Soil Vapor Extraction Test and Well Installation

TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington 98032

Prepared for:

TOC Holdings Co.
2737 W. Commodore Way
Seattle, WA 98199
April 27, 2017

Prepared by:

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Soil Vapor Extraction Test and Well Installation

Prepared for:
TOC Holdings Co.
2737 West Commodore Way
Seattle, Washington 98199

TOC Holdings Co. Facility No. 01-323
301 Central Avenue North
Kent, Washington 98033

HydroCon Project No: 01-323

Prepared by:

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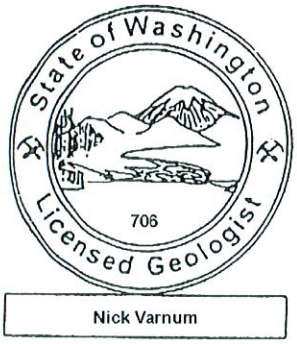

Reviewed by:

Craig Hultgren, LHG
Project Manager

April 27, 2017

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ACRONYMS

AS	air sparge or sparging
BTEX	benzene, toluene, ethylbenzene, and total xylenes
CAP	Cleanup Action Plan
COC	Chemical of Concern
DRPH	diesel-range petroleum hydrocarbons
DTW	Depth-to-water
Ecology	Washington State Department of Ecology
FS	Feasibility Study
GRPH	Gasoline-range petroleum hydrocarbons
HydroCon	HydroCon Environmental LLC
iow	Inches of water
LEL	Lower explosive limit
mg/m^3	Milligrams per cubic meter
MTCA	Model Toxics Control Act
ORPH	oil-range petroleum hydrocarbons
PID	Photoionization detector
PSCAA	Puget Sound Clean Air Agency
PVC	Polyvinyl chloride
RI	Remedial Investigation
scfm	Standard cubic feet per minute
SVE	soil vapor extraction
TOC	TOC Holdings Co.

ACRONYMS (continued)

UST	underground storage tank
VIA	Vapor Intrusion Assessment
VOCs	volatile organic compounds
WAC	Washington Administrative Code

1 PURPOSE AND OBJECTIVES

HydroCon Environmental, LLC (HydroCon) prepared this report for TOC Holdings Co. (TOC) Facility No. 01-323, located at 301 Central Avenue North in Kent, Washington (hereinafter referred to as the Property) on behalf of TOC. The location of the Property is shown in Figure 1. This report was prepared for submittal to the Washington State Department of Ecology (Ecology).

As established in WAC §173-340-200, the "Site" is defined by the full lateral and vertical extent of contamination that has resulted from the former operation of a retail gasoline service station on the Property. Based on the information gathered to date, the Site occupies the southeast portion of the Property and slightly off-Property to the south as described more fully in the Remedial Investigation/Feasibility Study (RI/FS; HydroCon 2016a). Figure 2 illustrates the historical features that resulted in the releases of fuel hydrocarbons to soil and groundwater.

This document is supplemental to the RI/FS and Cleanup Action Plan (CAP) to satisfy the requirements of MTCA at WAC §173-340-380, -400, and -410. This report provides procedures and results of a soil vapor extraction (SVE) pilot conducted at the Site and describes the installation of additional wells at the Site.

2 BACKGROUND

Historical investigations confirmed elevated concentrations of chemicals of concern (COCs) present in soil and groundwater beneath the Property as a result of a release of petroleum hydrocarbons from the former USTs and fuel-dispensing pump islands that formerly occupied the Property (Figure 2).

Subsurface soil beneath the Property, to depth of 15 feet, consists primarily of sand with varying amounts of silt. Silt is present at the bottom of Boring HC07. Gravel and gravel fill are present in some borings to a depth of approximately 3 feet. Groundwater was present in monitoring wells at a depth of approximately 7 to 8 feet bgs and flows towards the west with a very low gradient.

Petroleum-contaminated soil generally extends to the south and east of the existing restaurant building ranging between 5 and 15 feet bgs. The area of petroleum-contaminated groundwater generally coincides with the area of soil contamination.

COCs for the site include diesel-range petroleum hydrocarbons (DRPH); oil-range petroleum hydrocarbons (ORPH); gasoline-range petroleum hydrocarbons GRPH; benzene, toluene, ethylbenzene, and xylenes (BTEX); and naphthalene.

The RI/FS recommended a remedy involving air sparging of contaminated groundwater to remediate volatile contaminants of concern by phase transfer, while remediating other nonvolatile target compounds in soil and groundwater by in-situ aerobic biodegradation. Contaminants transferred to the vapor phase and those present in soil gas that potentially threaten the nearby building indoor air would be recovered by soil vapor extraction.

The details on the historical site investigations and response actions are provided in the RI/FS (HydroCon 2016a).

3 SVE TECHNICAL INFORMATION/FIELD TEST METHODOLOGY

The recommended cleanup action alternative employs air sparging of contaminated groundwater to remediate volatile contaminants of concern by phase transfer, while remediating other nonvolatile target compounds by insitu aerobic biodegradation. Contaminants transferred to the vapor phase from groundwater by air sparging, and those present in soil gas that potentially threaten the nearby building indoor air would be recovered by soil vapor extraction. Recovered soil vapor would be treated prior to atmospheric discharge. Air emissions would be controlled and monitored on a monthly basis in accordance with requirements of the Puget Sound Clean Air Agency (PSCAA).

A pilot SVE test was conducted in July 2016 on existing site wells (MW01, MW02, MW03, MW04, and VP-2) to demonstrate that SVE would be effective in capturing contaminants in soil vapors. This section describes the methods used and results of the SVE pilot test.

The pilot test consisted of the following major tasks:

1. Pre-Field Activities
2. SVE Pilot Test
3. Data Analysis and Reporting

3.1 TASK 1—PRE-FIELD ACTIVITIES

Pre-field activities involved the following activities:

- Designing and procuring the correct fittings, instruments, and gauges
- Constructing the testing manifold;
- Coordinating schedule and site activities with the current building property management; and vacuum truck vendor
- Finalizing sampling and analytical methods with the analytical laboratory (Friedman and Bruya, Inc.)

Task 1 was performed during June and July of 2016.

3.2 TASK 2 - SVE PILOT TEST

HydroCon implemented the pilot test field work on July 27, 2016. This section summarizes the field test methods.

3.2.1 Summary of Test Method

A commercial vacuum truck company (MARVAC) was hired to apply vacuum to existing monitoring well MW-2 using their vacuum blower. The vacuum blower model was a Fruitland RCF500 producing a maximum flow rate of 350 cubic feet per minute at a maximum vacuum of 28.5 inches of mercury. An instrument train was installed on the air suction line between an individual test well and vacuum truck to monitor vacuum, air flow rate, and petroleum

hydrocarbon vapor concentrations from the test well. The test commenced with the manual air dilution valve fully open on the instrument train resulting in the minimum vacuum applied to the test well.

Subsequent vacuum step tests involved closing the manual air dilution valve incrementally and allowing the flow to stabilize prior to collecting test well and observation well measurements. While the test was being conducted, HydroCon personnel recorded the vacuum induced at nearby monitoring wells (observation wells) to determine if there was a measurable pressure differential between the test well and the observation well. The table below identifies the test and observation wells implemented during the test. Figure 3 is a site plan showing the locations of the test well and the observation wells.

Table 1 -Test and Observation Wells

Test Well	Observation Wells
MW02	MW01, MW03, MW04, VP-2

3.2.2 Test Procedures

The SVE pilot test involved conducting a stepped vacuum test at the proposed test well to obtain a flow versus vacuum relationship for the test well. Details for the test procedure are outlined below:

Stepped Vacuum Tests. Vacuum was increased incrementally and held at a constant vacuum at each increment, until the maximum vacuum from the blower or flow from the formation was achieved. Real time vapor analyses were completed during each “step” using a MultiRae™ 4-gas meter to measure total organic vapor concentration, percent of the lower explosive limit (LEL); carbon dioxide concentration, and percent oxygen. The vacuum applied at the test well, bleed air flow rate, air flow rate from the test well, and vapor measurements were recorded at each increment of the test Induced vacuum was also measured at the observation wells.

Upon the conclusion of the stepped vacuum test, a vapor sample was collected in a one liter Tedlar® bag for analysis of gasoline-range petroleum hydrocarbons (GRPH) by Method NWTPH-Gx, and benzene, toluene, ethylbenzene, and total xylenes by modified EPA Method 8120B.

3.3 TASK 3 - DATA ANALYSIS AND REPORTING

The data collected during the SVE pilot test are shown in the following tables provided in Appendix A:

- Table A-1. Soil Vapor Extraction Pilot Test; Test Well Measurements
- Table A-2. Soil Vapor Extraction Pilot Test; Step Test Observation Well Measurements

- Table A-3. Soil Vapor Extraction Pilot Test; Depth to Water Measurements

The results for analytes detected in the vapor samples collected at the end of the test are summarized below. The analytical laboratory report is provided in Appendix B. The results are further discussed in Section 4.0.

