GROUNDWATER SAMPLING EVENT REPORT JUNE 30, 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

June 30, 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 May 21, 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 6.93 ft., MW2 - 4.64 ft., MW3 - 3.44 ft., and MW4 - 4.86 ft.

The inferred direction of groundwater flow was determined to be to northeast 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 May 21, 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 May 21, 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 3.44 ft. - 6.93 ft.

Based on the May 21, 2015 groundwater elevation measurements, the inferred direction of groundwater flow is to the northeast. 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 1

| ANALYSIS OF DIE | | | | | | | | VICS & |
|------------------|--------------|-------------|-----------|-----------|----------|------------|----------|----------|
| BTEX IN WATER E | BY METHOD | NWTPH D | x/Dx EXTE | NDED AND | METHOD N | WTPH-Gx/82 | 60 | |
| • | | | | | | GASOLINE | DIESEL | LUBE OIL |
| SAMPLE | SAMPLE | | | ETHYL- | TOTAL | RANGE | RANGE | RANGE |
| NUMBER | DATE | RENZENE | TOLLIENE | BENZENE | | | ORGANICS | |
| NOWIDEN | DAIL | DLINZLINL | TOLULINE | DLINZLINL | ATLLINES | ONGANICS | ONGANICS | ONGANIC |
| | | 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 |
| MW2 | 5/21/15 | ND | ND | ND | ND | ND | ND | ND |
| MW3 | 5/21/15 | ND | ND | ND | ND | ND | ND | ND |
| MW4 | 5/21/15 | ND | ND | ND | ND | ND | ND | · ND |
| REPORTING LIMIT | | 1 | 1 | 1 | 3 | 100 | 250 | 500 |
| METHOD "A" CLEA | | | 1000 | 700 | 1000 | *1000 | 2000 | 2000 |
| * BENZENE NOT P | | | | | | | | |
| TOTAL LEAD IN W | ATER BY M | IETHOD EP | A-6020 | | | | | |
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| SAMPLE | SAMPLE | | | | | | | |
| NUMBER | DATE | LEAD (Pb) | | | | | | |
| | | ug/L | | | | | | |
| MW1 | 5/21/15 | ND | | | | | | |
| MW2 | 5/21/15 | ND | | | | | | |
| MW3 | 5/21/15 | ND | | | | | | |
| MW4 | 5/21/15 | ND | | | | | | |
| MAY 21, 2015 GRC | UNDWATE | R MONITO | RING EVEN | J NT | | | | |
| | | | | | | | | |
| WELL NUMBER | TOC | GW | GW | | | | | |
| | | DEPTH | ELEV. | | | | | |
| MW1 | 132.76 | 6.93 | 125.83 | | | | | 1 |
| MW2 | 129.76 | 4.64 | 125.23 | | | | | |
| MW3 | 129.21 | 3.44 | 125.77 | | | | | , |
| MW4 | 129.63 | 4.86 | 124.77 | | | | | |



<u>LEGEND</u>

Approximate Property Boundary

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

Approximate Calculated Direction of Groundwater Flow (5/21/15) Based on Elevations in MW-1, MW-2, and MW-4

