268)^2 + (-668)^2 + (-68)^2 + (-1018)^2 + (-978)^2 + (2932)^2 + (-618)^2 / 17 - 1}$$

$$= \sqrt{283,024 + 289,444 + 574,564 + 868,624 + 5,914,624 + 311,364 + 71,824 + 736,164 + 71,824 + 1,024 + 71,824 + 446,224 + 4624 + 1,036,324 + 956,484 + 8,596,624 + 381,924 / 16}$$

$$= \sqrt{20,616,508 / 16}$$

$$= \sqrt{1,288,531}$$

Standard Deviation (s) = 1,135

Step 2: Calculate the following quantity:

Mean + [(Standard Deviation) X (T/ $\sqrt{N}$)] Note: T = 1.337 according to "Values for T"

1,468 + [(1,135) X (1.337/$\sqrt{17}$)] = 1,468 + [1,135 X (1.337/4.123)]

= 1468 + [1,135 X 0.324] = 1,468 + 368

= 1,836

Step 3: Compare the quantity calculated in step 2 with the cleanup standard. If it is less than the cleanup standard, the soil meets the standard.

In this case, 1,836 is less than the cleanup standard for Diesel (2,000 mg/kg). The Diesel TPH level is in compliance with the cleanup standard.

4.0 Recommendations

Based upon statistical evaluation analytical results for soil samples collected from the treated soil, the diesel range petroleum hydrocarbons meet the Cleanup Standard of 2,000 parts per million.

Although the soil meets the Cleanup Standard, diesel range petroleum hydrocarbons remain in the soil. Therefore, Sage recommends that further use of this treated soil be limited to:

- Treatment
- Disposal at the original site (no solid waste disposal permit needed)
- Road Construction (no solid waste permit disposal permit needed)
- Use or disposal in permitted municipal landfills
- Permitted as a new PCS landfill
- Fill in or near: wetlands, surface water, groundwater, drinking water wells or utility trenches is NOT recommended. Use as residential topsoil is also NOT recommended.

An evaluation should be made to ensure that disposal will not cause a threat to human health or the environment, e.g. use near water bodies. If the soil is used to backfill the remedial excavation, Sage recommends placing clean, imported fill to a depth above the maximum groundwater table. This will prevent residual petroleum hydrocarbons from contacting groundwater.

5.0 Limitations

In performance of this project, Sage Earth Sciences has conducted its activities in accordance with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. The conclusions and recommendations are based upon our field observations and independent laboratory analyses. Since the scope of work for this project is confined to sampling and analysis of soil samples from a soil treatment cell, this document does not imply that the property is free of other environmental constraints. This report is solely for the use and information of our client. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and other parameters indicated. Sage Earth Sciences, Inc. is not responsible for the impacts of changes in environmental standards, practices, or regulations subsequent to the performance of services. Sage Earth Sciences, Inc. does not warrant the accuracy of information supplied by others, nor use of segregated portions of this report. Sage Earth Sciences, Inc. assumes no liability for conditions we were not authorized to evaluate, or conditions not generally recognized as predictable when services were performed.

Appendix A

Excavation Soil Sampling Methodology

Soil sampling locations were chosen at locations considered representative of soil conditions. To collect representative soil samples, Sage Earth Sciences, Inc. uses the methodology outlined below.

1. Select a laboratory supplied sample jar whose specifications are adequate for the appropriate analysis.

2. Remove a minimum of six (6) inches of soil to minimize the loss of volatile compounds.

3. Immediately transfer the soil to the sample container, using the container itself to collect the sample. Using new disposable vinyl gloves, pack the soil tightly into the container to prevent the loss of volatile compounds. If the "jar-pack" method is used, the container is filled completely to exclude any airspace in the sample.

4. Label the jar with a unique identification number, the analytical procedure to be used, the time and date of sample collection and the person who collected the sample.