Table 2 - Summary of SVE Pilot Test; Vapor Analytical Results

Sample ID	Concentration in Vapor in mg/m^3				
	Gasoline	Benzene	Toluene	Ethylbenzene	Total Xylenes
01-323-vapor	16	<0.1	<0.1	<0.1	<0.3

mg/m^3 = milligrams per cubic meter
< = less than

4 DISCUSSION AND ANALYSIS OF THE PILOT TEST RESULTS

This section presents summary analyses of the results from the SVE pilot test. The analyses include a discussion of air flow rate versus applied vacuum, the zone of vacuum influence, and contaminant mass recovery.

4.1 FLOW VERSUS VACUUM

The results of the flow versus vacuum testing are tabulated in Table A-1 and illustrated in the plot in Figure 4. The plots show that the soils exhibited a fairly consistent air flow permeability and flow rate over the fairly wide vacuum range of 1.5 to 30 inches of water (iow). The air flow during the latter stages of the test dropped off drastically as vacuum approached 30 inches of water (iow) indicating that the water level in the well had mounded up to the point where the exposed well screen became flooded thus cutting off or significantly reducing air flow.

4.2 ZONE OF VACUUM INFLUENCE (GRADIENT)

The vacuum responses measured in observation wells during the pilot test are presented in Table A-2. Included with the vacuum data are the approximate horizontal distances of each observation well from the test well.

Theoretically, in soils with an isotropic, homogeneous texture and no significant flow boundaries, a uniform, concentric, and radially-decreasing vacuum gradient is predicted in three dimensions with distance from the pumping well. The actual vacuum distribution from a venting well is a function of many variables that are beyond the scope of this report, but are well documented in other sources (i.e., U.S. EPA 2001).

Not surprisingly, the vacuum measurements did not reveal a concentric radially-decreasing vacuum gradient with distance from the test well, which confirmed the predicted anisotropy and heterogeneous distribution of induced vacuum from a single extraction well. Nevertheless, vacuum was observed in the horizontal plane over a 180-degree arc starting in the west at MW01 and terminating east of the test well in well MW03. The actual vacuum influence from the test well probably exceeded the 180-degree west to east arc, but since there were no observation wells located in this area, the vacuum influence to the south of the test well could not be confirmed. A vacuum influence was observed in all observation wells when the applied vacuum was equal to or greater than 10 inches of water (iow) at the test well (Table A-2). The significance of the detection of a vacuum influence at a point distant from a venting well is that it confirms that a pressure gradient exists between the two points, and; therefore, air flow was occurring toward the test well from the observation location.

A vacuum influence was observed at a distance of 22 feet (Well VP-2, Table A-2) from the pumping well at a vacuum greater than 10 iow. The fact that a vacuum was induced at this distance from a test well that had only a small length of exposed well screen (i.e., less than 3.2 feet) is strong evidence that additional vertical or horizontal SVE vents installed near the

restaurant building foundation and floor slab would be effective in capturing contaminated soil gas and preventing future vapor intrusion into the building as part of full-scale remediation.

Depth-to-Water (DTW) measurements prior to and about an hour after the test are summarized in Table A-3. These measurements were taken primarily to confirm that the test well exhibited a sufficient length of unsaturated well screen to complete the test (which was confirmed by the measurement). The measurements also indicate a slight response (qualitatively) to the surrounding groundwater elevations from the applied vacuum.

4.3 CONTAMINANT RECOVERY

Based on the GRPH concentration measured in the vapor sample collected during this pilot test (16 mg/m^3), and the flow rate measured during the test from a single vertical SVE well [11.2 standard cubic feet per minute (scfm)], the uncontrolled daily mass recovery of gasoline-range hydrocarbons would be 0.02 pounds per day or 5.8 pounds per year. If this concentration was extrapolated to an estimated full-scale SVE flow rate of 100 scfm, the uncontrolled mass recovery would be approximately 52 pounds per year.

These analytical results were not consistent with the soil gas samples collected on the property near the building foundation in the earlier Tier I Vapor Intrusion Assessment (VIA) (HydroCon 2016a) which revealed an average air-phase petroleum hydrocarbon concentration of 66,000 mg/m^3. Using the Tier I VIA average concentration, the mass recovery from a full-scale SVE system running at 100 scfm would be approximately 600 pounds per day. A summary of the Tier I VIA analytical results and the worst-case emissions estimate is provided in Table 3. At that emission rate, vapor treatment would be required to comply with local air quality regulations promulgated by the PSCAA.

4.4 CONCLUSIONS

HydroCon performed an SVE pilot test at the TOC Holdings Co. facility 01-323 because it was considered a potentially effective technology for the remediation of the remaining COCs. The objective of the pilot test was to confirm the presumed effectiveness of SVE, and to generate pre-design data sufficient to enable a full-scale SVE system design. The results of the pilot test confirmed the effectiveness of SVE as a potentially effective technology as demonstrated by an observable and quantifiable mass recovery; an adequate vacuum zone of influence from a single pumping well, and adequate data with which to design full-scale SVE system.

Table 3
Air Contaminant Emission Worst Case Estimate
Air Sparge and Soil Vapor Extraction Remediation
TOC Holdings Co. Facility No. 01-323
301 North Central Avenue; Kent, Washington

Analyte	Sample Date / Method	Soil Gas Analytical Results (µg/m³) Sample IDs 12/28/2015 SG-01	12/28/2015 SG-01 1/200	12/28/2015 SG-02 1/1000	12/28/2015 SG-03	Average of detectable SG01, SG02 and SG03
benzene	EPA TO-15	**1,200**	**6,600**	**6,600**	3.4	4,401
dichloroethane;1,2- (EDC)	EPA TO-15	**63**	<320	<1,600	<1.6	63
ethylbenzene	EPA TO-15	260	860	**36,000**	6.2	12,289
ethylene dibromide (EDB)	EPA TO-15	<0.77 j	<154 j	<770 j	<0.77 j	
hexane; n-	EPA TO-15	9,900	**110,000**	**820,000**	170	310,057
methyl tert-butyl ether	EPA TO-15	<1.4	<290	<1,400	<1.4	
naphthalene	EPA TO-15	<2.1	<420	<2,100	**2.6**	3
toluene	EPA TO-15	1,900 ve	9,200	2,900	8.5	4,036
trimethylbenzene; 1,2,4-	EPA TO-15	85	<400	<3,900	<3.9	
xylene; m-[2]	EPA TO-15	**1,600**	**4,800**	**7,600**	27	4,142
xylene; o-	EPA TO-15	630 ve	**1,700**	(1,700/2)	10	855
VPH [EC5-6 aliphatics + EC6-8 aliphatics] fraction						
VPH [EC8-10 aliphatics + EC 10-12 aliphatics] fraction						
VPH [EC8-10 aromatics + EC10-12 aromatics] fraction minus [naphthalene]						
APH [EC5-8 aliphatics] fraction	APH		**2,300,000**	**140,000,000**	1,200	47,433,733
APH [EC9-12 aliphatics] fraction	APH		**200,000**	**54,000,000**	3,800	18,067,933
APH [EC9-10 aromatics] fraction	APH		830	**410,000**	39	136,956

Bold red = result exceeds the Ecology subslab soil gas screening level concentration

		Units
Average Concentration of detected (sum)	65,974,469	µg/m³
Average Concentration of detected (sum)	65,974	mg/m³
Average Gas Flow Rate	100	ft³/min

AIR CONTAMINANT WORST CASE ESTIMATE					
Pollutant	Uncontrolled lb/day[1]	Uncontrolled lb/year[2]	Uncontrolled lb/lifetime[3]	Control Efficiency[4]	Controlled lbs/lifetime
Total petroleum hydrocarbons (includes benzene)	593	216,485	432,971	>95%	<21,645
Benzene	0.04	14.44	28.88	>95%	<1.44

[1]Daily mass removal rate (lb/day) = average concentration (mg/m³) x average flow rate (cfm) x conversion (8.99x10-5 lb-m³-min/mg-ft³-day).
[2]Assumes constant operation for 365 days per year
[3]Assumes a two-year life cycle
[4]Assumes catalytic oxidation, which provides a greater than 95% control efficiency for the pollutants

µg/m³ = micrograms per cubic meter
mg/m³ = milligrams per cubic meter
ft³/min = cubic feet per minute

4.5 RECOMMENDATIONS

Some key design considerations and recommendations from the test are:

- There was adequate air flow at a relatively low vacuum, as well as an adequate vacuum gradient with distance from a pumping well to ensure capture of contaminated soil gas and prevent vapor intrusion into the restaurant building. Due to the shallow depth to groundwater that has been historically measured, SVE should be implemented in shallow, horizontal pipe trenches situated over a network of air sparging wells installed in the groundwater plume area. The trenches should be constructed with machine-slotted SVE collection pipes backfilled with gravel, and with pipes installed no deeper than 3 feet below ground surface.
- At least two SVE pipe trenches are recommended in separate east-west transects covering the width of the groundwater plume. Because of the uncertainty with respect to actual contaminant concentrations recovered in soil vapor from SVE (plus contaminants in vapors produced from sparging contaminated groundwater); designers should prepare to treat the recovered soil vapor as needed to comply with PSCAA limits for gasoline-range and BTEX compounds.

A full-scale AS/SVE system would recover a substantial mass of residual hydrocarbons from the areas that still exhibit residual contaminants in soil and groundwater detected near in the former UST excavations.

5 WELL INSTALLATION

In July and August 2016, HydroCon installed twelve air sparge wells and one additional monitoring well.

