GROUNDWATER SAMPLING EVENT REPORT SEPTEMBER 29, 2015

FORMER FLINTSTONE FUEL SITE 2840 C BLACKLAKE BOULEVARD SW TUMWATER, WASHINGTON

Prepared By

Paul W. Stemen

Stemen Environmental, Inc.

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STEMEN ENVIRONMENTAL, INC.

PO BOX 3644 LACEY, WA. 98509-3644 CONTR. LIC. #STEMEEI081J9

Telephone 360-438-9521 Fax 360-412-1225

September 29, 2015

Mr. John Meek Meek Logging Olympia, Washington

Dear Mr. Meek:

RE: QUARTERLY GROUNDWATER MONITORING EVENT FOR FORMER FLINSTONE FUEL SITE LOCATED AT 2840 - C BLACKLAKE BOULEVARD SW, TUMWATER, WASHINGTON.

1.0 MONITORING WELL INSTALLATION

On February 19, 2015, four (4) groundwater monitoring wells were installed at selected locations on the subject site. The one (1) inch diameter PVC monitoring wells were installed using a Direct Push Probe operated by licensed well drillers from ESN Northwest, Inc, Olympia, Washington. The monitoring wells were advanced to approximate depths of 25 b.g.s. (below ground surface) and screened, with a pre-packed screen, at depths of approximately 5 to 25 feet b.g.s.

The monitoring wells were properly developed by the removal of ten (10) volumes of water from each of the wells using a low flow pump.

Measurable quantities of water were found to be present in all of the monitoring wells on the dates of their installation.

2.0 GROUNDWATER ELEVATIONS AND DIRECTION OF GROUNDWATER FLOW

Groundwater elevations were measured, during the groundwater sampling event using an electronic water level indicator. Groundwater depths were measured from the northern side of the top of the well casing/pipe.

On August 16, 2015, depth to groundwater measurements were obtained from the four (4) on-site groundwater monitoring wells .Groundwater was present in monitoring well MW1 at a depth of 7.75 ft., MW2 - 10.47 ft., MW3 - 6.99 ft., and MW4 - 5.97 ft.

The inferred direction of groundwater flow was determined to be to south/southeast on this date.

Approximate direction of groundwater flow was determined using the relative groundwater elevations in three wells installed in a triangular configuration. The groundwater elevation in each well was calculated by surveying the top of each well casing, and subtracting the measured depth to groundwater from the same surveyed points.

The groundwater gradient was then calculated using the three point problem, in which the calculated gradient is perpendicular to the contour line connecting the midelevation well with the line between the low and high points at the elevation of the midelevation well.

Groundwater gradients were determined by John Kane, Licensed Geologist/Hydrogeologist #1193, of Kane Environmental, Inc.

Monitoring well, top of casing/pipe elevations were surveyed by Coastal Land Surveying. (See attached survey map)

3.0 GROUNDWATER SAMPLING

Prior to sampling, the monitoring wells were properly purged by removing a minimum of three (3) casing volumes (4.8 gallons) of water from the wells using a peristaltic pump set a low flow rate.

On August 16, 2015, representative samples of the groundwater present in each of the on-site groundwater monitoring wells were obtained. The representative groundwater samples were obtained from the waters present in the upper portion of the screened interval of the well and approximately 12 inches below the measured water level using a variable speed peristaltic pump operating set at the lowest flow rating and disposable PVC tubing that was replaced prior to each individual sampling event.

The sampled waters were transferred directly into laboratory supplied containers for temporary storage and transport.

All waters generated during purging activities were placed in appropriate containers for transportation to an appropriate off-site treatment/disposal facility.

All disposable PVC tubing was properly disposed as solid waste.

Water samples MW1, MW2, MW3, and MW4 were submitted for appropriate laboratory analyses.

Ground water sampling was performed by Paul Stemen of Stemen Environmental, Inc.

<u>Laboratory analyses results for groundwater water samples MW1, MW2, MW3, and MW4 reported no detectable presence of gasoline range T.P.H. and/or B.T.E.X.s in these sampled waters.</u>

4.0 LABORATORY ANALYSES

All samples were tightly packed in recommended containers with no head space, properly refrigerated and transported with proper chain of custody forms to ESN Northwest, Inc., of Olympia, Washington for appropriate laboratory analyses. Groundwater samples were screened for Gasoline Range TPH (Total Petroleum Hydrocarbons) using methods NWTPH-Gx , and B.T.E.X.s (Benzene, Toluene, Ethylbenzene, and Xylenes) using E.P.A. method 8260. These analytical methods meet all current Department of Ecology recommendations for groundwater sample analyses and quality controls.