5. Enter the sample on the Chain-of-Custody form and the Daily Field Sampling Log.

6. Place the sample in wet ice to cool the samples to approximately four (4) degrees Celsius.

7. Place the samples in a shipping cooler packed with absorbent material and blue ice for shipment.

8. Secure the Chain-of-Custody form to the underside of the cooler lid in a sealable plastic bag with tape.

9. Upon completion of sampling activities, secure the lid of the cooler with strapping tape and affix custody seals across the lid/cooler interface. Place appropriate shipping waybills atop the cooler.

10. Ship the samples to the laboratory via commercial courier.

Appendix B

Daily Field Sampling Log

Project# CT-0310 Date 11-03-10 Field Crew Rod Hart

Time	Sample #	Sample Location	Matrix	Staining	Odors	Depth/ Area	TOV/ TLC
11:49	CT-0310-SP109	PCS TREATMENT AREA S.E CORN	Soil	None	None	1-3	NA
11:55	CT-0310-SP110	" " S. END Cent.	Soil	None	None	1-0	
12:01	CT-0310-SP111	" " S.W CORN	Soil	None	None	1-2	
12:07	CT-0310-SP112	" " S.W	Soil	None	None	1-0	
12:12	CT-0310-SP113	" " S.E	Soil	Grayish	Diesel	0-8"	
12:18	CT-0310-SP114	" " S.E Mid	Soil	None	None	1-2'	
12:24	CT-0310-SP115	" " S. Cent. Mid	Soil	None	None	1-4'	
12:29	CT-0310-SP116	" " S.W	Soil	None	None	1-0	
12:35	CT-0310-SP117	" " W. Cent	Soil	None	None	0-6"	
12:42	CT-0310-SP118	" " E. Cent	Soil	None	None	0-10"	
12:47	CT-0310-SP119	" " E. Side North	Soil	None	None	1-2'	
12:52	CT-0310-SP120	" " North Central	Soil	None	None	1-0'	
12:58	CT-0310-SP121	" " West Central N	Soil	None	None	1-0'	
1:05	CT-0310-SP122	" " N.W Cent.	Soil	None	None	0-8"	
1:09	CT-0310-SP123	" " N.E	Soil	None	None	0-11"	
1:14	CT-0310-SP124	" " N.E CORN	Soil	Grayish	Diesel	1-3'	
1:20	CT-0310-SP125	" " N.W CORN	Soil		None	1-0	

Ambient Vapors: NA Units. TLC Standards: NA

Sheet 1 of 1

Appendix C

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Charlene Morrow, M.S.
Yelena Aravkina, M.S.
Bradley T. Benson, B.S.
Kurt Johnson, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
TEL: (206) 285-8282
FAX: (206) 283-5044
e-mail: fbi@isomedia.com

November 11, 2010

Rodney Heit, Project Manager
Sage Earth Sciences, Inc.
1705 S 24th Ave
Yakima, WA 98902

Dear Mr. Heit:

Included are the results from the testing of material submitted on November 4, 2010 from the CT-0310, F&BI 011049 project. There are 5 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you should have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
SES1111R.DOC

Date of Report: 11/11/10
Date Received: 11/04/10
Project: CT-0310, F&BI 011049
Date Extracted: 11/05/10
Date Analyzed: 11/07/10

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL AND MOTOR OIL USING METHOD NWTPH-Dx

Results Reported on a Dry Weight Basis
Results Reported as mg/kg (ppm)

Sample ID Laboratory ID	Diesel Range (C_{10}-C_{25})	Motor Oil Range (C_{25}-C_{36})	Surrogate (% Recovery) (Limit 50-150)
CT-0310-SP109 011049-01	2,000	<250	119
CT-0310-SP110 011049-02	930	<250	111
CT-0310-SP111 011049-03	710	<250	117
CT-0310-SP112 011049-04	2,400	<250	134
CT-0310-SP113 011049-05	3,900	<250	125
CT-0310-SP114 011049-06	910	<250	123
CT-0310-SP115 011049-07	1,200	<250	107
CT-0310-SP116 011049-08	610	<250	123
CT-0310-SP117 011049-09	1,200	<250	127
CT-0310-SP118 011049-10	1,500	<250	137
CT-0310-SP119 011049-11	1,200	<250	116
CT-0310-SP120 011049-12	800	<250	119

Date of Report: 11/11/10
Date Received: 11/04/10
Project: CT-0310, F&BI 011049

QUALITY ASSURANCE RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS DIESEL EXTENDED USING METHOD NWTPH-Dx

Laboratory Code: 011049-10 (Matrix Spike)

Analyte	Reporting Units	Spike Level	(Wet wt) Sample Result	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	118	124	63-146	5

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	102	79-144

011049 ME 11-04-10 A04

SAGE Earth Sciences, Inc.