5.1 AS WELL INSTALLATION

The borings were installed by Cascade Drilling of Seattle, Washington using a limited access hollow-stem auger drilling rig on August 16, 17, and 18, 2016. The borings were all drilled to a total depth of 20 feet bgs and completed as a 2-inch diameter air sparging wells with identical construction details. The wells were constructed using 2-inch diameter Schedule 40 polyvinyl chloride (PVC) well materials. The bottom well caps were threaded to a 1-foot length of 2-inch diameter Schedule 40 PVC machine-slotted screen with a slot size of 0.020 inch. The screened sections were threaded to a 2-inch diameter Schedule 40 PVC blank riser casing from a depth of 18.80 feet to the ground surface. The filter pack consists of clean 10-20 graded silica sand and was placed from the bottom of the borehole (20 feet bgs) to 1.2 feet above the well screen (17 feet bgs). Bentonite was placed in the annulus from a depth of 17 feet bgs to a depth of 16 feet bgs. A bentonite/Portland cement grout was placed between 16 and 3 feet bgs. Concrete was installed in the annulus from 2 feet bgs to ground surface, where a flush-mounted well monument was completed. A J-plug was installed in the well casing to prevent the introduction of any surface water or other contaminants into the well. All drilling and sampling tools were decontaminated between boring locations using a hot water pressure washer. All investigation-derived waste generated during purging and decontamination was placed in a labeled 55-gallon drum and stored on Site pending disposal to a licensed disposal facility.

Well logs are provided in Appendix C. Photographs taken during the well installation are included in Appendix D.

5.2 MONITORING WELL INSTALLATION

At the request of Ecology, one monitoring well, MW07 was installed by ESN Northwest of Olympia Washington using direct push drilling methods on July 28, 2016. The well is located within the backfill material of UST excavation located north of the site building.

The borehole was drilled to a depth of 15 feet bgs and completed as a 2-inch diameter monitoring well. The well was constructed using 2-inch diameter Schedule 40 polyvinyl chloride (PVC) well materials. The bottom well caps were threaded to a 10-foot length of 2-inch diameter Schedule 40 PVC machine-slotted screen with a slot size of 0.020 inch. The screened sections were threaded to a 2-inch diameter Schedule 40 PVC blank riser casing from a depth of 3.90 feet to the ground surface. The filter pack consists of clean 10-20 graded silica sand and was placed from the bottom of the borehole (20 feet bgs) to 0.9 feet above the well screen (3.0 feet bgs). Bentonite grout was placed in the annulus from a depth of feet bgs to a depth of 2 feet bgs. Concrete was installed in the annulus from 2 feet bgs to ground surface, where a flush-

mounted well monument was completed. A J-plug was installed in the well casing to prevent the introduction of any surface water or other contaminants into the well.

The boring was advanced in five-foot intervals to a completion depth up to 15 feet bgs. Continuous soil samples were collected using a five-foot long “macro” core tube sampler equipped with new, clear polyethylene liners in each boring sampled for soil.

Each sample core was inspected for lithologic composition, presence of water, and field screened for the presence of petroleum hydrocarbons (i.e., odor and organic vapors). The total organic vapor concentration of each sample was measured using a PID. A portion of each soil sample was placed in a sealable plastic baggie. The tip of the PID was inserted into the plastic bag in the airspace above the soil sample and the PID measurement was recorded. The PID was calibrated before use at the Site to a test gas standard consisting of 100 parts per million (ppm) isobutylene. Because several factors can affect PID readings (e.g. moisture, temperature, and background conditions), HydroCon determined that a value of 2 ppm or greater may indicate the presence of organic vapors originating from contaminants at the Site.

The selected soil samples were removed from the polyethylene tubing using a new pair of disposable gloves and placed directly into labeled laboratory-prepared jars and sealed with Teflon-lined lids. A portion of each sample was placed in a sealable plastic baggie for field screening purposes described in further detail below. Soil samples were placed into laboratory-supplied containers (utilizing EPA Method 5035A field preservation) and immediately placed in an ice-filled cooler along with chain-of-custody documentation for shipment to Friedman & Bruya Laboratory in Seattle, Washington. A total of 28 soil samples were collected for laboratory analysis.

Soil samples obtained from the soil boring was submitted for laboratory analysis of one or more of the following:

- GRPH by Northwest Total Petroleum Hydrocarbon (NWTPH) Method NWTPH-Gx
- DRPH and ORPH by Method NWTPH-Dx
- BTEX by EPA Methods 8021B and 8260C

Analytical results for samples collected at depths of 4, 7, and 15 feet bgs are summarized below.

Table 4 - Summary of Soil Analytical Results

			Concentration micrograms per liter				
Sample ID	**Gasoline**	**Diesel**	**Oil**	**Benzene**	**Toluene**	**Ethylbenzene**	**Total Xylenes**
MW07-04	<2	<50	<250	<0.03	<0.05	<0.05	<0.15
MW07-07	<2	97	<250	<0.03	<0.05	<0.05	<0.15
MW07-15	<2	<50	<250	<0.03	<0.05	<0.05	<0.15

<=less than

None of the analytes were detected above method detection limits except diesel at a depth of 7 feet, which was detected at a concentration below the MTCA Method A cleanup level. The laboratory report is included in Appendix B.

6 LIMITATIONS

HydroCon's services were performed in a manner consistent with generally accepted practices of the profession undertaken in similar studies in the same geographical area during the same time period. HydroCon makes no warranties, either expressed or implied, regarding the findings, conclusions or recommendations. Please note that HydroCon does not warrant the work of laboratories, regulatory agencies, or other third parties supplying information used in the preparation of the report.

Findings and conclusions resulting from these services are based upon information derived from the on-Site activities and other services performed under this scope of work; such information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, non-detectable or not present during these services, and we cannot represent that the Site contains no hazardous substances, toxic materials, petroleum products, or other latent conditions beyond those identified during this monitoring. Subsurface conditions may vary from those encountered at specific sampling locations or during other surveys, tests, assessments, investigations, or exploratory services; the data, interpretations and findings are based solely upon data obtained at the time and within the scope of these services.

This report is intended for the use of TOC Holdings Co. This report may not be used or relied upon by any other party without the written consent of HydroCon. The scope of services performed in execution of this evaluation may not be appropriate to satisfy the needs of other users, and use or re-use of this document or the findings, conclusions, or recommendations is at the risk of said user.

The conclusions presented in this report are, in part, based upon subsurface sampling performed at selected locations and depths. There may be conditions between borings or samples that differ significantly from those presented in this report and which cannot be predicted by this study.