5.0 HEALTH AND SAFETY

- 1. All on-site work was performed under the Health and Safety guidelines set forth in sections 29 CRF 1910.120 of the Federal Register and Chapter 296-62 WAC which provide regulations for individuals who are engaged in activities involving hazardous substances, including petroleum, and who perform confined space entry during field activities, also Chapter 296-155 WAC which provides State safety standards for construction work.
 - 2. All on-site workers were 40 hour Hazmat certified.

6.0 SUMMARY AND CONCLUSIONS

The following summary and conclusions are based on information gathered during on-site investigations described in this report.

1. On August 16, 2015, groundwater elevations were measured in the four (4) on-site groundwater monitoring wells.

Groundwater was present in the on-site monitoring wells at depths of 5.97 ft. - 10.47 ft.

Based on the August 16, 2015 groundwater elevation measurements, the inferred direction of groundwater flow is to the south/southeast. Groundwater gradients were determined by John Kane, Licensed Geologist/Hydrogeologist #1193, of Kane Environmental, Inc.

2. On August 15, 2016, representative samples of the groundwater present in onsite monitoring wells MW1, MW2, MW3, and MW4 were obtained and submitted for appropriate laboratory analyses.

<u>Laboratory analyses results for groundwater water samples MW1, MW2, MW3, and MW4 reported no detectable presence of gasoline range T.P.H. and/or B.T.E.X.s in these sampled waters.</u>

If you have any questions or require further information please feel free to contact us at the above phone number.

Sincerely,

Paul W Stemen

Ecology-Registered Site Assessment Supervisor

IFCI #0874201-26

ASTM Certificate

APPENDIX A

LABORATORY ANALYSES CHARTS, MONITORING WELL LOCATION MAP, SURVEYORS MAP, LABORATORY ANALYSES DATA, AND WELL LOGS

MONITORING WELL EVENT 2

BTEX IN WATER E	, we will	1111111	I DA DA LAT	LITELD	ID WILTHOU		740200		
							GASOLINE	DIESEL	LUBE OIL
SAMPLE	SAMPLE				ETHYL-	TOTAL	RANGE	RANGE	, RANGE
NUMBER	DATE		BENZENE	TOLUENE	BENZENE				
			ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
MW1	5/21/15		ND	ND	ND	ND	ND	ND	ND
MW1	8/16/15		ND	ND	ND	ND	ND	ND	ND
MW2	5/21/15		ND	ND	ND	ND	ND	ND	ND
MW2	8/16/15		ND	ND	ND	ND	ND	ND	ND
MW3	5/21/15		ND	ND	ND	ND	ND	ND	ND
MW3	8/16/15	-	ND	ND	ND	ND	ND	ND	ND
WWVO	0/10/13		ND	IND	IND	IND	ND	, ND	NU
MW4	5/21/15		ND	ND	ND	ND	ND	ND	ND
MW4	8/16/15								
REPORTING LIMIT			1	1	1	3	100	250	500
METHOD "A" CLEA		ELS	5	1000	700	1000	*1000	2000	2000
* BENZENE NOT P	RESENT								
AUGUST 16, 2015	GROUNDV	VATER M	ONITORING	SEVENT					
WELL NUMBER	TOC	GW	GW						
•		DEPTH	ELEV.						
MW1	132.76	6.93	125.83						
MW1	132.76	7.75	125.01						•
MW2	129.87	4.64	125.23						
MW2	129.87	10.47	119.4						
MW3	129.21	2.44	105.77						
		3.44	125.77						
MW3	129.21	6.99	122.22						
MW4	129.63	4.86	124.77						
MW4	129.63	5.97	123.66						



<u>LEGEND</u>

Approximate Property Boundary



Approximate Locations of Groundwater Monitoring Wells (Groundwater Elevations above Mean Sea Level)



Approximate Calculated Direction of Groundwater Flow (8/15/15) Based on Elevations in MW-1, MW-2, and MW-4