CHAIN OF CUSTODY

1705 South 24th Avenue
Yakima, WA 98902
Phone (509) 834-2333
Fax (509) 834-2334
info@sage-earth-sciences.com

Sampler: Rod Heit
Project ID: CT-0310
Location: Comet Trailer Site
Turn-around Time: STANDARD
Sampler Signature: Rodney Heit
Date: 11-03-10

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	Sample Size	# of Containers	NWTPH-HCID	NWTPH-Gx	NWTPH-Dx	Method 8260B	Method 8270	Method 6010	Methamphetamine (Methanol Solvent)	Asbestos by Bulk PLM	Lab Archive	Notes:
CT-0310-SP109	01	11-3-10	11:49	Soil	4oz	1			X							
CT-0310-SP110	02		11:55						X							
CT-0310-SP111	03		12:01						X							
CT-0310-SP112	04		12:07						X							
CT-0310-SP113	05		12:12						X							
CT-0310-SP114	06		12:18						X							
CT-0310-SP115	07		12:24						X							
CT-0310-SP116	08		12:29						X							
CT-0310-SP117	09		12:35						X							
CT-0310-SP118	10		12:42						X							
CT-0310-SP119	11		12:47						X							
CT-0310-SP120	12		12:52						X							
CT-0310-SP121	13		12:58						X							
CT-0310-SP122	14		1:05						X							

Laboratory Destination:

Friedman & Bruya, Inc.
3012 – 16th Avenue West
Seattle, WA 98119-2029
Phone (206) 285-8282
Fax (206) 283-5044

	SIGNATURE	PRINTED NAME	COMPANY	DATE	TIME
Relinquished By	Rodney Heit	RODNEY HEIT	Sage Earth Sciences, Inc.	11-03-10	2:15 PM
Received By	DAVID	DAVID	FEDEX	11-04-10	9 AM
Relinquished By					
Received By			Samples received at 7 °C		

Appendix D

Table 740-1
Method A Soil Cleanup Levels for Unrestricted Land Uses.[a]

Hazardous Substance	CAS Number	Cleanup Level
Arsenic	7440-38-2	20 mg/kg[b]
Benzene	71-43-2	0.03 mg/kg[c]
Benzo(a)pyrene	50-32-8	0.1 mg/kg[d]
Cadmium	7440-43-9	2 mg/kg[e]
Chromium		
Chromium VI	18540-29-9	19 mg/kg[f1]
Chromium III	16065-83-1	2,000 mg/kg[f2]
DDT	50-29-3	3 mg/kg[g]
Ethylbenzene	100-41-4	6 mg/kg[h]
Ethylene dibromide (EDB)	106-93-4	0.005 mg/kg[i]
Lead	7439-92-1	250 mg/kg[j]
Lindane	58-89-9	0.01 mg/kg[k]
Methylene chloride	75-09-2	0.02 mg/kg[l]
Mercury (inorganic)	7439-97-6	2 mg/kg[m]
MTBE	1634-04-4	0.1 mg/kg[n]
Naphthalenes	91-20-3	5 mg/kg[o]
PCB Mixtures		1 mg/kg[p]
Tetrachloroethylene	127-18-4	0.05 mg/kg[q]
Toluene	108-88-3	7 mg/kg[r]
Total Petroleum Hydrocarbons[s]		
[Note: Must also test for and meet cleanup levels for other petroleum components--see footnotes!]		
Gasoline Range Organics		100 mg/kg
Gasoline mixtures Without benzene and consisting of no more than 20% aromatic hydrocarbons between EC 8 and EC 16		30 mg/kg
All other gasoline mixtures		2,000 mg/kg
Diesel Range Organics		2,000 mg/kg
Heavy Oils		4,000 mg/kg
Mineral Oil		
1,1,1 Trichloroethane	71-55-6	2 mg/kg[t]
Trichloroethylene	79-01-5	0.03 mg/kg[u]
Xylenes	1330-20-7	9 mg/kg[v]