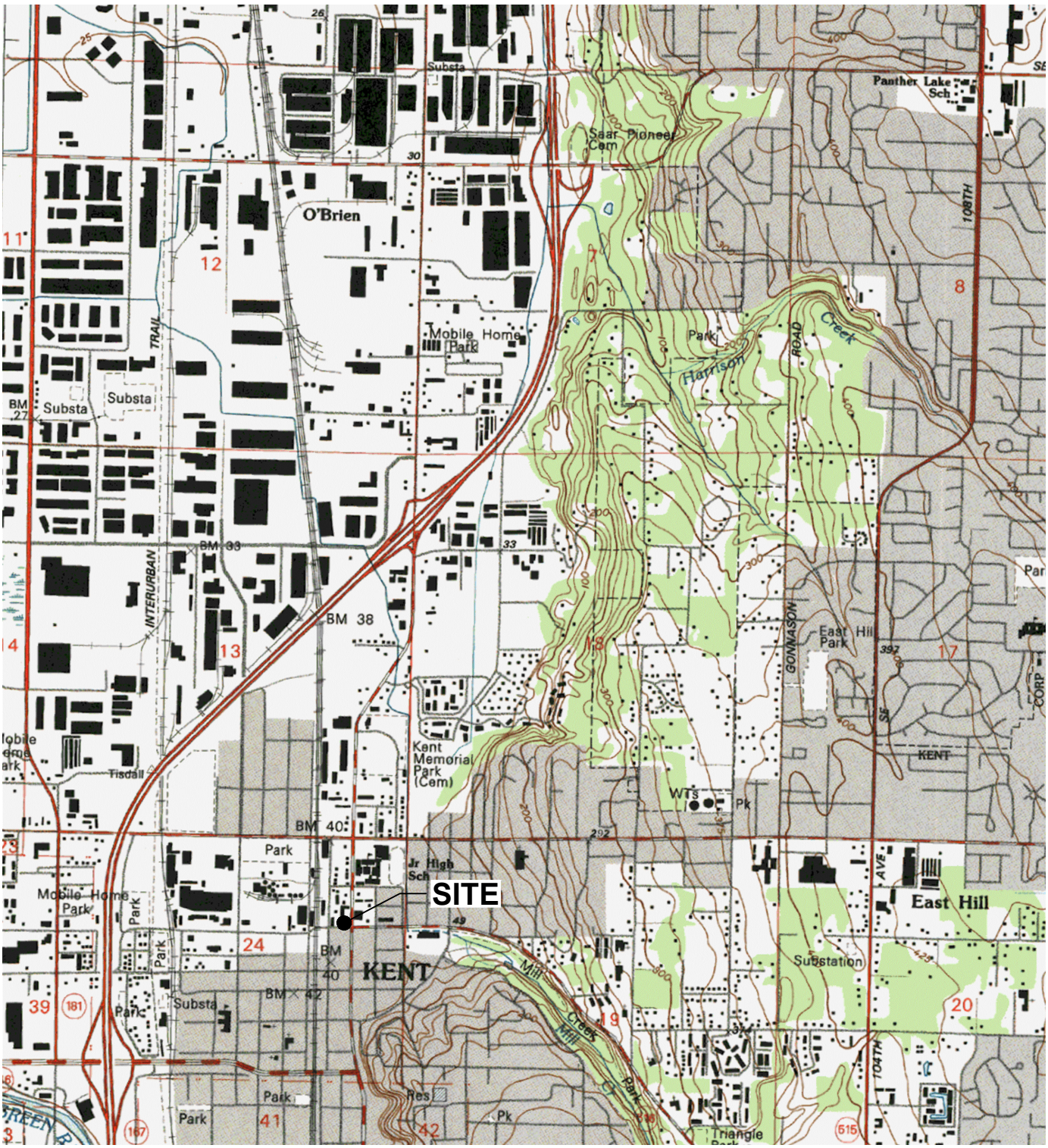
7 REFERENCES

HydroCon 2016a. Remedial Investigation/Feasibility Study. TOC Holdings Co. Facility No. 01-323; 301 Central Avenue North, Kent, Washington. Prepared for TOC Holdings. Co. March 23.

_____2016b. Cleanup Action Plan TOC Holding Co. Facility No. 01-323; 301 Central Avenue North, Kent, Washington. Prepared for TOC Holdings Co. April 29.

US Environmental Protection Agency 2001. Development of Recommendations and Methods to Support Assessment of Soil Venting Performance and Closure. USEPA Office of Research and Development. EPA/600/R-01/070. September.

FIGURES



NOTE(S):

USGS, RENTON QUADRANGLE
WASHINGTON-KING CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

0 2000 4000

SCALE IN FEET
1" = 2000'

N
W E
S

HydroCon

DATE: 2-11-16
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: RH
PROJECT NO: 01-323

FIGURE 1
SITE LOCATION MAP

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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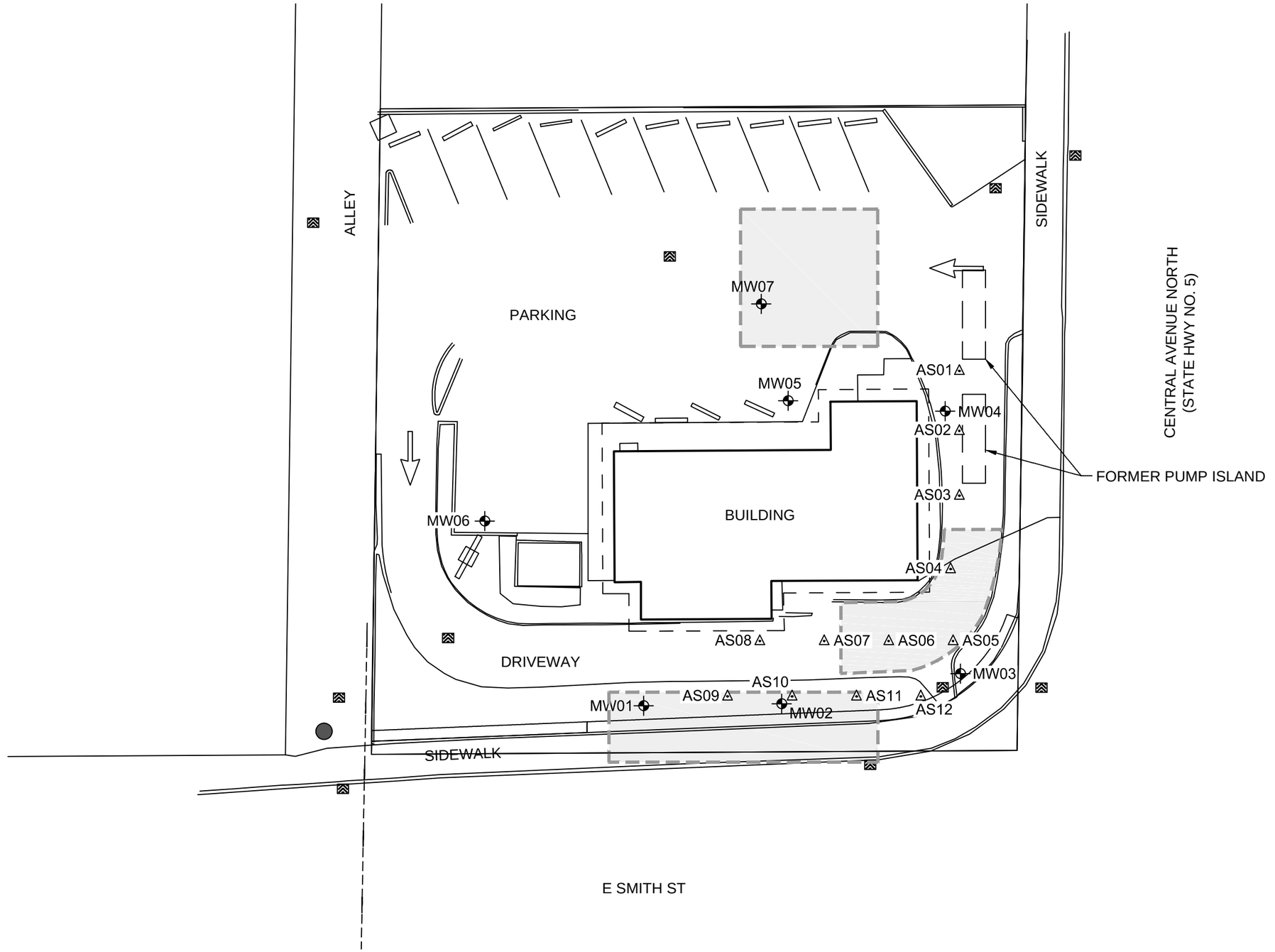
LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- EXCAVATION LOCATIONS
- AS01 — AIR SPARGE WELL



N W E S

0 20 40

SCALE IN FEET
1" = 20'

Hydro Con
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 3-7-17
DWN: JJT
CHK: NV
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 2
WELL LOCATION MAP

TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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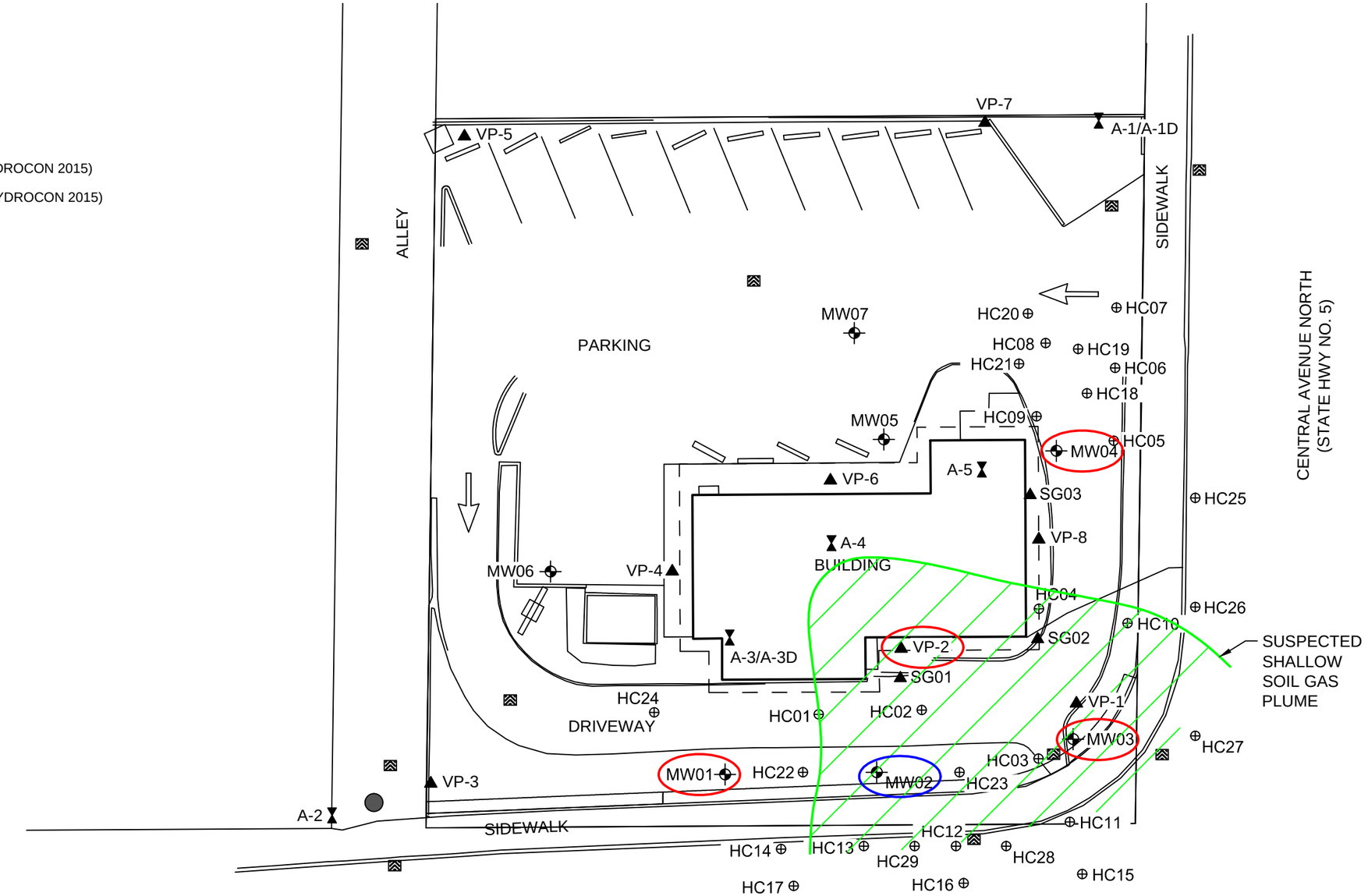
LEGEND