0

50

100

Approximate Scale in Feet

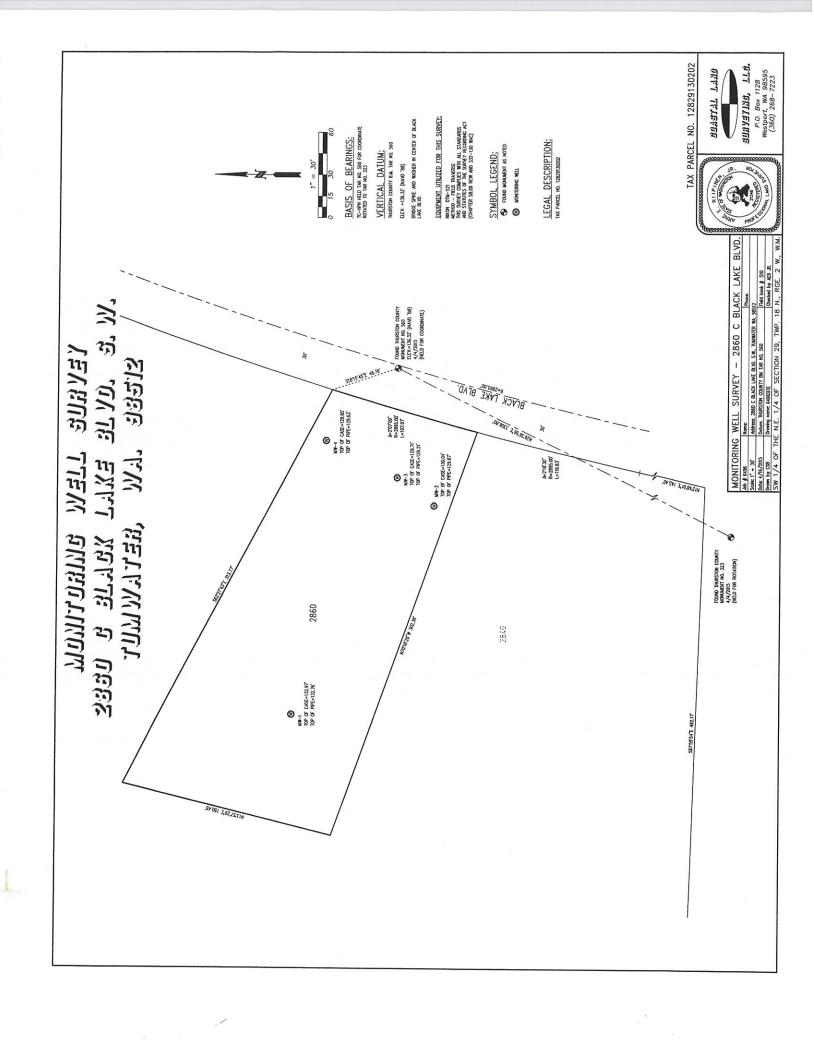


Flintstone Fuel 2840-C Black Lake Blvd Tumwater, Washington



JOHN R. KANT

Figure 3b
Site Plan with
Groundwater Elevations
(8/15/2015)



August 21, 2015

Paul Stemen Stemen Environmental P.O. Box 3644 Lacey, WA 98509

Dear Mr. Stemen:

Please find enclosed the analytical data report for the Flintstone Fuel Project in Tumwater, Washington. Water samples were analyzed for Diesel and Oil by NWTPH-Dx/Dx Extended, Gasoline by NWTPH-Gx, and BTEX by Method 8260 on August 18 - 19, 2015.

The results of these analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. An invoice for this work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to Stemen Environmental for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we look forward to the next opportunity to work together.

Sincerely,

Michael A. Korosec

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President

ESN NORTHWEST CHEMISTRY LABORATORY

Stemen Environmental, Inc PROJECT FLINSTONE FUEL Tumwater, Washington ESN Northwest 1210 Eastside Street SE Suite 200 Olympia, WA 98501 (360) 459-4670 (360) 459-3432 Fax lab@esnnw.com

Analysis of Diesel Range Organics & Lube Oil Range Organics in Water by Method NWTPH-Dx Extended

Sample Number	Date Prepared	Date Analyzed	Surrogate Recovery (%)	Diesel Range Organics (ug/L)	Lube Oil Range Organics (ug/L)
Method Blank	8/19/2015	8/19/2015	95	nd	nd
LCS	8/19/2015	8/19/2015	72	119%	
MW1	8/19/2015	8/19/2015	86	nd	nd
MW2	8/19/2015	8/19/2015	84	nd	nd
MW3	8/19/2015	8/19/2015	102	nd	nd
MW4	8/19/2015	8/19/2015	102	nd	nd
Reporting Limits				250	500

[&]quot;nd" Indicates not detected at the listed detection limits.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE: 50% TO 150%

[&]quot;int" Indicates that interference prevents determination.

