NW 2491

Hilton Seattle Hotel
Third Quarter Groundwater Monitoring Report
Seattle, Washington

May 2014

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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Submitted To:
Mr. Zahoor Ahmed
R.C. Hedreen Company
217 Pine Street, Suite 200
Seattle, Washington 98101

By:
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, Washington 98103

(206) 632-8020
www.shannonwilson.com

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HILTON SEATTLE HOTEL
THIRD QUARTER GROUNDWATER MONITORING REPORT
SEATTLE, WASHINGTON

1.0 INTRODUCTION

This report summarizes the status of groundwater-monitoring activities at the Hilton Seattle Hotel in Seattle, Washington (the Site), facility number 56642815. Cleanup of gasoline-contaminated groundwater is being conducted in response to the rescission of No Further Action (NFA) determination by the Washington State Department of Ecology (Ecology). The cleanup action is being conducted on behalf of the former property owner, R.C. Hedreen Company of Seattle, Washington, as part of a real estate transaction agreement with the purchaser, Stonebridge Companies of Englewood, Colorado. Cleanup activities have been performed in general accordance with our Cleanup Action Plan (CAP), dated July 18, 2012. Cleanup activities have included the installation of a single-phase skimmer pump to recover free-floating petroleum product to the extent practicable from one monitoring well located in the sidewalk right-of-way (ROW) adjacent east of the Site and in situ groundwater treatment using oxygen release compounds. This report summarizes monitoring activities performed for the period December 2013 to February 2014, considered to be the third quarter of monitoring.

2.0 BACKGROUND

The Site is located at 1301 Sixth Avenue in downtown Seattle, Washington (Figure 1). The hotel was built over a parking structure in approximately 1970. Two 2,000-gallon gasoline underground storage tanks (USTs) were installed along the eastern property line during construction of the hotel (Figure 2). Approximately two years after installation, it was reported that one of the two USTs developed a leak and was replaced. The two tanks were abandoned in place in 1985 by filling with cement slurry. Although a service station occupied the main level of the parking structure that occupied the site prior to the hotel's construction, no other fuel tanks are known to be present beneath the property.

In the early 1990s, gasoline vapors were encountered in an excavation to extend the hotel's elevator shaft down to the depth of the pedestrian concourse leading toward Rainier Tower (refer, Figure 2). In 1994, Environmental Associates, Inc., drilled a boring adjacent to the abandoned USTs and confirmed the presence of gasoline-related contamination in soil samples from the boring. In 1997 and 1998, Shannon & Wilson conducted site investigations and data evaluations related to closure of the two former USTs beneath the hotel. At the time, no soil contamination was detected in borings advanced at the hotel, but more than a foot of gasoline-range petroleum product was observed floating in the upgradient monitoring well MW-5.

Gasoline-range hydrocarbons; benzene, toluene, ethylbenzene, and xylenes (BTEX); and lead were detected in groundwater at downgradient monitoring wells MW-2, MW-3, and MW-4 above the Washington Model Toxics Cleanup Act (MTCA) Method A cleanup levels established at the time.

Because groundwater flow was interpreted to be to the west-northwest at a relatively steep gradient, and a relatively impermeable layer of clay and silt was observed in borings advanced at the Site, the floating product encountered upgradient of the abandoned USTs was attributed to an offsite source. In 1998, Shannon & Wilson also assessed risks and found no complete exposure pathways exist at the Site. Based on the available site information, Ecology issued an NFA letter in October 1998.

In a periodic review conducted in February 2010, Ecology rescinded the NFA, citing the presence of floating petroleum product at monitoring well MW-5 as a risk to environmental health. In response to Ecology's concern, an investigation was conducted by Shannon & Wilson in August 2011 to assess current groundwater conditions at the Site. The investigation confirmed the presence of approximately 2.3 feet of relatively unweathered floating petroleum product at monitoring well MW-5 and gasoline-range hydrocarbons, BTEX, and lead in groundwater at downgradient monitoring wells MW-2, MW-3, and MW-4. Vacuum extraction using an eductor truck was attempted as an interim cleanup action on January 24 and February 21, 2012; however, the effort had limited success and resulted in the removal of approximately 3 gallons of free product.

In June 2012, the hotel re-entered Ecology's Voluntary Cleanup Program (VCP), and Shannon & Wilson was retained to implement groundwater cleanup action with the goal of re-obtaining NFA determination from Ecology. The preferred cleanup action included the installation of a single-phase product recovery system at monitoring well MW-5 to remove source product and in situ groundwater treatment at monitoring wells MW-2, MW-3, MW-4, and MW-5 using oxygen release compounds to facilitate the degradation of residual contamination in groundwater under the Site. The overall objective is to remove source contamination and achieve cleanup levels through monitored natural attenuation.

3.0 GEOLOGIC AND HYDROGEOLOGIC SETTING

3.1 Regional and Site Geologic Conditions

The Site is situated on the Seattle Drift Plain, a gently rolling, elevated plain that formed approximately 13,500 years ago during the last period of continental glaciations. Geologic maps for the site vicinity suggest that much of the material underlying the subject site has been

modified extensively by excavation, filling, and/or construction. The Site is situated on a west-facing slope at approximately 175 above mean sea level. An arbitrary site datum was established with the sidewalk elevation at monitoring well MW-5 at 175.6 feet in elevation. This elevation was estimated using King County iMap.

Based on borings advanced by Shannon & Wilson in 1997, the Site is underlain by fill and then layers of silty sand, clayey silt, and silty fine sand. Below the fill, the soil is generally dense and hard, having been glacially overridden. The fill thickness ranges from approximately 3 to 12 feet beneath the basement and sidewalk at the Site. The fill layer is underlain by a silty sand/sandy silt layer that ranges from 1 to 12 feet thick. A hard, silty clay/clayey silt underlies the silty sand layer, ranging from 3 to 15 feet thick. The clayey silt layer was absent in the boring at monitoring well MW-5 but appears to be continuous beneath the basement and UST area. The clayey silt layer is underlain by a medium to very dense, silty, fine sand layer.

3.2 Groundwater Conditions

Groundwater is present beneath the Site in the lower silty sand layer, below the clayey silt layer. Water level measurements collected at the four monitoring wells indicate that groundwater is at an elevation of approximately 140 feet and flows to the west-northwest. The groundwater level at monitoring well MW-5 was adjusted to account for the floating product layer, when necessary. Groundwater is approximately 34 feet below ground surface (bgs) at the sidewalk along Sixth Avenue and ranges from approximately 15 to 22 feet bgs in the basement garage levels. Estimated flow gradients from previous groundwater monitoring events are presented below:

- 0.017 foot/foot in November 2013
- 0.015 foot/foot in August 2013
- 0.018 foot/foot in August 2011
- 0.026 foot/foot in January 1998

4.0 GROUNDWATER REMEDIATION ACTIVITIES

4.1 Conceptual Site Model

Based on measured water levels, monitoring well MW-5 is upgradient of the location of the closed USTs, monitoring well MW-2 is cross-gradient, and monitoring wells MW-3 and MW-4 are downgradient. When present, floating petroleum product had been observed at monitoring well MW-5 but not at monitoring wells MW-2, MW-3, or MW-4. Because floating petroleum product was not observed in what are believed to be hydraulically connected wells, the product observed at monitoring well MW-5 appears to be isolated. While the observed dense clayey silt layer is absent at monitoring well MW-5, an unknown boundary condition exists that prevents the floating product plume from migrating to downgradient locations. The material underlying

the subject site has been extensively modified by excavation, filling, and/or construction and has likely created a local subsurface depression that contains the product plume. This is further supported by the condition of the leaded gasoline petroleum product, which, based on a laboratory chromatogram of a collected sample, was relatively unweathered after being released into the environment more than 40 years ago.