- BUILDING
- MW01 — MONITORING WELL
- CATCH BASIN
- HC01 — BORING LOCATIONS (HYDROCON 2015)
- SG01 — SOIL GAS LOCATIONS (HYDROCON 2015)
- A-4 — INDOOR AIR SAMPLES
- SVE TEST WELL
- OBSERVATION POINTS



N W E S

0 20 40

SCALE IN FEET
1" = 20'

HydroCon
510 Allen St. Suite B Kelso, Wa 98626, Ph(360)-703-6086

DATE: 4-20-17
DWN: JJT
CHK: MS
APPROVED: CH
PRJ. MGR: CH
PROJECT NO: 01-323

FIGURE 3
SVE PILOT TEST
LOCATIONS OF TEST AND OBSERVATION WELLS
TOC HOLDING CO. FACILITY NO. 01-323
301 N CENTRAL AVE
KENT, WA.

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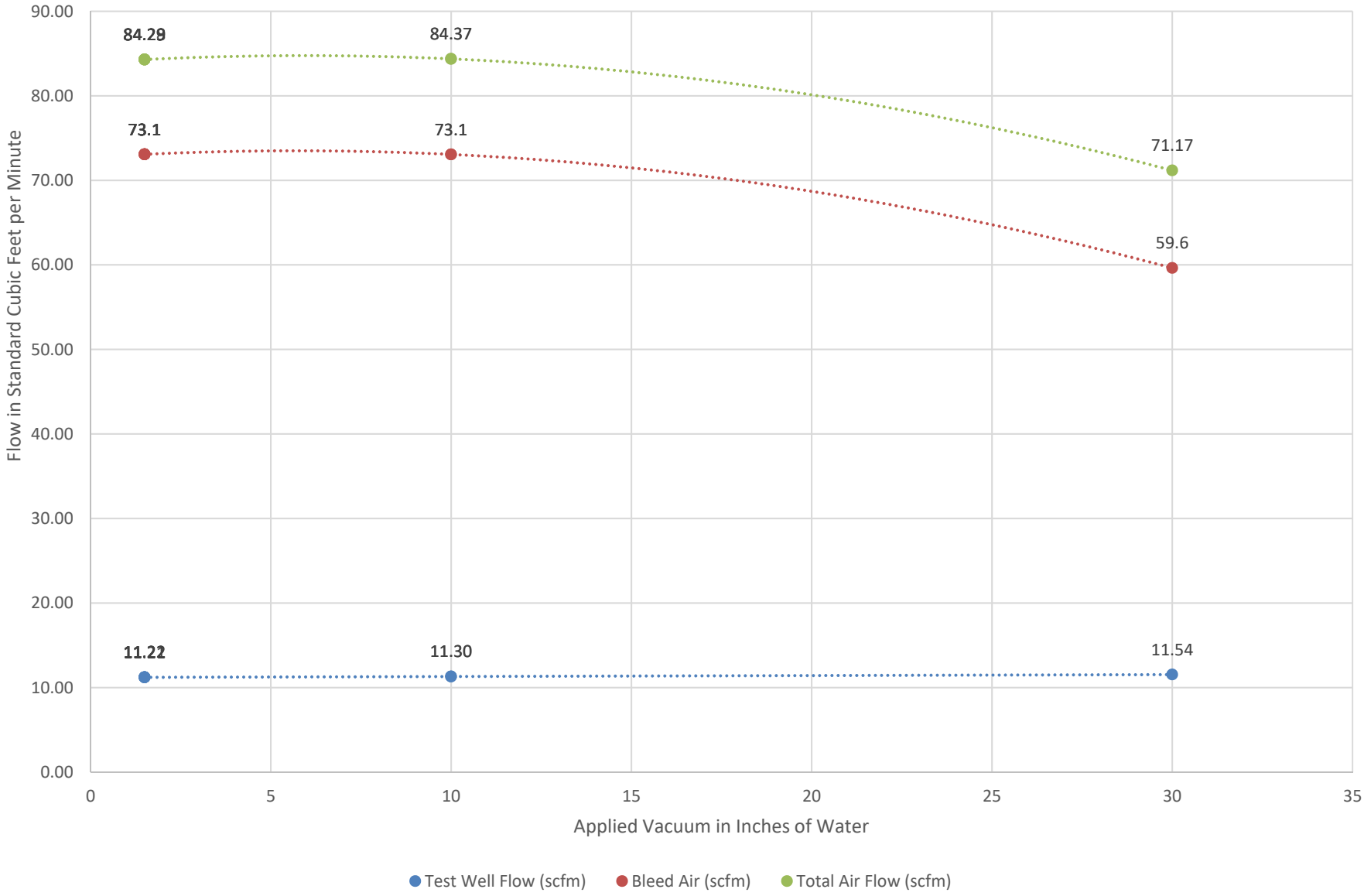
Figure 4:
Air Flow vs Vacuum
for SVE Test Well MW02



APPENDIX A

SVE Pilot Test Field Sheets

TABLE A-1
SOIL VAPOR EXTRACTION PILOT TEST
TEST WELL MEASUREMENTS DATA SHEET

TOC Holdings Co. Facility No. 01-323
301 N. Central Avenue
Kent, WA

Test Well: MW02

			Vacuum	Test Well Parameters									Bleed Air Leg Parameters					
									Real Time Vapor Measurements									
Date	Time	Wellhead Vacuum (iow)	Vacuum Truck Gauge	Static Pressure (iow)	Differential Pressure* (iow)	Temp (°F)	Nominal Pipe Dia Inches	Flow Rate (Calculated from DS-300) (scfm)	VOCs (RRUs)	%LEL	$\%O_2$	CO_2 (ppmv)	Manual Dilution Valve (% open)	Static Pressure (iow)	Differential Pressure (iow)	Temp (°F)	Nominal Pipe Dia. Inches	Flow Rate (Calculated from DS-300) (scfm)
07/27/16	0755	1.5	5 in. Hg	5	0.8	58.3	1	11.2	0.2	0.0	20.9	1000	100	2.0	1.5	58.3	2	73.1
	0800	1.5	5	5.5	0.8	58.3	1	11.2	0.3	0.0	20.5	930	100	2.0	1.5	58.3	2	73.1
	0805	1.5	5	5.5	0.8	58.3	1	11.2	0.3	0.0	20.5	930	100	2.0	1.5	58.3	2	73.1
	0810	1.5	5	5.5	0.8	58.3	1	11.2	0.3	0.0	20.5	930	100	2.0	1.5	58.3	2	73.1
	0815	1.5	5	5.5	0.8	58.3	1	11.2	0.3	0.0	20.5	930	100	2.0	1.5	58.3	2	73.1
	0825	10	5	12	0.8	58.3	1	11.3	0.4	0.0	20.3	1520	50	1.9	1.5	58.3	2	73.1
	0830	10	5	12	0.8	58.3	1	11.3	0.4	0.0	20.3	930	50	1.9	1.5	58.3	2	73.1
	0835	30	5	30	0.8	58.3	1	11.5	0.4	0.0	20.5	750	80	1.5	1.0	58.3	2	59.6

COMMENTS: Was able to run the test at max of 30 inches of water vacuum on the wellhead, which resulted in a rise of 1 foot in the static water level. Tried to increase the vacuum but choked off screen above 30 iow

Vacuum Pump Mfg/Model No: Fruitland RCF500

CO2 = carbon dioxide
DS-300 = Dwyer Flow Sensor
°F = degrees Fahrenheit
iow = inches of water
%LEL = percent of lower explo:
%O2 = percent oxygen
ppmv = parts per million by volume
psi = pounds per square inch
RRU = relative response units
scfm = standard cubic feet per minute
VOCs = volatile organic compounds

HydroCon

TABLE A-2
SOIL VAPOR EXTRACTION PILOT TEST
STEP TEST OBSERVATION WELL MEASUREMENTS

TOC HOLDINGS CO. Facility No. 01-323
301 N. Central Avenue
Kent, WA

Test Well:		**MW02**					
			Observation Well	**MW03**	**MW01**	**MW04**	**VP-2**
			Distance from Observation Well to MPE Test Well (feet)	33	26	62	22
Date	Time	Test Wellhead Vacuum (iow)	Manual Dilution Valve (% open)	VACUUM MEASUREMENTS IN INCHES OF WATER			
07/27/16	0810	1.5	100	0.00	0.00	0.04	0.00
07/27/16	0815	1.5	100	0.00	0.00	0.02	0.00
07/27/16	0820	1.5	100	0.00	0.00	0.02	0.00
07/27/16	0825	10	50	0.06	0.01	0.03	0.00
07/27/16	0830	10	50	0.06	0.02	0.02	0.02
07/27/16	0840	30	20	0.04	0.05	0.01	0.05