ESN NORTHWEST CHEMISTRY LABORATORY

Stemen Environmental, Inc PROJECT FLINSTONE FUEL Tumwater, Washington ESN Northwest 1210 Eastside Street SE Suite 200 Olympia, WA 98501 (360) 459-4670 (360) 459-3432 Fax lab@esnnw.com

Analysis of Gasoline Range Organics & BTEX in Water by Method NWTPH-Gx/8260

Sample Number	Date	Benzene	Toluene	Ethylbenzene	Xylenes	Gasoline Range Organics	Surrogate
	Analyzed	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	Recovery (%)
Method Blank	8/18/2015	nd	nd	nd	nd	nd	107
LCS	8/18/2015	104%	111%	96%	97%	96%	97
LCSD	8/18/2015	101%	99%	95%	93%		96
MW1	8/18/2015	nd	nd	nd	nd	nd	106
MW2	8/18/2015	nd	nd	nd	nd	nd	106
MW3	8/18/2015	nd	nd	nd	nd	nd	109
MW4	8/18/2015	nd	nd	nd	nd	nd	107
Trip Blank	8/18/2015	nd	nd	nd	nd	nd	108
Reporting Limits		1.0	1.0	1.0	3.0	100	

[&]quot;nd" Indicates not detected at the listed detection limits.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE (Bromoflurorbenzene) & LCS: 65% TO 135%

[&]quot;int" Indicates that interference prevents determination.

CHAIN-OF-CUSTODY RECORD

Services Network Environmental

NORTHWEST, INC. ESN

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ANNULAR SPACE: BACKFILL: 1-4 TYPE: bentenite V-25 Sand PVC BLANK: 0-5 SCREEN: 5-25 SLOT SIZE: 000 TYPE: 1 prepact screen RECEIVED MAR 19 2015 WA State Department of Ecology (SWRO) WELL DEPTH: 25	ANNULAR SPACE: BACKFILL: 1-4 TYPE: bentenite SCREEN: 5-25 SLOT SIZE: 000 TYPE: 1" pregach screen RECEIVED	Construction Design	Well D	ata	Formation Description
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DRILLING METHOD: DPT of Ecology (SWRO) WELL DEPTH: 25	MATERIAL: 10/20 silica sand MAR 19 2015.	-	MATERIAL: 10/20 5	ilica sand	MAR 1 9 2015.
WELL DEPTH: 25	of Ecology (SWRO)		DRILLING METHOL). DOT	
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4	RESOURCE PROTECTION SUBMIT ONE WELL REPORT PER W		CURRENT	Notice of Intent No. RE10973
ba	Construction/Decommission ("x" in box)	ELL INSTALLED)		Type of Well ("x in box)
2	Construction Decommission			Resource Protection Geotech Soil Boring
a	PRIGINAL INSTALLATION Notice of Intend	t Number:	Property Owner M	
				Black Lake Blvd
¥	onsulting Firmnique Ecology Well IDTag No. BIM·140			County Thurston
	/ELL CONSTRUCTION CERTIFICATIO			/4 <u>NE</u> I/4 Sec <u>29</u> Twn <u>18</u> R <u>02</u>
5	cept responsibility for construction of this well, and it	ts compliance with all	EWM or WWN	
formation	'ashington well construction standards. Materials use ported above are true to my best knowledge and belief		Lat/Long (s, t, r still REQUIRED)	Lat Deg MinSec
吊	Driller □ Engineer □ Trainee			Long DegMinSec
E	ame (Print Last, First Name) <u>Harnden, Don</u> riller/Engineer /Trainee Signature		Cased or Uncased I	Diameter/ " Static Level 7
4	riller or Trainee License No. 2914			on Start Date <u>2/19/15</u>
<u></u>	f trainee, licensed driller's Signature and	License Number:		on Completed Date 2/19/15
Ē				
Data and/or	Construction Design	Well D	ata	Formation Description
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æ		flush mount		
		CONCRETE SURFA	CE SEAL:	
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E		TYPE: Dentonite		<i>i</i> *
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3		SCREEN: 5-25		
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Ħ		SAND PACK: 4-2 MATERIAL: 10/20 Si	lica sand	WA State Department
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ב		BORING DIAMETER		
ww		SCALE: 1"= PAG	SE 1 OF 4	