Contaminants of concern (COCs) include gasoline-range hydrocarbons, BTEX, and lead. The contamination plume is approximately 34 feet bgs at monitoring well MW-5, and dissolved groundwater contamination is approximately 15 to 22 feet bgs in the basement garage levels. The depth of the contamination below the built environment prevents exposure to contaminated soil and groundwater by human and environmental receptors. Groundwater under downtown Seattle is not likely to be used for drinking water and is not considered a complete exposure pathway. A vapor survey was conducted during our 1998 site evaluation, and gasoline vapors were not measured in the hotel's parking garage, suggesting that this exposure pathway is also incomplete.

4.2 Status of Product Recovery System

A product recovery system was installed in general accordance with our CAP and features a pneumatic, single-phase skimmer pump installed in monitoring well MW-5, with air supply and product-extraction tubing routed under the sidewalk ROW to an equipment compound inside the hotel's parking garage. The system was started on November 6, 2012, and operated until August 14, 2013, when the results of a second rebound test showed petroleum product was no longer accumulating in monitoring well MW-5. Product was not observed during the third quarter monitoring event, and the system remains shut off. Approximately 125 total gallons of product have been removed by the system, and 128 total gallons have been removed when including interim cleanup actions. Additional system performance details can be found in our *First Quarter Groundwater Monitoring Report* (Shannon & Wilson, 2013).

4.3 Status of In Situ Groundwater Treatment

In situ groundwater treatment using oxygen release compounds (ORC) was initiated on May 28, 2013, at monitoring wells MW-2, MW-3, and MW-4 and on September 12, 2013, at monitoring well MW-5 to enhance biodegradation of contamination. Regenesis ORC Advanced™ well socks, containing a mixture of calcium oxyhydroxide and calcium hydroxide, were installed in the wells to deliver oxygen as electron acceptors for the biodegradation of the petroleum compounds. An oil-absorbent sock was also deployed at monitoring well MW-5 to remove any remaining free product from the groundwater surface as treatment continues.

5.0 GROUNDWATER MONITORING

5.1 Monitoring Program

Quarterly monitoring is being conducted to document groundwater conditions during cleanup actions at the Site. Monitoring events are generally scheduled for the months of February, May, August, and November. While upgradient of the closed USTs, floating product had been confined to the vicinity of monitoring well MW-5, and the well is considered to be within the contamination source. Monitoring wells MW-2, MW-3, and MW-4 are considered to be downgradient of the source, within the contaminated groundwater plume. Third quarter monitoring was performed at monitoring wells MW-2, MW-3, MW-4, and MW-5. Groundwater monitoring parameters include the following:

- COCs
  - Gasoline-Range Hydrocarbons
  - BTEX
  - Total Lead
- Primary Geochemical Indicators
  - Dissolved Oxygen (DO)
  - Oxidation-Reduction Potential (ORP)
  - pH
  - Specific Conductance
  - Temperature
- Secondary Geochemical Indicators
  - Ferrous Iron
  - Nitrate
  - Sulfate

5.2 Groundwater Sampling

On February 21, 2014, groundwater samples were collected from monitoring wells MW-2, MW-3, and MW-4 using a peristaltic pump and low-flow sampling techniques, and from monitoring well MW-5 using a high-density polyethylene bailer. The bailer was used at monitoring well MW-5 due to the limitations of the peristaltic pump as well as to better evaluate the presence of potential floating product or sheen. ORC socks in these wells were removed one month prior to sampling, and the groundwater was allowed to equilibrate. The absorbent sock was also removed from monitoring well MW-5.

Monitoring wells MW-2, MW-3, and MW-4 were purged at a low-flow (less than 500 milliliter per minute) pumping rate prior to sampling. The purge water was monitored using a YSI water quality meter until the measured groundwater quality parameters (pH, conductivity, temperature,

etc.) stabilized to ±5 percent for three consecutive readings taken at three- to five-minute intervals. Monitoring well MW-5 was purged by bailing three well volumes, and water quality parameters were not monitored. The purge water was collected in a bucket and transferred to the storage tank at the equipment compound for future disposal.

Following purging, groundwater samples were collected in clean, laboratory-supplied containers and placed in a cooler with ice for transport to the laboratory. Purging and sampling data are presented in Table 1.

5.3 Laboratory Analyses

Groundwater samples were submitted under chain-of-custody procedures to Fremont Analytical in Seattle, Washington. The collected samples were analyzed for COCs as well as geochemical indicators to evaluate the potential for natural attenuation. Analyses for COCs included gasoline-range hydrocarbons by the Northwest Total Petroleum Hydrocarbons-Gasoline Method (NWTPH-Gx), BTEX by Environmental Protection Agency (EPA) Method 8021B, and total lead by EPA Method 6020/200.8. Analyses for geochemical indicators included ferrous iron by Standard Method 3500B and nitrate and sulfate by EPA Method 300.0.

5.4 Monitoring Results

The third quarter groundwater monitoring results for COCs are shown in Table 2. The data are presented along with previous quarterly results and two historical datasets for comparison. One of the historical datasets is from our initial site assessment in 1997, and the other is from our evaluation of groundwater conditions prior to cleanup activities in 2011. Similarly, third quarter results for geochemical indicators are shown in Table 3, with available historical results shown for comparison. The analytical laboratory report for the third quarter results is provided in Appendix A.

5.4.1 Contaminants of Concern

In the third quarter, the samples collected from monitoring wells MW-2 and MW-5 had detectable concentrations of gasoline, BTEX, and lead. Except for toluene, the detected concentrations at monitoring well MW-5 were above their respective MTCA Method A groundwater cleanup criteria. Only the gasoline concentration at monitoring well MW-2 was above the MTCA Method A groundwater cleanup criterion of 800 micrograms per liter (µg/L) for gasoline. Gasoline was also detected in the sample from monitoring well MW-3, but below the MTCA cleanup criterion. The COCs were not detected in the sample from monitoring well MW-4.

The concentrations of gasoline and BTEX in the groundwater at monitoring well MW-5 continued to decrease from the second quarter to the third quarter. The concentrations of gasoline and ethylbenzene at monitoring well MW-2 continued to decrease in the third quarter; however, the concentrations of benzene, toluene, xylenes, and lead showed slight increases but were generally stable. The gasoline detection at monitoring well MW-3 continued to decrease over the second quarter results, while BTEX and lead remained non-detected. The gasoline, BTEX, and lead concentrations at monitoring well MW-4 also remained non-detected.

The estimated extents of gasoline and benzene in groundwater for the datasets collected since 2011 are shown in Figures 3 and 4, respectively. The leading edge of groundwater contaminated with gasoline extended past monitoring well MW-4 in 2011, but had receded with the first quarter result and continues to recede with the third quarter result (Figure 3). The estimated extent of gasoline at concentrations above its MTCA cleanup criterion (i.e., 800 micrograms per liter [µg/L]) is relatively stable in the central portion of the Site. The leading edge of groundwater contaminated with benzene at concentrations above its MTCA cleanup criterion (i.e., 5 µg/L) has receded significantly from levels observed historically, and remains stable with the third quarter result (Figure 4).

5.4.2 Geochemical Indicators

Geochemical indicators are categorized as primary or secondary. Primary indicators were measured in the field during purging using a YSI water quality meter (except at monitoring well MW-5), and the secondary indicators were analyzed by the laboratory. Low DO concentrations (e.g., 0 to 1.0 milligrams per liter [mg/L]), measurable ferrous iron, and depleted nitrate and sulfate concentrations generally suggest that active biodegradation of hydrocarbons is occurring. ORP values are a measure of the reducing conditions present and can be correlated to the presence or absence of secondary geochemical indicators to support the identification of biodegradation processes.

In the third quarter, DO ranged from 0.21 to 0.39 mg/L in the sampled wells. Measurable ferrous iron was observed in all wells, with the highest concentration (7,100 µg/L) at monitoring well MW-5 and the lowest concentration (100 µg/L) at monitoring well MW-4. Nitrate and sulfate concentrations were non-detect, except for sulfate at monitoring wells MW-4 and MW-5 (18,300 and 16,300 µg/L, respectively). The negative ORP values measured correlate well with the observed detections. Additionally, elevated groundwater temperatures were observed in all wells (Table 1). The elevated temperatures, ranging from 19 to 20.8 degrees Celsius, are likely attributable to the hotel's underground electrical vault in the immediate vicinity of the monitoring wells and may be beneficial to microbial growth.