O 50 100

Approximate Scale in Feet

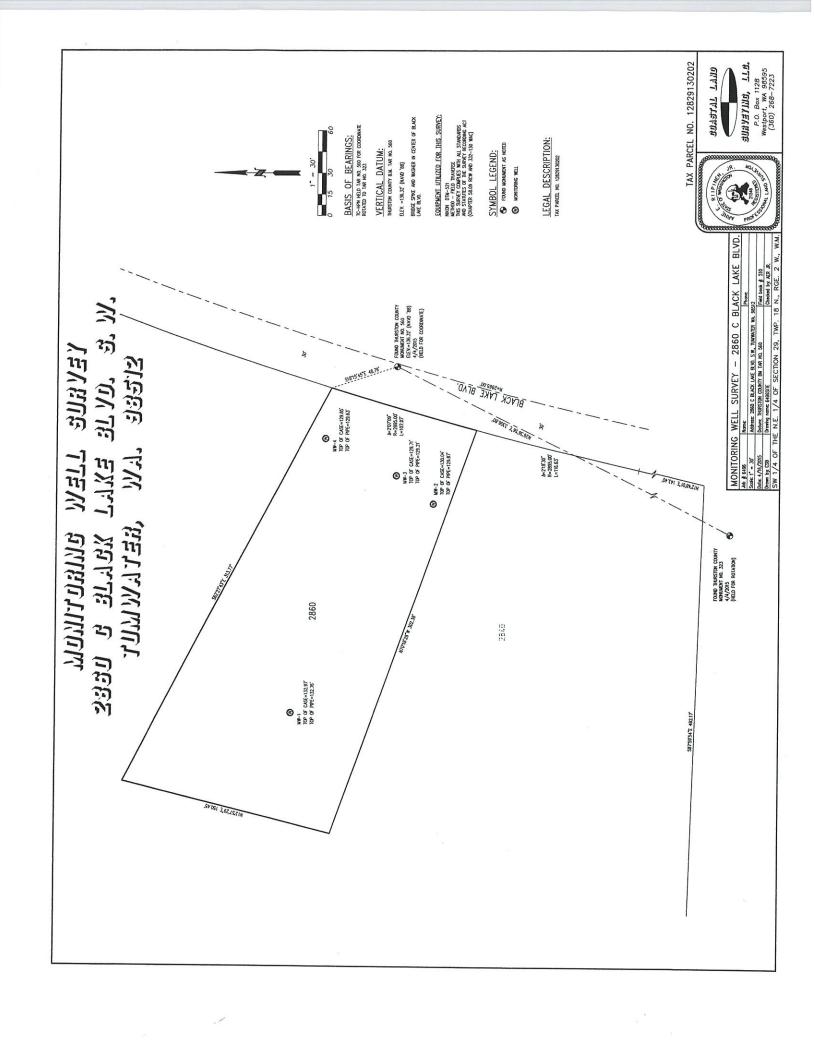
ENVIRONMENTAL INC

Flintstone Fuel 2840-C Black Lake Blvd Tumwater, Washington



OHN R. KAN

Figure 3a
Site Plan with
Groundwater Elevations
(5/21/2015)





Environmental

Services Network

June 5, 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 Olympia, Washington. Water samples were analyzed for Diesel and Oil by NWTPH-Dx/Dx Extended, Gasoline by NWTPH-Gx, BTEX by Method 8260, and Pb by Method 6020 on May 27 - June 2, 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

michael a Korne

President

ESN NORTHWEST CHEMISTRY LABORATORY

Stemen Environmental, Inc PROJECT FLINTSTONE 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 | Date | Date | Surrogate | Diesel Range Organics | Lube Oil Range Organics |
|------------------|-----------|-----------|--------------|-----------------------|-------------------------|
| Number | Prepared | Analyzed | Recovery (%) | (ug/L) | (ug/L) |
| Method Blank | 5/27/2015 | 5/27/2015 | 127 | nd | nd |
| LCS | 5/27/2015 | 5/27/2015 | 124 | 98% | |
| MW1 | 5/27/2015 | 5/27/2015 | 121 | nd | nd |
| MW2 | 5/27/2015 | 5/27/2015 | 132 | nd | nd |
| MW3 | 5/27/2015 | 5/27/2015 | 124 | nd | nd |
| MW4 | 5/27/2015 | 5/27/2015 | 142 | 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 FLINTSTONE 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 | Date | Benzene | Toluene | Ethylbenzene | Xylenes | Gasoline Range Organics | Surrogate |
|------------------|----------|---------|---------|--------------|---------|-------------------------|--------------|
| Number | Analyzed | (ug/L) | (ug/L) | (ug/L) | (ug/L) | (ug/L) | Recovery (%) |
| Method Blank | 6/1/2015 | nd | nd | nd | nd | nd | 102 |
| LCS | 6/1/2015 | 109% | 118% | 126% | 118% | 82% | 77 |
| LCSD | 6/1/2015 | 93% | 102% | 112% | 99% | | 78 |
| MW1 | 6/2/2015 | nd | nd | nd | nd | nd | 101 |
| MW2 | 6/1/2015 | nd | nd | nd | nd | nd | 76 |
| MW3 | 6/1/2015 | nd | nd | nd | nd | nd | 81 |
| MW4 | 6/2/2015 | nd | nd | nd | nd | nd | 92 |
| 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.