ESOURCE PROTECTION		CURREN	T Notice of Intent No.	. <u>RE10973</u>
UBMIT ONE WELL REPORT PER V onstruction/Decommission ("x" in box)	VELL INSTALLED)		Type of Well ("x in bo	(xc)
Construction	20		Resource Protection	
👺] Decommission			Geotech Soil Bori	ng
RIGINAL INSTALLATION Notice of Inter	ıt Number:	Property Owner]	Michael Wood	
nique Ecology Well IDTag No. BIM -/4		Site Address 286	Black Lake Blvd	
onsulting Firm		City Tumwater	County Thurston	n
nique Ecology Well IDTag No. <u>BIM - / 4</u>	3	Location SW1/4-	1/4 <u>NE</u> 1/4 Sec <u>29</u> Twn <u>18</u> R	. 02
		EWM 🔲 or WW		
ELL CONSTRUCTION CERTIFICATION		Lat/Long (s, t, r		0
orted above are true to my best knowledge and belie		still REQUIRED)	<u> </u>	
ashington well construction standards. Materials us norted above are true to my best knowledge and belied Driller Engineer Trainee me (Print Last, First Name) Harnden, Don iller/Engineer /Trainee Signature :iller or Trainee License No. 2914			Long DegMin_ 829130202	Sec
me (Print Last, First Name) Harnden, Don			Diameter / Stati	
iller/Engineer /Trainee Signature				ic Level
Ther or Trainee License No. 2914		Work/Decommiss	ion Start Date 2/19/15	
trainee, licensed driller's Signature and Construction Design	License Number:	Work/Decommiss	ion Completed Date 2/19/1:	5
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	ANNULAR SPACE	D:		
	DACKETT 1.4	,		
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	TITE. DENIMAN	<u> </u>		
			10-25 sand	
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5	SCREEN: 5-25		***************************************	
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\$'	TYPE: 1ª prepe	2.CK		
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	MATERIAL: 10/20	silica sand		
			VVA ST	are Department
			Of EC	ology (SWRO)
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		20		
	WELL DEPTH:	25		
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ESOURCE PROTECTION		I CURREN	IT Notice of Intent No. RE10973	
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Construction	(x)		Type of Well ("x in box) Resource Protection	
Decommission				
RIGINAL INSTALLATION Notice of Ir	itent Number	Property Owner 1	Geotech Soil Boring	
The state of the s	NOTE ITALIFOCE .	Property Owner]		
onsulting Firm			0 Black Lake Blvd	
nique Ecology Well IDTag No. <u>BIM</u> -	142		County Thurston	
			1/4 <u>NE</u> 1/4 Sec <u>29</u> Twn <u>18</u> R <u>02</u>	
ELL CONSTRUCTION CERTIFICA cept responsibility for construction of this well, a	CION: I constructed and/or	EWM 🗌 or WW	'M ⊠ '.	
shington well construction standards. Materials	used and the information	Lat/Long (s, t, r	Lat Deg Min Sec	
orted above are true to my best knowledge and i	pelief.	still REQUIRED)	Long DegMinSec	
Driller Engineer Trainee		Tax Parcel No.12	829130202	
ne (Print Last, First Name) <u>Hamden, Don</u> iller/Engineer /Trainee Signature	01		Diameter Static Level 7	
iller or Trainee License No. 2914				
		_	sion Start Date 2/19/15	
trainee, licensed driller's Signature a	nd License Number:	Work/Decommiss	ion Completed Date 2/19/15	
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Construction Design	Well	Data	Formation Description	
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			Dala cont of	
	ANNULAR SPACE	7.	0-10 Sandandpeat	
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			10-25 sand	
			10-25 3412	
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	SCREEN: 5-25 SLOT SIZE: .0/6			
	TYPE: 1" Prepa	ch series		
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	DRILLING METHO	D: DPT	WA State Departme	
			of Ecology (SWR)	J)
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