5.5 Water Level Monitoring

Table 4 presents water level data for the third quarter monitoring event and historical sampling events. Figure 5 shows approximate groundwater elevation contours for the third quarter data. The measurements show the groundwater flow direction to the west-northwest, with a calculated groundwater flow gradient of approximately 0.017 foot/foot. The calculated flow gradient has historically ranged from approximately 0.015 foot/foot to 0.026 foot/foot.

5.6 Investigation-Derived Waste

Investigation-derived waste during the third quarter monitoring event included purge water from groundwater monitoring and disposable sampling equipment (nitrile gloves, bailers, etc.). Approximately 4 gallons of purge water was added to the system storage tank. There is approximately 244 gallons of mixed waste (recovered petroleum and purged groundwater) in the storage tank pending disposal. Shannon & Wilson will coordinate disposal once the storage tank is full. Disposable sampling equipment was placed in a plastic bag and disposed as solid waste.

6.0 DATA ANALYSIS

Groundwater monitoring data was analyzed using Ecology's natural attenuation guidance for petroleum-contaminated groundwater (Ecology, 2005a,b). The technical guidance package provides six computational tools, or modules, for evaluating the feasibility and performance of natural attenuation as a cleanup action for groundwater. Available data were analyzed using modules that do not incorporate groundwater flow models, including *Module 1: Non-Parametric Analysis for Plume Stability Test*, *Module 2: Graphical and Regression Analysis for Plume Stability & Restoration Time Calculation*, and *Module 3: Evaluation of Geochemical Indicators*. The computational module output is provided in Appendix B.

The data analysis results for Modules 1 and 2 are summarized in Table 5. Module 1 evaluates plume stability using the Mann-Kendall non-parametric statistical method, while Module 2 evaluates plume stability using linear regression. Both evaluations provide evidence that gasoline and BTEX concentrations at monitoring well MW-2 are stable and/or shrinking at relatively high levels of confidence. The Mann-Kendall method shows gasoline concentrations as stable and xylenes concentrations as shrinking at monitoring well MW-3. Concentrations of benzene, toluene, and ethylbenzene at monitoring well MW-3 are undetermined by the Mann-Kendall method, but the parameters have been non-detect for the past four sampling events and therefore do not show a strong decreasing trend. However, linear regression for the data at monitoring well MW-3 indicates that gasoline and BTEX concentrations are shrinking at high levels of confidence. Trend analyses are again limited in their application at monitoring well

MW-4 because parameter concentrations are predominantly non-detect. At monitoring well MW-4, the Mann-Kendall method shows gasoline as undetermined and BTEX as stable, while linear regression shows gasoline as undetermined and BTEX as not applicable.

Point decay rates and half-life results at 50- and 85-percent confidence levels were determined using linear regression (Table 5). While the module calculates values for both stable and shrinking plumes as shown, the regression analysis is only appropriate for shrinking plumes. Because of this, the estimated time to meet cleanup criterion for gasoline at monitoring well MW-2 (the only downgradient location with a concentration in exceedance of cleanup criteria in the third quarter) cannot be determined.

Module 3 calculates assimilative capacity and plots geochemical indicators. Assimilative capacity is the potential capacity of groundwater to biodegrade contaminants, and the calculation is based on background concentrations of electron acceptors (i.e., DO, nitrate, sulfate, etc.). Background geochemical values for downtown Seattle groundwater have not been established for this project; therefore, the assimilative capacities calculated by the module are not usable. However, the plots of geochemical indicators provide evidence that biodegradation is occurring. Biodegradation proceeds according to reactions that are energetically preferred by microbes. Electron acceptors evaluated for this project, from most preferred to least preferred, are oxygen, nitrate, ferric iron, and sulfate. DO and nitrate were depleted at all locations measured. Ferrous iron, a metabolic by-product of reactions involving ferric iron, was detected at elevated levels in source monitoring well MW-5 and in downgradient monitoring wells MW-2 and MW-3. Monitoring well MW-4, the furthest downgradient well, had a minor ferrous iron detection. Concentrations of ferrous iron generally decreased with distance from the source well. Sulfate was depleted in monitoring wells MW-2 and MW-3, but was elevated in monitoring wells MW-4 and MW-5. Additionally, ORP and pH field measurements correlate well with the observed detections.

7.0 CONCLUSIONS

Based on our review and analysis of the third quarter monitoring results, we offer the following conclusions regarding remediation at the Site.

- Floating product was not observed at any well location.
- Source monitoring well MW-5 had detected concentrations of all COCs and, except for toluene, the concentrations exceeded their respective MTCA Method A cleanup criteria. The concentration of lead increased over second quarter results, but all other parameters showed a decreasing trend. Concentrations at this location are expected to remain relatively elevated in the near-term due to residual product in the formation surrounding the well.

- Downgradient monitoring well MW-2 had detected concentrations of gasoline, BTEX, and lead, with the gasoline concentration exceeding the MTCA Method A cleanup criterion. Except for lead, all detected concentrations decreased over second quarter results. Lead concentrations at this location have alternated between minor detections and non-detects.
- Gasoline was detected below the cleanup criterion in downgradient monitoring well MW-3 and decreased over second quarter results. No other COCs were detected in downgradient monitoring wells MW-3 or MW-4.
- Contamination is not migrating off-site, and an analysis of the data indicates that the contamination plume is stable and/or shrinking in response to remedial efforts.
- Geochemical indicators suggest that biodegradation is occurring at the Site. Monitored natural attenuation appears to be a viable long-term remediation alternative and should continue to be evaluated as additional monitoring data is collected.

The fourth quarter groundwater monitoring event is scheduled to be conducted May 2014. These activities will be the subject of the next quarterly groundwater monitoring report.

8.0 LIMITATIONS

The findings and conclusions documented in this report have been prepared for specific application to this project and have been developed in a manner consistent with the level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area, and in accordance with the terms and conditions set forth in our agreement. The conclusions presented in this report are professional opinions based on interpretation of information currently available to us and are made within the operational scope, budget, and schedule constraints of this project. No warranty, express or implied, is made.

Shannon & Wilson, Inc., has prepared Appendix C, "Important Information About Your Geotechnical/Environmental Report." While not written specifically for this project, this enclosure should assist you and other in understanding the use and limitations of our reports.

We appreciate the opportunity to be of continued service on this project. If you have any questions, please contact the undersigned at (206) 632-8020.

Sincerely,

SHANNON & WILSON, INC.

Michael S. Reynolds, P.E.
Senior Environmental Engineer

Scott W. Gaulke, P.E., L.H.G
Vice President

MSR:SWG/msr:amn

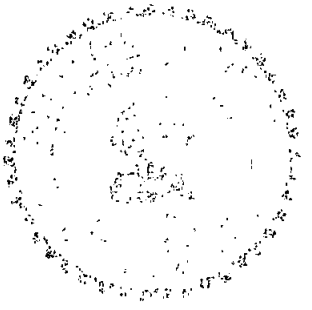

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TABLE 1
GROUNDWATER SAMPLING LOG

	Monitoring Well			
	MW-2	MW-3	MW-4	MW-5
Water Level Measurement Data				
Date Water Level Measured	2/21/2014	2/21/2014	2/21/2014	2/21/2014
Time Water Level Measured	12:50	12:00	11:10	13:50
Measuring Point (MP) Elevation, Feet	162.55	161.24	154.30	175.63
Depth to Water Below MP, Feet	22.67	21.60	16.20	34.10
Water Level Elevation, Feet	139.88	139.64	138.10	141.53
Purging/Sampling Data				
Date Sampled	2/21/2014	2/21/2014	2/21/2014	2/21/2014
Time Sampled	13:15	12:35	11:50	13:55
Depth to Water Below MP, Feet	22.67	21.60	16.20	34.10
Total Depth of Well Below MP, Feet	35.00	30.00	20.50	39.50
Water Column in Well, Feet	12.33	8.40	4.30	5.40
Gallons per Foot	0.16	0.16	0.16	0.16
Gallons in Well	1.97	1.34	0.69	0.86
Total Gallons Pumped/Bailed	0.8	0.8	1.0	2.5
Purging Method	Peristaltic	Peristaltic	Peristaltic	Bailer
Sampling Method	Peristaltic	Peristaltic	Peristaltic	Bailer
Diameter of Well Casing	2-inch	2-inch	2-inch	2-inch
Water Quality Data				
Temperature, °C	19.0	20.0	20.8	--
Dissolved Oxygen, mg/L	0.29	0.31	0.51	--
Specific Conductance, µS/cm	0.759	0.717	0.602	--
pH, standard units	6.88	6.91	7.69	--
Oxidation-Reduction Potential, mV	-136.2	-152.1	-150.2	--
Remarks	No free product observed. Hydrocarbon odor.	No free product observed. Hydrocarbon odor.	No free product observed. Hydrocarbon odor.	No free product observed. Water quality data not collected.