HydroCon

TABLE A-3
SOIL VAPOR EXTRACTION PILOT TEST
DEPTH-TO-GROUNDWATER
MEASUREMENTS DATA SHEET

TOC Holdings Co. Facility No. 01-323
301 N. Central Avenue
Kent, WA

Site: TOC Holdings Co. Facility No. 01-323
Field Personnel: RAH

Pilot Test—Depth-to-Groundwater Measurements (feet from top of casing)

Date	Time	MW03	MW02	MW01	MW04	MW05	MW06
07/27/16	0730	6.64	7.05	7.58	6.29	6.55	6.94
07/27/16	0955	6.62	6.88	7.58	6.28	6.55	6.95

Comments:

APPENDIX B

Laboratory Analytical Reports

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

August 1, 2016

Craig Hultgren, Project Manager
HydroCon
510 Allen St, Suite B
Kelso, WA 98626

Dear Mr. Hultgren:

Included are the results from the testing of material submitted on July 27, 2016 from the TOC_01-323, WORFDB8 F&BI 607452 project. There are 4 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
c: Rob Honsberger, Allison Greiner
HDC0801R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on July 27, 2016 by Friedman & Bruya, Inc. from the HydroCon TOC_01-323, WORFDB8 F&BI 607452 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	HydroCon
607452 -01	01-323-vapor

All quality control requirements were acceptable.

Date of Report: 08/01/16
Date Received: 07/27/16
Project: TOC_01-323, WORFDB8 F&BI 607452
Date Extracted: 07/28/16
Date Analyzed: 07/28/16

RESULTS FROM THE ANALYSIS OF AIR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES AND TPH AS GASOLINE USING MODIFIED METHODS 8021B AND NWTPH-Gx

Results Reported as mg/m^3

Sample ID Laboratory ID	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Gasoline Range	Surrogate (% Recovery) (Limit 50-150)
01-323-vapor 607452-01	<0.1	<0.1	<0.1	<0.3	16	85
Method Blank 06-1480 MB	<0.1	<0.1	<0.1	<0.3	<10	86

Date of Report: 08/01/16
Date Received: 07/27/16
Project: TOC_01-323, WORFDB8 F&BI 607452

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR BENZENE, TOLUENE, ETHYLBENZENE, XYLENES, AND TPH AS GASOLINE USING MODIFIED EPA METHOD 8021B AND NWTPH-Gx

Laboratory Code: 607452-01 (Duplicate)

Analyte	Reporting Units	Sample Result	Duplicate Result	RPD (Limit 20)
Benzene	mg/m^3	<0.1	<0.1	nm
Toluene	mg/m^3	<0.1	<0.1	nm
Ethylbenzene	mg/m^3	<0.1	<0.1	nm
Xylenes	mg/m^3	<0.3	<0.3	nm
Gasoline	mg/m^3	16	17	6

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/m^3	5.0	94	70-130
Toluene	mg/m^3	5.0	94	70-130
Ethylbenzene	mg/m^3	5.0	101	70-130
Xylenes	mg/m^3	15	100	70-130
Gasoline	mg/m^3	100	122	70-130

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

~~607252~~ (NP) 607452

SAMPLE CHAIN OF CUSTODY ME 07/27/16

Page # 1 of 1

Send Report To Craig Hultgren, Rob Hansberger / Mark Selman

Company Hydrocon Environmental

Address 510 Allen Street, Suite B

City, State, ZIP Kelso, WA 98626

Phone # 360.703.6079 Fax # 360.703.6086

SAMPLERS (signature) L. Namba/R. Hansberger

PROJECT NAME/NO. TOC Kent 01-323

PO#

REMARKS

TURNAROUND TIME
- ☑ Standard (2 Weeks)
- ☐ RUSH
- Rush charges authorized by

SAMPLE DISPOSAL
- ☑ Dispose after 30 days
- ☐ Return samples
- ☐ Will call with instructions

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of containers	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by8260	SVOCs by 8270	HFS						Notes
						ANALYSES REQUESTED											
01-323-vapor	01 AB	07/27/16	0900	Vapor	2		✓	✓									
																	Samples received at 20°C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Larry Namba	Hydrocon Environmental	07/27/16	1058
Received by:	Matt Langston	FBI	7/27/16	1058
Relinquished by:				
Received by:				

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

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

August 10, 2016

Craig Hultgren, Project Manager
HydroCon
510 Allen St, Suite B
Kelso, WA 98626

Dear Mr. Hultgren:

Included are the results from the testing of material submitted on July 28, 2016 from the TOC_01-323, WORFDB8 F&BI 607483 project. There are 11 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
c: Rob Honsberger, Allison Greiner
HDC0810R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on July 28, 2016 by Friedman & Bruya, Inc. from the HydroCon TOC_01-323, WORFDB8 F&BI 607483 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	HydroCon
607483 -01	MW07-04
607483 -02	MW07-07
607483 -03	MW07-15

All quality control requirements were acceptable.

Date of Report: 08/10/16
Date Received: 07/28/16
Project: TOC_01-323, WORFDB8 F&BI 607483
Date Extracted: 07/29/16
Date Analyzed: 07/29/16

RESULTS FROM THE ANALYSIS OF SOIL SAMPLES FOR TOTAL PETROLEUM HYDROCARBONS AS GASOLINE USING METHOD NWTPH-Gx

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

Sample ID Laboratory ID	Gasoline Range	Surrogate (% Recovery) (Limit 58-139)
MW07-04 607483-01	<2	93
MW07-07 607483-02	<2	94
MW07-15 607483-03	<2	94
Method Blank 06-1541 MB	<2	95

Date of Report: 08/10/16
Date Received: 07/28/16
Project: TOC_01-323, WORFDB8 F&BI 607483
Date Extracted: 07/28/16
Date Analyzed: 07/28/16

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 48-168)
MW07-04 607483-01	<50	<250	103
MW07-07 607483-02	97	<250	102
MW07-15 607483-03	<50	<250	98
Method Blank 06-1551 MB	<50	<250	99

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW07-04	Client:	HydroCon
Date Received:	07/28/16	Project:	TOC_01-323, WORFDB8 F&BI 607483
Date Extracted:	07/29/16	Lab ID:	607483-01
Date Analyzed:	08/01/16	Data File:	080115.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	102	89	113
Toluene-d8	104	64	137
4-Bromofluorobenzene	98	81	119

Compounds:	Concentration mg/kg (ppm)
Benzene	<0.03
Toluene	<0.05
Ethylbenzene	<0.05
m,p-Xylene	<0.1
o-Xylene	<0.05

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW07-07	Client:	HydroCon
Date Received:	07/28/16	Project:	TOC_01-323, WORFDB8 F&BI 607483
Date Extracted:	07/29/16	Lab ID:	607483-02
Date Analyzed:	08/01/16	Data File:	080116.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	101	89	113
Toluene-d8	102	64	137
4-Bromofluorobenzene	99	81	119

Compounds:	Concentration mg/kg (ppm)
Benzene	<0.03
Toluene	<0.05
Ethylbenzene	<0.05
m,p-Xylene	<0.1
o-Xylene	<0.05

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	MW07-15	Client:	HydroCon
Date Received:	07/28/16	Project:	TOC_01-323, WORFDB8 F&BI 607483
Date Extracted:	07/29/16	Lab ID:	607483-03
Date Analyzed:	08/01/16	Data File:	080117.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	103	89	113
Toluene-d8	104	64	137
4-Bromofluorobenzene	99	81	119

Compounds:	Concentration mg/kg (ppm)
Benzene	<0.03
Toluene	<0.05
Ethylbenzene	<0.05
m,p-Xylene	<0.1
o-Xylene	<0.05

Analysis For Volatile Compounds By EPA Method 8260C

Client Sample ID:	Method Blank	Client:	HydroCon
Date Received:	Not Applicable	Project:	TOC_01-323, WORFDB8 F&BI 607483
Date Extracted:	07/29/16	Lab ID:	06-1528 mb
Date Analyzed:	07/29/16	Data File:	072907.D
Matrix:	Soil	Instrument:	GCMS9
Units:	mg/kg (ppm) Dry Weight	Operator:	JS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
1,2-Dichloroethane-d4	99	89	113
Toluene-d8	101	64	137
4-Bromofluorobenzene	99	81	119

Compounds:	Concentration mg/kg (ppm)
Benzene	<0.03
Toluene	<0.05
Ethylbenzene	<0.05
m,p-Xylene	<0.1
o-Xylene	<0.05

Date of Report: 08/10/16
Date Received: 07/28/16
Project: TOC_01-323, WORFDB8 F&BI 607483

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR TPH AS GASOLINE USING METHOD NWTPH-Gx

Laboratory Code: 607483-01 (Duplicate)