Footnotes:

a **Caution on misusing this table.** This table has been developed for specific purposes. It is intended to provide conservative cleanup levels for sites undergoing routine cleanup actions or for sites with relatively few hazardous substances, and the site qualifies under WAC 173-340-7491 for an exclusion from conducting a simplified or site-specific terrestrial ecological evaluation, or it can be demonstrated using a terrestrial ecological evaluation under WAC 173-340-7492 or 173-340-7493 that the values in this table are ecologically protective for the site. This table may not be appropriate for defining cleanup levels at other sites. For these reasons, the values in this table should not automatically be used to define cleanup levels that must be met for financial, real estate, insurance coverage or placement, or similar transactions or purposes. Exceedances of the values in this table do not necessarily mean the soil must be restored to these levels at a site. The level of restoration depends on the remedy selected under WAC 173-340-350 through 173-340-390.

b **Arsenic.** Cleanup level based on direct contact using Equation 740-2 and protection of ground water for drinking water use using the procedures in WAC 173-340-747(4), adjusted for natural background for soil.

c **Benzene.** Cleanup level based on protection of ground water for drinking water use, using the procedures in WAC 173-340-747 (4) and (6).

d **Benzo(a)pyrene.** Cleanup level based on direct contact using Equation 740-2. This value may also be used as the total concentration that all carcinogenic PAHs must meet using the toxicity equivalency methodology in WAC 173-340-708(8).

e **Cadmium.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.

f1 **Chromium VI.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

f2 **Chromium III.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). Chromium VI must also be tested for and the cleanup level met when present at a site.

g **DDT (dichlorodiphenyltrichloroethane).** Cleanup level based on direct contact using Equation 740-2.

h **Ethylbenzene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

i **Ethylene dibromide (1,2 dibromoethane or EDB).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit for soil.

j **Lead.** Cleanup level based on preventing unacceptable blood lead levels.

k **Lindane.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4), adjusted for the practical quantitation limit.

l **Methylene chloride (dichloromethane).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

m **Mercury.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

n **Methyl tertiary-butyl ether (MTBE).** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

o **Naphthalenes.** Cleanup level based on protection of ground water for drinking water use, using the procedures described inWAC 173-340-747(4). This is a total value for naphthalene, 1-methyl naphthalene and 2-methyl naphthalene.

p **PCB Mixtures.** Cleanup level based on applicable federal law (40 C.F.R. 761.61). This is a total value for all PCBs.

q **Tetrachloroethylene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

r **Toluene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

s **Total Petroleum Hydrocarbons (TPH).** TPH cleanup values have been provided for the most common petroleum products encountered at contaminated sites. Where there is a mixture of products or the product composition is unknown, samples must be tested using both the NWTPH-Gx and NWTPH-Dx methods and the lowest applicable TPH cleanup level must be met.

– **Gasoline range organics** means organic compounds measured using method NWTPH-Gx. Examples are aviation and automotive gasoline. The cleanup level is based on protection of ground water for noncarcinogenic effects during drinking water use using the procedures described in WAC 173-340-747(6). Two cleanup levels are provided. The lower value of 30 mg/kg can be used at any site. When using this lower value, the soil must also be tested for and meet the benzene soil cleanup level. The higher value of 100 mg/kg can only be used if the soil is tested and found to contain no benzene and less than 20% of the gasoline mixture consists of aromatic petroleum hydrocarbons between EC 8 and EC 16. No interpolation between these cleanup levels is allowed. In both cases, the soil cleanup level for any other carcinogenic components of the petroleum [such as EDB and EDC], if present at the site, must also be met. Also, in both cases, soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes, naphthalene, and MTBE], also must be met if these substances are found to exceed ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for gasoline releases.