Notes:
Water quality parameters were measured with YSI instruments.
-- = not applicable or not measured
°C = degrees Celsius
mg/L = milligram per liter
µS/cm = microsiemens per centimeter
mV = millivolt

TABLE 2
GROUNDWATER MONITORING RESULTS

Monitoring Well	Sample Date	Product Thickness (feet)	Sampling Results (µg/L)					
			Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	Lead
MW-2	9/25/1997	--	**4,700**	**6,700**	**210**	**670**	**590**	**8.00**
	8/25/2011	--	**2,950**	**76.1**	**2.19**	**863**	**22.0**	< 1.0
	8/22/2013	--	**5,000**	**3.07**	**2.01**	**408**	**10.8**	**8.14**
	11/21/2013	--	**1,760**	**1.40**	**1.57**	**83**	**6.9**	< 1.0
	2/21/2014	--	**1,360**	**2.90**	**1.62**	**21**	**7.4**	**8.10**
MW-3	9/25/1997	--	**700**	**7,200**	**10.0**	**74.0**	**97.0**	**9.00**
	8/25/2011	--	**153**	< 1.0	< 1.0	< 1.0	**1.35**	< 1.0
	8/22/2013	--	**209**	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	11/21/2013	--	**235**	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	2/21/2014	--	**114**	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
MW-4	11/14/1997	--	< 50	< 1.0	< 1.0	< 1.0	< 3.0	< 4.0
	8/26/2011	--	**135**	< 1.0	< 1.0	< 1.0	< 2.0	**5.57**
	8/22/2013	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	11/21/2013	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	2/21/2014	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
MW-5	12/22/1997	1.69	NS	NS	NS	NS	NS	NS
	8/11/2011	2.33	NS	NS	NS	NS	NS	NS
	8/22/2013	--	NS	NS	NS	NS	NS	NS
	11/21/2013	--	**98,100**	**230**	**179**	**1,070**	**6,100**	**26.1**
	2/21/2014	--	**30,300**	**193**	**122**	**796**	**3,670**	**47.2**
MTCA Method A Groundwater Cleanup Levels:			800	5	1,000	700	1,000	15

Notes:
Bold indicates analyte detected above method reporting limit.
Shaded cell indicates detection is above the groundwater cleanup criterion.
-- = no product observed
< = detection below reporting limit shown
µg/L = micrograms per liter
MTCA = Washington State Model Toxics Control Act
NS = not sampled

TABLE 3
GEOCHEMICAL INDICATORS

Monitoring Well	Sample Date	Primary Indicators					Secondary Indicators		
		Dissolved Oxygen (mg/L)	Oxidation-Reduction Potential (mV)	pH	Specific Conductance (µS/cm)	Temperature (°C)	Nitrate (µg/L)	Ferrous Iron (µg/L)	Sulfate (µg/L)
MW-2	9/25/1997	--	--	--	--	--	--	--	--
	8/25/2011	0.25	-86.0	6.94	0.701	20.5	--	--	--
	8/22/2013	0.10	40.8	8.33	0.833	22.4	< 100	980	970
	11/21/2013	0.29	-136.2	6.88	0.759	19.0	< 100	3,150	< 300
	2/21/2014	0.21	-154.1	6.95	0.845	17.8	<100	5,100	< 300
MW-3	9/25/1997	--	--	--	--	--	--	--	--
	8/25/2011	1.87	-92.8	6.95	0.718	20.5	--	--	--
	8/22/2013	0.27	-99.8	6.37	0.739	21.5	< 100	2,430	< 300
	11/21/2013	0.31	-152.1	6.91	0.717	20.0	< 100	4,900	< 300
	2/21/2014	0.23	-142.1	7.07	0.791	18.4	<100	3,270	<300
MW-4	11/14/1997	--	--	--	--	--	--	--	--
	8/26/2011	1.26	-85.1	7.56	0.447	21.2	--	--	--
	8/22/2013	0.10	51.3	9.22	0.599	21.5	< 100	80	39,100
	11/21/2013	0.51	-150.2	7.69	0.602	20.8	< 100	80	30,900
	2/21/2014	0.39	-105.6	7.80	0.680	19.3	<100	100	18,300
MW-5	11/21/2013	--	--	--	--	--	< 100	5,300	3,860
	2/21/2014	--	--	--	--	--	<100	7,100	16,300

Notes:
°C = degrees Celsius
mg/L = milligrams per liter
mV = millivolt
µg/L = micrograms per liter
µS/cm = microsiemens per centimeter
< = analyte not detected below reporting limit shown
-- = not tested

TABLE 4
WATER LEVEL DATA

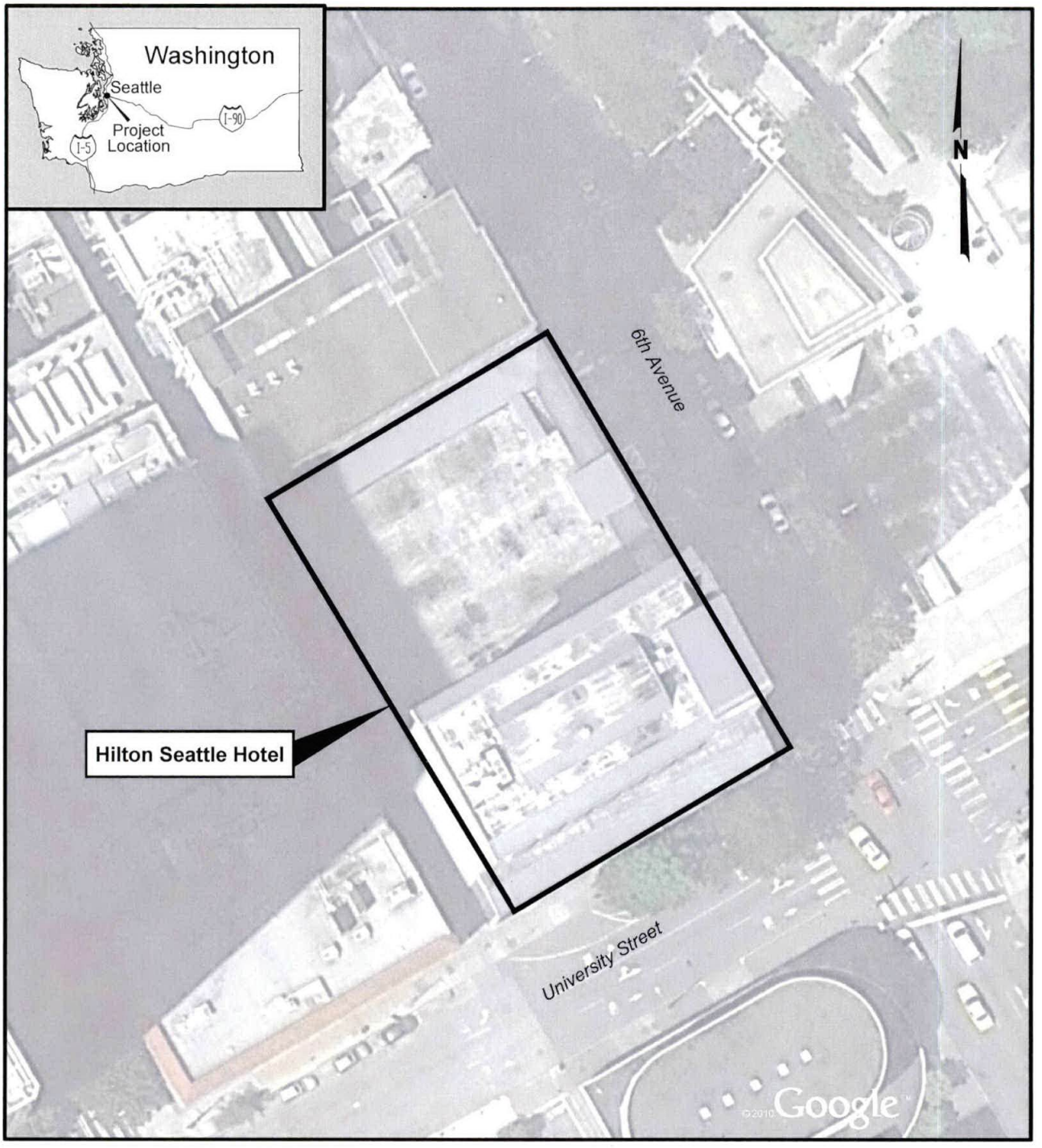
Monitoring Well	Date	Top of Casing Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
MW-2	9/25/1997	162.55	21.36	141.19
	8/25/2011	162.55	22.09	140.46
	8/22/2013	162.55	22.20	140.35
	11/21/2013	162.55	22.85	139.70
	2/21/2014	162.55	22.67	139.88
MW-3	9/25/1997	161.24	20.49	140.75
	8/25/2011	161.24	21.08	140.16
	8/22/2013	161.24	21.10	140.14
	11/21/2013	161.24	21.72	139.52
	2/21/2014	161.24	21.60	139.64
MW-4	11/14/1997	154.30	15.31	138.99
	8/26/2011	154.30	15.43	138.87
	8/22/2013	154.30	15.26	139.04
	11/21/2013	154.30	16.25	138.05
	2/21/2014	154.30	16.20	138.10
MW-5	11/14/1997	175.38	32.79	142.59
	8/26/2011	175.38	34.21	141.17
	8/14/2013	174.35	33.51	140.84
	11/21/2013	174.35	34.17	140.18
	2/21/2014	174.35	34.10	140.25