Analyte	Reporting Units	Sample Result (Wet Wt)	Duplicate Result (Wet Wt)	RPD (Limit 20)
Gasoline	mg/kg (ppm)	<2	<2	nm

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Gasoline	mg/kg (ppm)	20	95	61-153

Date of Report: 08/10/16
Date Received: 07/28/16
Project: TOC_01-323, WORFDB8 F&BI 607483

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

Laboratory Code: 607457-04 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet Wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Diesel Extended	mg/kg (ppm)	5,000	<50	113	121	73-135	7

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Diesel Extended	mg/kg (ppm)	5,000	125	74-139

Date of Report: 08/10/16
Date Received: 07/28/16
Project: TOC_01-323, WORFDB8 F&BI 607483

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR VOLATILES BY EPA METHOD 8260C

Laboratory Code: 607470-01 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Percent Recovery MSD	Acceptance Criteria	RPD (Limit 20)
Benzene	mg/kg (ppm)	2.5	<0.03	70	69	26-114	1
Toluene	mg/kg (ppm)	2.5	<0.05	73	71	34-112	3
Ethylbenzene	mg/kg (ppm)	2.5	<0.05	73	71	34-115	3
m,p-Xylene	mg/kg (ppm)	5	<0.1	74	71	25-125	4
o-Xylene	mg/kg (ppm)	2.5	<0.05	76	73	27-126	4

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Benzene	mg/kg (ppm)	2.5	96	72-106
Toluene	mg/kg (ppm)	2.5	97	74-111
Ethylbenzene	mg/kg (ppm)	2.5	96	75-112
m,p-Xylene	mg/kg (ppm)	5	97	77-115
o-Xylene	mg/kg (ppm)	2.5	97	76-115

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

607483

SAMPLE CHAIN OF CUSTODY

ME 7/28/16

D01/V81

Report To Craig Haltgren

Company HydroCon

Address 510 Alki St Suite B

City, State, ZIP Kelso WA 98626

Phone _____ Email _____

SAMPLERS (*signature*)	
PROJECT NAME: Toc 01-323	PO #
REMARKS	INVOICE TO

Page # 1 of 1

TURNAROUND TIME
- ☑ Standard Turnaround
- ☐ RUSH _____
- Rush charges authorized by: _____

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Archive Samples
- ☐ Other _____

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	BTEX by 8260				Notes
MW07-04	01 A-E	7-28-16	0650	Soil	5		X	X					X				
MW07-07	02	"	0655	"	5		X	X					X				
MW07-15	03	"	0700	"	5		X	X					X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Robert A. Hornsberger	HydroCon	7-28-16	1050
Received by:	Michael Erdahl	F&B	7/28/16	1050
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

Samples received at 4 °C

APPENDIX C

Well Logs

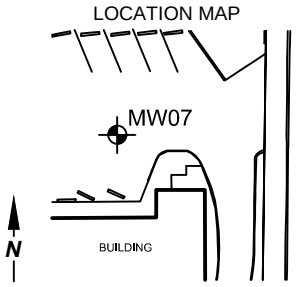
HydroCon

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER MW07

PROJECT NAME: TOC Amboy
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 4-26-17

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface	0							
SAND (SP) Dark brown, 95% medium to fine sand, 5% low plastic fines, no hydrocarbon odor, becomes wet at 7'bgs.				MW07-04	0			
	5			MW07-07	0.5	▽		
	10			MW07-15	0.2			
BOTTOM OF BORING AT 15' B.G.S.	15							
	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 15
Sump: 13.90 to 14.10
Screen: 3.90 to 13.90
Casing: 0 to 3.90
Backfill:
Sand Pack: 3 to 15
Bentonite: 1 to 3
Concrete: 0 to 3
Grout:

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 2 50lb bags 10-20
Bentonite: 1 60lb bags
Concrete: 1 60lb bags
Monument: Flush
Well Cap: J plug
Other:

LEGEND:

- FILTER PACK
- BENTONITE
- CEMENT GROUT
- CUTTINGS/BACKFILL
- WATER LEVEL DURING DRILLING
- WATER LEVEL AFTER DRILLING

DRILLING CONTRACTOR: ESN
DRILLING METHOD: Direct Push
BOREHOLE DIAMETER: 4-Inch
SAMPLING METHOD: Continuous Core
WELL TAG ID: BJR562

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: 143070.24
EASTING: 1294073.96

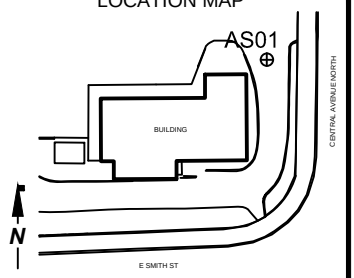
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

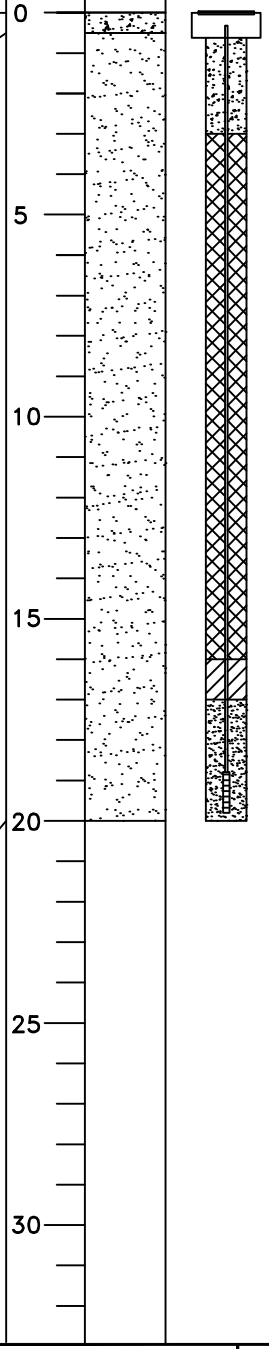
WELL/BORING NUMBER: AS01

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-16-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface **SAND (SP)**, dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs. BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	0 5 10 15 20 25 30				NR	▽		



WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY163

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

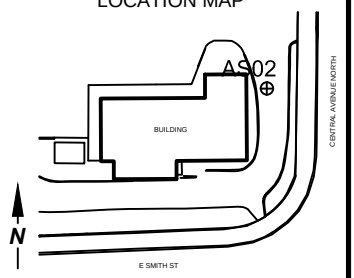
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS02

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-16-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface **SAND (SP)**, dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.	0				NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY164

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

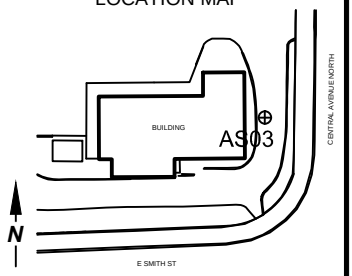
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS03

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-16-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface **SAND (SP)**, dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.	0				NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY165

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

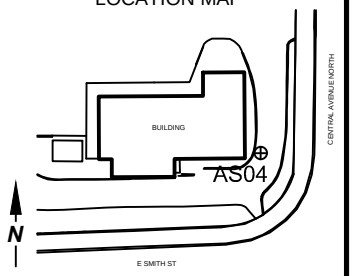
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS04

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-16-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface	0							
SAND (SP), dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.					NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY166

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

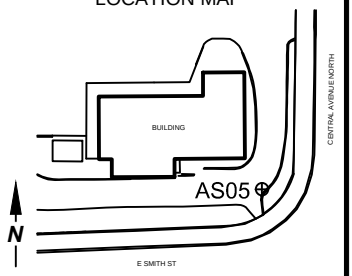
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS05

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-18-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface	0							
SAND (SP), dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.					NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY171

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

Hydro Con

510 Allen Street
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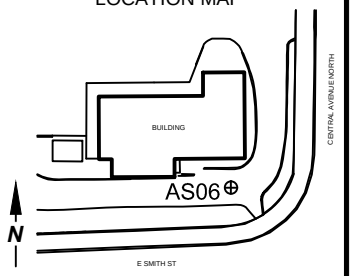
Phone: 360-703-6079

WELL/BORING NUMBER: AS06

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-18-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface	0							
SAND (SP), dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.					NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY172

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

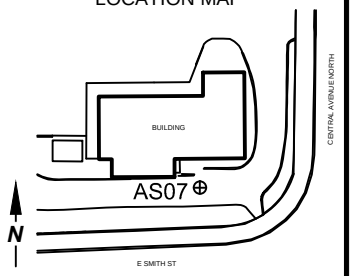
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS07

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-18-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
ASPHALT 3" thick at ground surface	0							
SAND (SP), dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.					NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY173

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

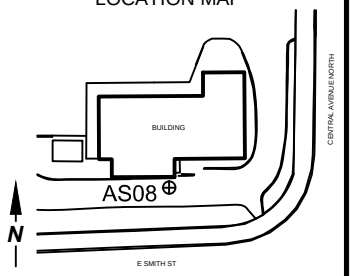
HydroCon

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS08

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-18-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
CONCRETE 10"	0							
SAND (SP), dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.					NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY174

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

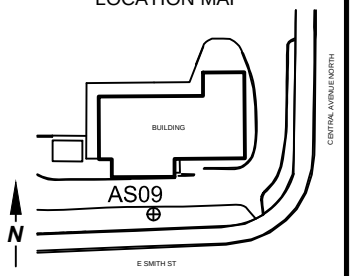
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