– **Diesel range organics** means organic compounds measured using method NWTPH-Dx. Examples are diesel, kerosene, and #1 and #2 heating oil. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10). The soil cleanup level for any carcinogenic components of the petroleum [such as benzene and PAHs], if present at the site, must also be met. Soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes and naphthalenes], also must be met if these substances are found to exceed the ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for diesel releases.

– **Heavy oils** means organic compounds measured using NWTPH-Dx. Examples are #6 fuel oil, bunker C oil, hydraulic oil and waste oil. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10) and assuming a product composition similar to diesel fuel. The soil cleanup level for any carcinogenic components of the petroleum [such as benzene, PAHs and PCBs], if present at the site, must also be met. Soil cleanup levels for any noncarcinogenic components [such as toluene, ethylbenzene, xylenes and naphthalenes], also must be met if found to exceed the ground water cleanup levels at the site. See Table 830-1 for the minimum testing requirements for heavy oil releases.

– **Mineral oil** means non-PCB mineral oil, typically used as an insulator and coolant in electrical devices such as transformers

and capacitors, measured using NWTPH-Dx. The cleanup level is based on preventing the accumulation of free product on the ground water, as described in WAC 173-340-747(10). Sites using this cleanup level must also analyze soil samples and meet the soil cleanup level for PCBs, unless it can be demonstrated that: (1) The release originated from an electrical device that was manufactured after July 1, 1979; or (2) oil containing PCBs was never used in the equipment suspected as the source of the release; or (3) it can be documented that the oil released was recently tested and did not contain PCBs. Method B must be used for releases of oils containing greater than 50 ppm PCBs. See Table 830-1 for the minimum testing requirements for mineral oil releases.

t **1,1,1 Trichloroethane.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

u **Trichloroethylene.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4).

v **Xylenes.** Cleanup level based on protection of ground water for drinking water use, using the procedures described in WAC 173-340-747(4). This is a total value for all xylenes.

Appendix E

APPENDIX E

STATISTICAL GUIDANCE FOR PETROLEUM-CONTAMINATED SOIL CLEANUP LEVEL DETERMINATIONS

The following examples illustrate a simplified procedure to determine whether contaminated soil meets a cleanup standard. This guidance is intended for LUST sites where a state remedial investigation/feasibility report is not required. For more detailed information on the statistical requirements for demonstrating that soil cleanup standards are met, see WAC 173-340-740(7). Statistical requirements for demonstrating compliance with groundwater cleanup standards are found in WAC 173-340-720(8).

Example 1. Three samples are taken from a well-mixed pile containing 100 cubic yards of treated soil. The samples are analyzed for TPH (gasoline) and the lab reports the following concentrations:

Sample #1 50 mg/kg
Sample #2 90 mg/kg
Sample #3 105 mg/kg

The Method A cleanup level is 100 mg/kg. Does the treated soil meet this cleanup standard?

STEP 1. Calculate the mean (average) and standard deviation for the three samples.
Mean = 81.7 mg/kg
Standard deviation = 28.4

STEP 2.
Calculate the following quantity:

Mean + [(Standard deviation) X ($T/\sqrt{N}$)]

N is the number of samples. T is a number whose value depends on the number of samples. Consult the Table 1 below to find T.

In this case, N = 3 and T = 1.886. The quantity to be calculated is

$81.7 + [(28.4) \times (1.886/\sqrt{3})] = 112.6$

STEP 3. Compare the quantity calculated in step 2 with the cleanup standard. If it is less than the cleanup standard, the soil meets the standard.

In this example, since 112.6 is larger than the cleanup standard (100 mg/kg), the gasoline TPH level is not in compliance.

VALUES FOR T

# Samples	T	# Samples	T
3	1.886	12	1.363
4	1.638	13	1.356
5	1.533	14	1.350
6	1.476	15	1.345
7	1.440	16	1.341
8	1.415	17	1.337
9	1.397	18	1.333
10	1.383	19	1.330
11	1.372	20	1.328