Notes:
Elevations were estimated from King County iMap (Aug 2011).
Depth to groundwater in 1997 and 2011 for MW-5 were adjusted to account for floating product.
Top of casing elevation for MW-5 modified during system installation in 2012.

TABLE 5
DATA ANALYSIS SUMMARY

Monitoring Well	Analysis		Parameter				
			Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes
MW-2	Mann-Kendall	Plume Stability	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking
		CL	88.3%	95.8%	95.8%	95.8%	95.8%
	Linear Regression	Plume Stability	Stable	Shrinking	Shrinking	Stable	Shrinking
		CL	66.1%	98.7%	99.9%	61.9%	99.9%
		Point Decay Rate at 50% CL, yr^{-1}	0.045	0.475	0.300	0.114	0.262
		Point Decay Rate at 85% CL, yr^{-1}	NA	0.368	0.281	NA	0.240
		Half Life at 50% CL, yr	15.391	1.458	2.309	6.083	2.646
		Half Life at 85% CL, yr	NA	1.885	2.468	NA	2.885
MW-3	Mann-Kendall	Plume Stability	Stable	Undetermined	Undetermined	Undetermined	Shrinking
		CL	75.8%	75.8%	75.8%	75.8%	83.3%
	Linear Regression	Plume Stability	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking
		CL	96.2%	99.9%	99.9%	99.9%	99.9%
		Point Decay Rate at 50% CL, yr^{-1}	0.088	0.601	0.188	0.314	0.285
		Point Decay Rate at 85% CL, yr^{-1}	0.059	0.543	0.170	0.283	0.270
		Half Life at 50% CL, yr	7.876	1.152	3.683	2.208	2.430
		Half Life at 85% CL, yr	11.847	1.277	4.080	2.446	2.568
MW-4	Mann-Kendall	Plume Stability	Undetermined	Stable	Stable	Stable	Stable
		CL	59.2%	40.8%	40.8%	40.8%	40.8%
	Linear Regression	Plume Stability	Undetermined	NA	NA	NA	NA
		CL	14.5%	NA	NA	NA	NA
		Point Decay Rate at 50% CL, yr^{-1}	NA	NA	NA	NA	NA
		Point Decay Rate at 85% CL, yr^{-1}	NA	NA	NA	NA	NA
		Half Life at 50% CL, yr	NA	NA	NA	NA	NA
		Half Life at 85% CL, yr	NA	NA	NA	NA	NA

Notes:
CL = confidence level
NA = not applicable
yr = year



0 60 120

Approximate Scale in Feet

LEGEND

Approximate Parcel Boundary

NOTE

Aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth™ Mapping Service.

Hilton Seattle Hotel
Seattle, Washington

VICINITY MAP

May 2014 21-1-12341-004

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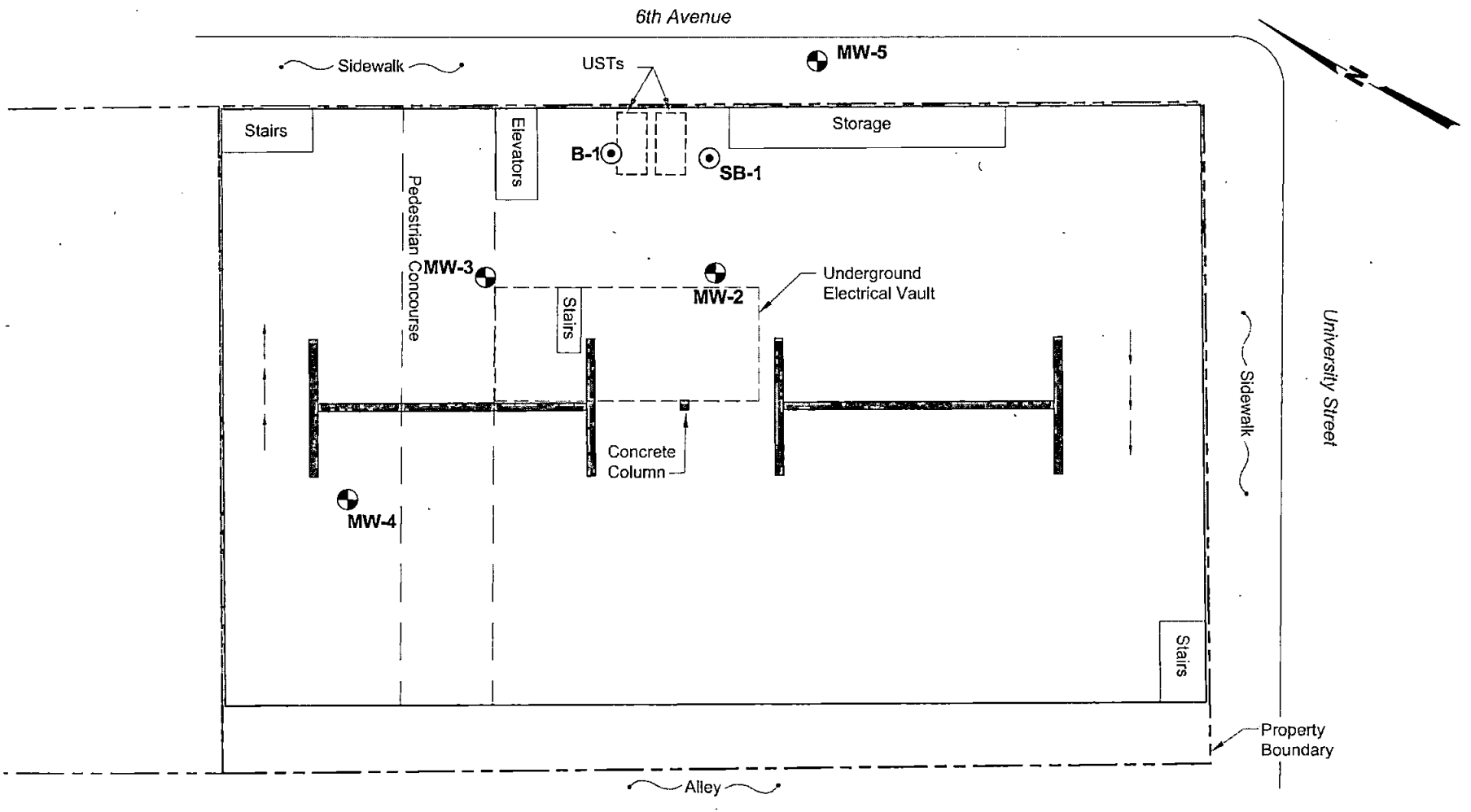
Geotechnical and Environmental Consultants