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

Total Lead in Water by EPA-6020 Method

| Sample | Date | Lead (Pb) |
|------------------|-----------|-----------|
| Number | Analyzed | (ug/L) |
| Method Blank | 5/28/2015 | nd |
| MW1 | 5/28/2015 | nd |
| MW2 | 5/28/2015 | nd |
| MW3 | 5/28/2015 | nd |
| MW4 | 5/28/2015 | nd |
| Reporting Limits | | 2.0 |

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

QA/QC Data - Total Metals EPA-6020

| | Labo | ratory Control | Sample | Laboratory (| Control Sample | Duplicate | RPD |
|------|---------------------------|-----------------------------|--------------------------|---------------------------|-----------------------------|--------------------------|------|
| | Spiked Conc. (ug/L) | Measured Conc. (ug/L) | Spike Recovery (%) | Spiked Conc. (ug/L) | Measured Conc. (ug/L) | Spike Recovery (%) | (%) |
| Lead | 20.0 | 22.9 | 115 | 20.0 | 23.3 | 117 | 1.73 |

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 80%-120% ACCEPTABLE RPD IS 35%

CHAIN-OF-CUSTODY RECORD

Environmental Services Network ESN NORTHWEST, INC.

| | | | | | 198 | | | | | 4 | | | | | | 4 | | | | | | | | | | | 100 | |
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Olympia, Washington 98501

Fax: 360-459-3432

E-Mail: info@esnnw.com

Please print, sign and return to the Department of Ecology
*ESOLIRCE PROTECTION WELL REPORT
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Please print, sign and return to the Department of Ecology

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| | | | Site Address 2860 B | Black Lake Blvd | |
| n | onsulting Firm | * | City Tumwater | County Thurston | |
| 5 | nique Ecology Well IDTag No. BIM - 143 | 5 | Location <u>SW</u> 1/4-1/4 | NE 1/4 Sec 29 Twn 18 R 02 | |
| | ELL CONSTRUCTION CERTIFICATIO | | EWM 🔲 or WWM | \boxtimes | |
| - | cept responsibility for construction of this well, and is ashington well construction standards. Materials use norted above are true to my best knowledge and belief | d and the information | Lat/Long (s, t, r still REQUIRED) | Lat Deg Min Sec | |
| Ē | Driller Engineer Trainee | | Tax Parcel No. 12829 | Long DegMinSec | |
| Ĕ | me (Print Last First Name) Harnden Don | | | iameter Static Level | |
| 5 | filler/Engineer /Trainee Signature filler or Trainee License No. 2914 | | | | |
| | Ther or Trainee License No. 2914 | | Work/Decommission | 1 Start Date 2/19/15 | |
| u · | trainee, licensed driller's Signature and | License Number: | Work/Decommission | Completed Date 2/19/15 | |
| = | | - Allert - A | | | |
| 5. | Construction Design | Well I | Data | Formation Description | |
| | 🕷 | MONUMENT TYP | Tier and the state of the state | | |
| 3 | | flush mount | 4 | | |
| 3 | | CONCRETE SURF. | ACE SEAL: | | |
| 3 | | 04 | | | |
| 2 | | | | 0-10 Sandandpeat | |
| 3 | | ANNULAR SPACE | : | the same and practice and pract | - |
| 7 | | | | | |
| | | BACKFILL: 1-4 TYPE: bentonit | | | |
| | | TYPE: bentonit | <u> </u> | * j | |
| 2 | | | 1 | 10-25 sand | |
| | | PVCBLANK: | -5 | | |
| ŀ | | TVC BEARK | | + U | |
| i. T | | - | | | |
| | | | * | ∞ | |
| b | | SCREEN: 5-25 | - | | |
| | | SLOT SIZE: .0/0 | | | |
| 1 | | TYPE: 1" prepa | ck | • | |
| e K | # | , , | | DE0- | |
| 3 | | | 10 | RECEIVED |) |
| n S | | CAND BLOW | 2.5 | | |
| | *** | SAND PACK: 4- MATERIAL: 10/20 | | MAR 19 2015 | |
| | | MATERIAL, 1/76 | uica sand | WA State Departme | ent |
| | | | * | of Ecology (SWRO |)) |
| | | DRILLING METHO | D: DPT | | , |
| | | * | | | |
| p . | <u>∰</u> | WELL DEPTH: | 25 | v. | |
| and the second | | BORING DIAMETE | R: | | |
| | hiddistrict. | SCALE: 1"= PA | GE 4 OF 4 | , , , , , , , , , , , , , , , , , , , | |