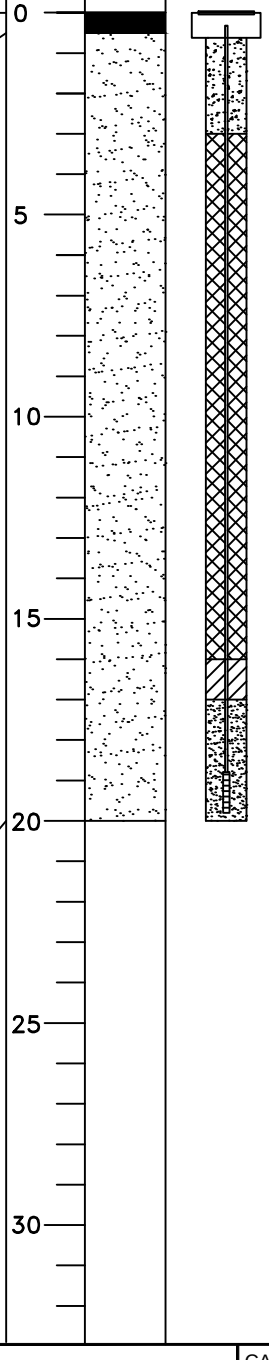
WELL/BORING NUMBER: AS09

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-17-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
Grass and Topsoil **SAND (SP)**, dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs. BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	0 5 10 15 20 25 30				NR			



WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY170

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

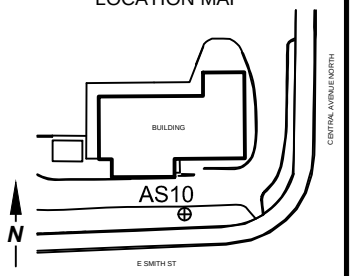
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

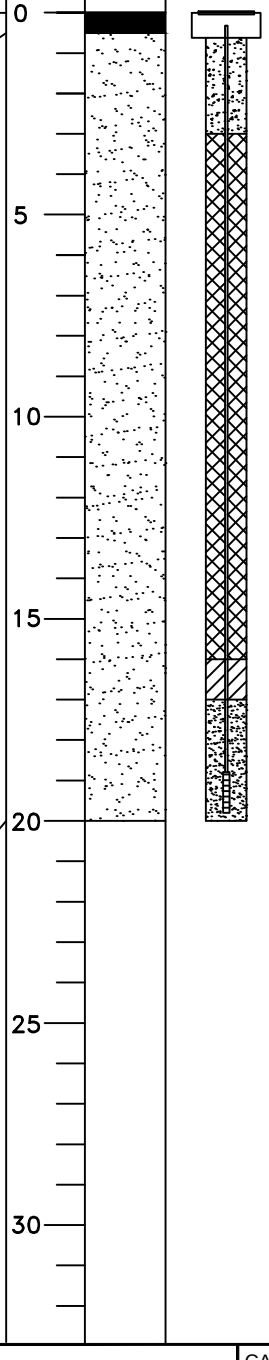
WELL/BORING NUMBER: AS10

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-17-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
Grass and Topsoil **SAND (SP)**, dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs. BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	0 5 10 15 20 25 30				NR			



WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY169

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

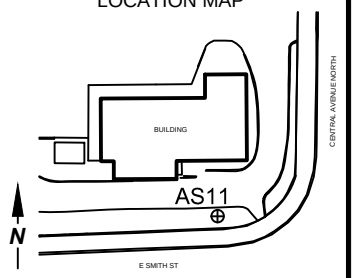
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

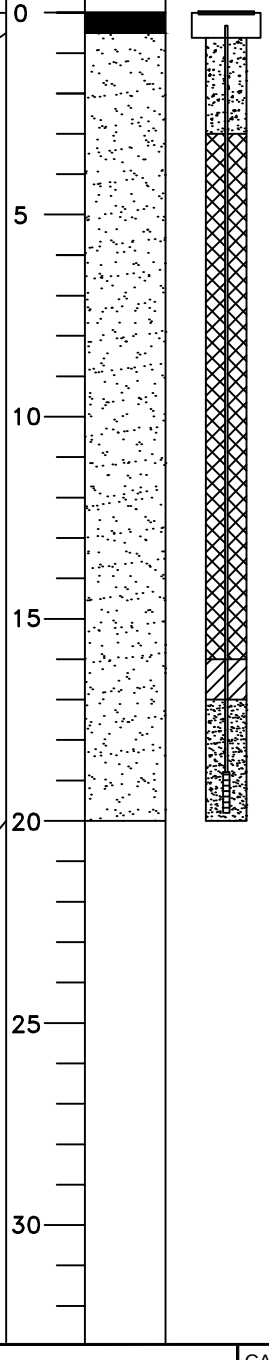
WELL/BORING NUMBER: AS11

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-17-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
Grass and Topsoil **SAND (SP)**, dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs. BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	0 5 10 15 20 25 30				NR	▽		



WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY168

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

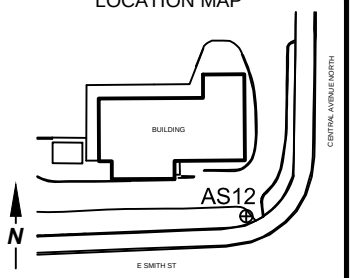
Hydro Con

510 Allen Street
Kelso, WA 98626
Phone: 360-703-6079

WELL/BORING NUMBER: AS12

PROJECT NAME: TOC Kent
PROJECT NUMBER: 01-323
PROJECT LOCATION: Kent, WA
LOGGED BY: R. Honsberger
REVIEWED BY: C. Hultgren
DATE: 8-17-16

LOCATION MAP



DESCRIPTION (USCS Classification, Depth Interval, Color, Grain Size, Plasticity, Shapes, Mineral Composition, Density or Consistency, Moisture, Odor, Geological Interpretation)	DEPTH (FT.)	SYMBOL	WELL DETAILS	SAMPLE ID	PID	FIRST WATER	BLOW COUNTS	BOREHOLE/WELL CONSTRUCTION DETAILS
Grass and Topsoil	0							
SAND (SP), dark brown, 95% medium to fine sand and 5% low plastic fines, no hydrocarbon odor, damp. Becomes wet at 7'bgs.					NR			
	5					▽		
	10							
	15							
BOTTOM OF BORING AT 20' B.G.S. Boring backfilled with hydrated bentonite upon completion.	20							
	25							
	30							

WELL CONSTRUCTION

Depths (feet bgs)

Borehole: 20
Sump: 19.80 to 20
Screen: 18.80 to 19.80
Casing: 0 to 3.90
Backfill:
Sand Pack: 17 to 20
Bentonite: 16 to 17
Concrete: 0 to 3
Grout: 2 to 16

MATERIALS USED

Casing: 2" PVC
Well Screen: 0.010"
End Cap: Sump
Sand Pack: 1.5 50lb bags 10-20
Bentonite: 1.5 60lb bags
Concrete: 2 60lb bags
Monument: Flush
Well Cap: J Plug
Other: 30 Gal Grout

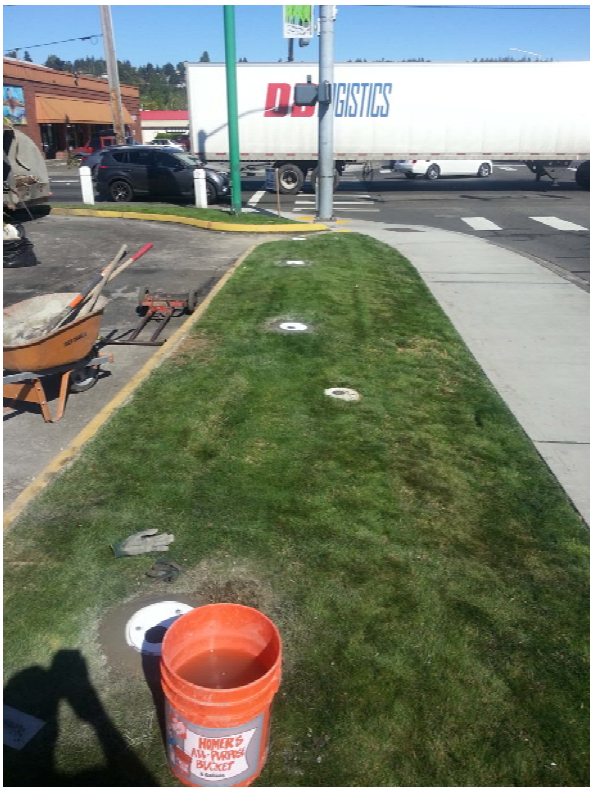
DRILLING CONTRACTOR: Cascade
DRILLING METHOD: Limited Access Hollow Stem Auger
BOREHOLE DIAMETER: 4.25-Inch
SAMPLING METHOD: None
WELL TAG ID: BJY167

CASING ELEVATION: --
GROUND SURFACE ELEVATION: --
NORTHING: --
EASTING: --

APPENDIX D

Photographs of Air Sparge Well Installation


TAQUERIA
EL RINCONSITO


HOMER'S
ALL-PURPOSE
BUCKET