FIG. 1

Filename: J:\21\1\12341-004\21-1-12341-004 Fig 1.dwg Date: 04-22-2014 Login: mas

Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O.dwg Date: 04-22-2014 Login: mas



LEGEND

- Monitoring Well Designation and Approximate Location
- Historical Boring Designation and Approximate Location

0 30 60

Scale in Feet

NOTE

Locations of site features shown are approximate.

Hilton Seattle Hotel
Seattle, Washington

SITE PLAN

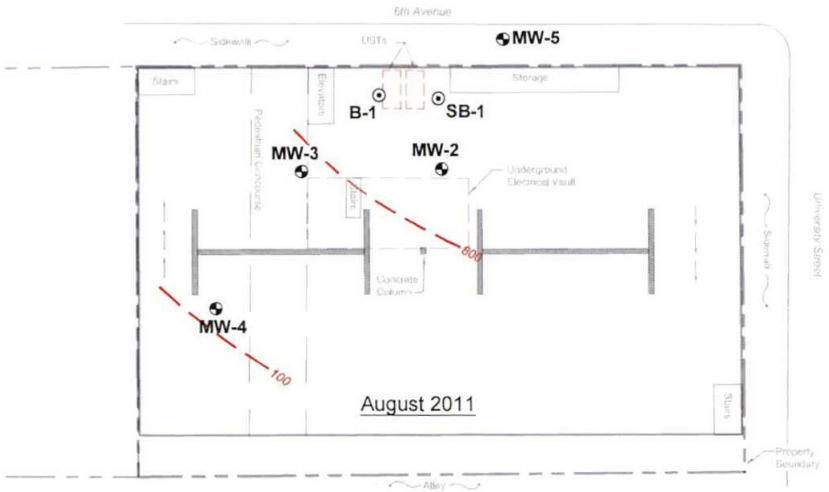
May 2014 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

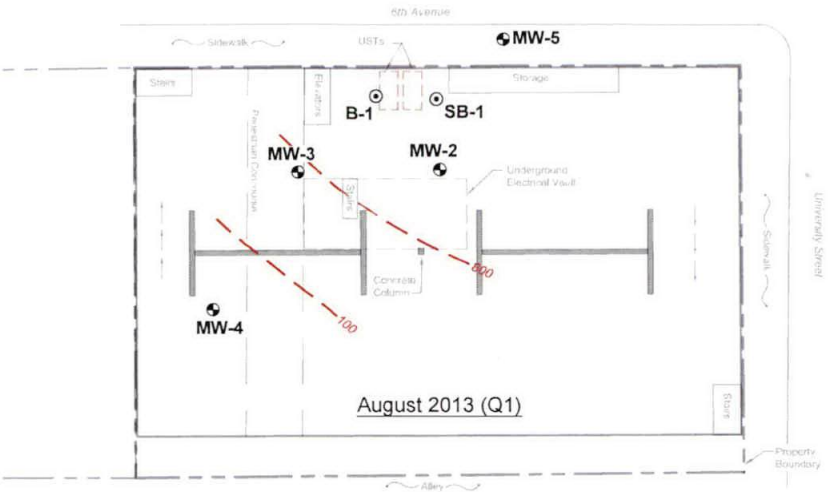
FIG. 2

FIG. 2

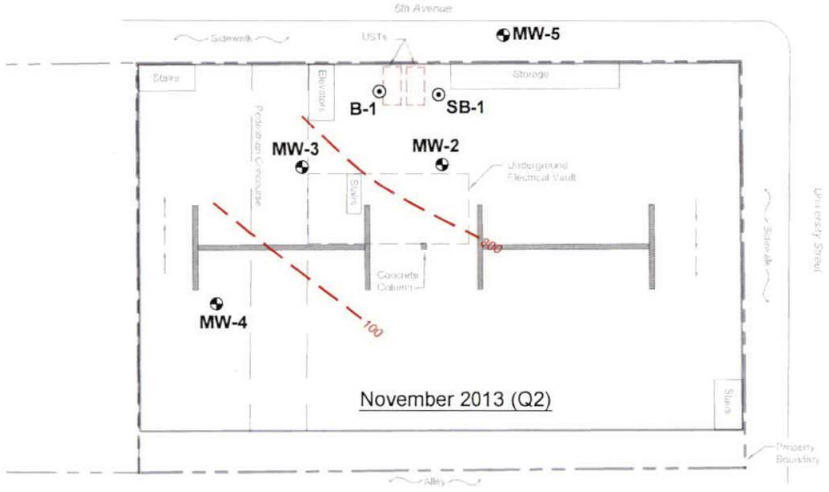
Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O.dwg Date: 04-22-2014 Login: mas



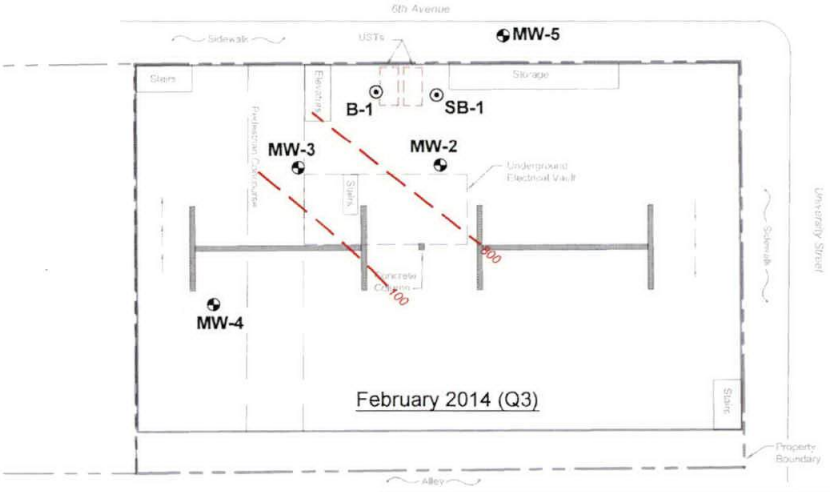
August 2011



August 2013 (Q1)



November 2013 (Q2)



February 2014 (Q3)

LEGEND

- Monitoring Well Designation and Approximate Location
- Historical Boring Designation and Approximate Location
- Approximate Gasoline Concentration Contour

NOTES:

1. Concentrations are in micrograms per liter.
2. Locations of site features shown are approximate.
3. Figure originally produced in color.