Please print, sign and return to the Department of Ecology
*ESOURCE PROTECTION WELL REPORT
**CURRENT Nation of Ecology

| UBMIT ONE WELL REPORT PE | | CURRENT Notice of Intent No. <u>RE10973</u> |
|--|--|---|
| onstruction/Decommission ("x" in b | ox) | Type of Well ("x in box) |
| Construction Decommission | | Resource Protection |
| RIGINAL INSTALLATION Notice of I | utent Number | Geotech Soil Boring |
| | ment Number. | Property Owner Michael Wood |
| | | Site Address 2860 Black Lake Blvd |
| nique Ecology Well IDTag No. BIM - | 142 | City Turnwater County Thurston |
| ELL CONSTRUCTION CERTIFICA | | Location SW1/4-1/4 NE1/4 Sec 29 Twn 18 R 02 |
| cept responsibility for construction of this well, | and its compliance with all | EWM 🗌 or WWM 🔯 |
| ashington well construction standards. Material sorted above are true to my best knowledge and | s used and the information | Lat/Long (s, t, r Lat Deg Min Sec |
| | ociici. | still REQUIRED) Long DegMinSec |
| Driller Engineer Trainee me (Print Last, First Name) Hamden, Don | | Tax Parcel No. 12829130202 |
| iller/Engineer /Trainee Signature | | Cased or Uncased Diameter Static Level7 |
| riller or Trainee License No. 2914 | - Approximation - Approximatio | Work/Decommission Start Date 2/19/15 |
| trainee, licensed driller's Signature | and License Number | Work/Decommission Completed Date 2/19/15 |
| The state of the s | Diverso riumber. | Date 2/17/13 |
| | | |
| Construction Design | Well | Data Formation Description |
| | MONUMENT TYPE | |
| | flush moun | £ |
| | CONCRETE SURF | FACE SEAL: |
| | 0-1 | |
| | | 0-10 Sandandpeat |
| | ANNULAR SPACE | E: |
| | D. C.V. DYLY | * * * |
| | BACKFILL: 1-1 TYPE: bentoni | <u></u> |
| | DETTION ! | |
| | | 10-25 sand |
| | PVC BLANK:O | 2-5 |
| | | |
| | , | |
| | SCREEN: 5-25 | • |
| | SLOT SIZE: .0/0 | |
| | TYPE: 1" Prepa | |
| ≋≡ ₩ | | |
| | | |
| | | |
| | SAND PACK: 5 | RECEIVED |
| | MATERIAL: 10/20 | silica sand |
| | | MAR 1 9 2015 |
| | DRILLING METHO | DD: <u>DPT</u> WA State Department of Ecology (SWR) |
| | WELL DEPTH: | |
| | BORING DIAMETE | ER: |
| 100.000.000 | · | AGE 3 OF 4 |