N

0 60 120

Scale in Feet

Hilton Seattle Hotel
Seattle, Washington

ESTIMATED EXTENT OF GASOLINE CONTAMINATION

May 2014 21-1-12341-004

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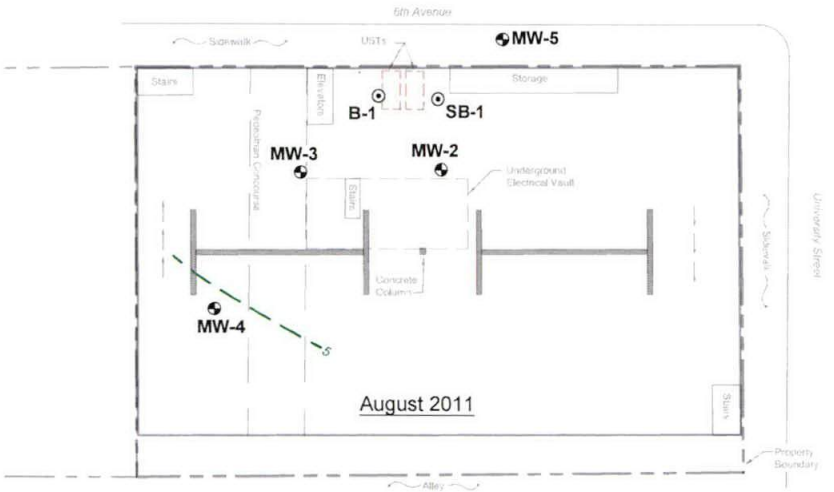
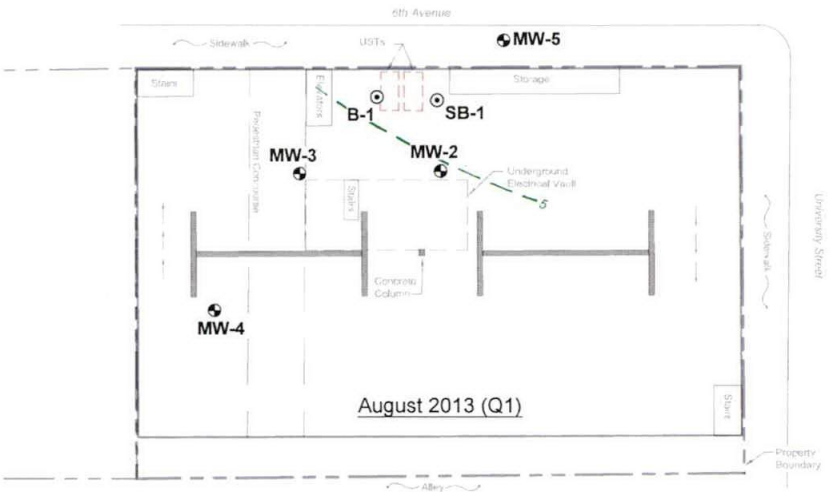
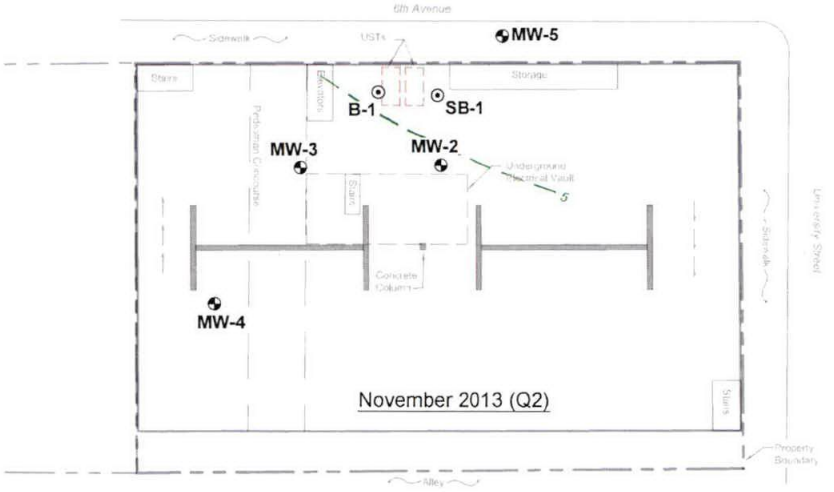
FIG. 3

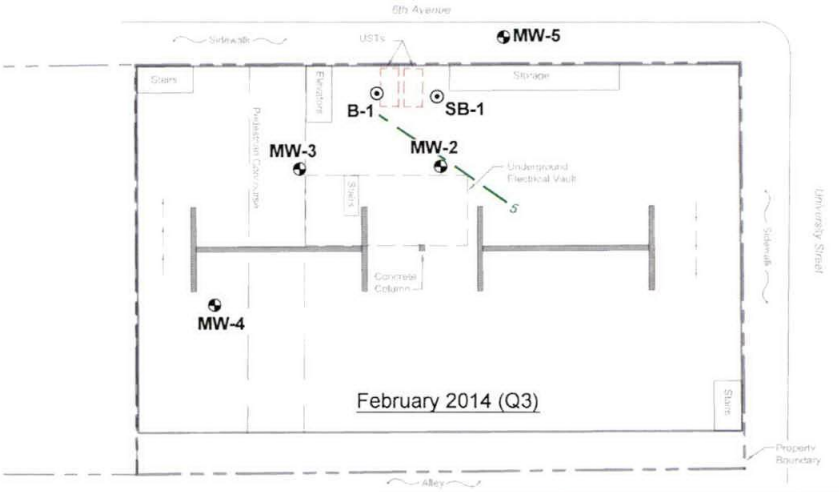
FIG. 3

Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O.dwg Date: 04-22-2014 Login: mas







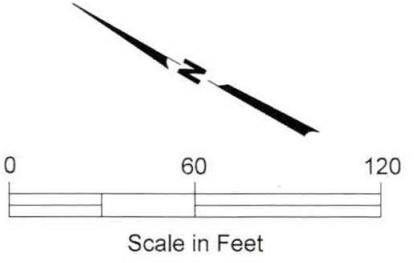


LEGEND

- Monitoring Well Designation and Approximate Location
- Historical Boring Designation and Approximate Location
- Approximate Benzene Concentration Contour

NOTES:

1. Concentrations are in micrograms per liter.
2. Locations of site features shown are approximate.
3. Figure originally produced in color.



Hilton Seattle Hotel
Seattle, Washington

ESTIMATED EXTENT OF BENZENE CONTAMINATION

May 2014 21-1-12341-004

SHANNON & WILSON, INC.
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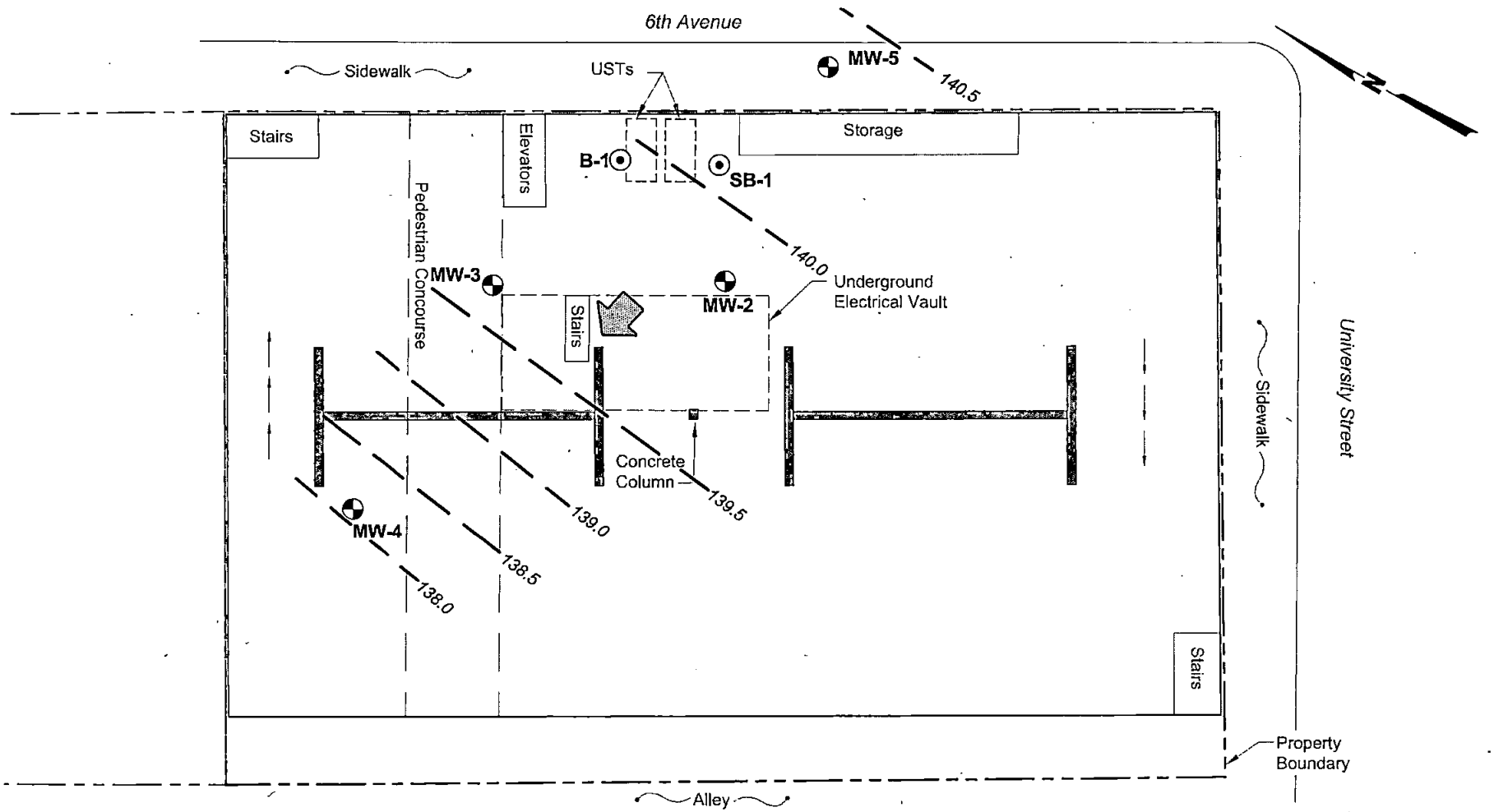
FIG. 4

FIG. 4

Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O.dwg Date: 04-22-2014 Login: mas



LEGEND

- Monitoring Well Designation and Approximate Location
- Historical Boring Designation and Approximate Location
- Approximate Groundwater Elevation Contour 2/21/13
- Approximate Groundwater Flow Direction

0 30 60

Scale in Feet

NOTES

1. Locations of site features shown are approximate.
2. Groundwater elevations are based on an arbitrary site datum.

Hilton Seattle Hotel
Seattle, Washington

GROUNDWATER ELEVATION CONTOURS

May 2014 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 5

FIG. 5

Appendix A

Appendix A

APPENDIX A

ANALYTICAL LABORATORY REPORT

3600 Fremont Ave. N.
Seattle, WA 98103
T: (206) 352-3790
F: (206) 352-7178
info@fremontanalytical.com

Shannon & Wilson
Michael Reynolds
400 N. 34th Street, Suite 100
Seattle, WA 98103

RE: Seattle Hilton
Lab ID: 1402222

February 28, 2014

Attention Michael Reynolds:

Fremont Analytical, Inc. received 4 sample(s) on 2/21/2014 for the analyses presented in the following report.

Ferrous Iron by SM3500-Fe B
Gasoline by NWTPH-Gx
Ion Chromatography by EPA Method 300.0
Total Metals by EPA Method 200.8
Volatile Organic Compounds by EPA Method 8260

This report consists of the following:

- Case Narrative
- Analytical Results
- Applicable Quality Control Summary Reports
- Chain of Custody

All analyses were performed consistent with the Quality Assurance program of Fremont Analytical, Inc. Please contact the laboratory if you should have any questions about the results.

Thank you for using Fremont Analytical.

Sincerely,

Michael Dee
Sr. Chemist / Principal

Fremont Analytical

Date: *02/28/2014*

CLIENT: Shannon & Wilson
Project: Seattle Hilton
Lab Order: 1402222

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1402222-001	MW-4	02/21/2014 11:50 AM	02/21/2014 3:00 PM
1402222-002	MW-3	02/21/2014 12:35 PM	02/21/2014 3:00 PM
1402222-003	MW-2	02/21/2014 1:15 PM	02/21/2014 3:00 PM
1402222-004	MW-5	02/21/2014 1:55 PM	02/21/2014 3:00 PM

Note: If no "Time Collected" is supplied, a default of 12:00AM is assigned

Fremont Analytical

Case Narrative

WO#: **1402222**
Date: **2/28/2014**

CLIENT: Shannon & Wilson
Project: Seattle Hilton

I. SAMPLE RECEIPT:
Samples receipt information is recorded on the attached Sample Receipt Checklist.

II. GENERAL REPORTING COMMENTS:
Results are reported on a wet weight basis unless dry-weight correction is denoted in the units field on the analytical report ("mg/kg-dry" or "ug/kg-dry").

Matrix Spike (MS) and MS Duplicate (MSD) samples are tested from an analytical batch of "like" matrix to check for possible matrix effect. The MS and MSD will provide site specific matrix data only for those samples which are spiked by the laboratory. The sample chosen for spike purposes may or may not have been a sample submitted in this sample delivery group. The validity of the analytical procedures for which data is reported in this analytical report is determined by the Laboratory Control Sample (LCS) and the Method Blank (MB). The LCS and the MB are processed with the samples and the MS/MSD to ensure method criteria are achieved throughout the entire analytical process.

III. ANALYSES AND EXCEPTIONS:
Exceptions associated with this report will be footnoted in the analytical results page(s) or the quality control summary page(s) and/or noted below.

Analytical Report

WO#: **1402222**
Date Reported: **2/28/2014**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1402222-001
Client Sample ID: **MW-4**

Collection Date: 2/21/2014 11:50:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R12707		Analyst: GH
Gasoline	ND	50.0		µg/L	1	2/24/2014 5:06:00 PM
Surr: 4-Bromofluorobenzene	116	65-135		%REC	1	2/24/2014 5:06:00 PM
Surr: Toluene-d8	104	65-135		%REC	1	2/24/2014 5:06:00 PM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R12705		Analyst: GH
Benzene	ND	1.00		µg/L	1	2/24/2014 5:06:00 PM
Toluene	ND	1.00		µg/L	1	2/24/2014 5:06:00 PM
Ethylbenzene	ND	1.00		µg/L	1	2/24/2014 5:06:00 PM
m,p-Xylene	ND	1.00		µg/L	1	2/24/2014 5:06:00 PM
o-Xylene	ND	1.00		µg/L	1	2/24/2014 5:06:00 PM
Surr: Dibromofluoromethane	99.6	72.1-122		%REC	1	2/24/2014 5:06:00 PM
Surr: Toluene-d8	101	62.1-129		%REC	1	2/24/2014 5:06:00 PM
Surr: 1-Bromo-4-fluorobenzene	115	66.8-124		%REC	1	2/24/2014 5:06:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R12669		Analyst: GH
Nitrate	ND	0.100		mg/L	1	2/21/2014 5:20:00 PM
Sulfate	18.3	0.300		mg/L	1	2/21/2014 5:20:00 PM
Total Metals by EPA Method 200.8				Batch ID: 6686		Analyst: MC
Iron	291	100		µg/L	1	2/24/2014 10:17:05 PM
Lead	ND	1.00		µg/L	1	2/24/2014 10:17:05 PM
Ferrous Iron by SM3500-Fe B				Batch ID: R12676		Analyst: MC
Ferrous Iron	0.100	0.0300		mg/L	1	2/21/2014 4:12:29 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Analytical Report

WO#: **1402222**
Date Reported: **2/28/2014**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1402222-002
Client Sample ID: **MW-3**

Collection Date: 2/21/2014 12:35:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R12707		Analyst: GH
Gasoline	114	50.0		µg/L	1	2/24/2014 5:35:00 PM
Surr: 4-Bromofluorobenzene	112	65-135		%REC	1	2/24/2014 5:35:00 PM
Surr: Toluene-d8	104	65-135		%REC	1	2/24/2014 5:35:00 PM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R12705		Analyst: GH
Benzene	ND	1.00		µg/L	1	2/24/2014 5:35:00 PM
Toluene	ND	1.00		µg/L	1	2/24/2014 5:35:00 PM
Ethylbenzene	ND	1.00		µg/L	1	2/24/2014 5:35:00 PM
m,p-Xylene	ND	1.00		µg/L	1	2/24/2014 5:35:00 PM
o-Xylene	ND	1.00		µg/L	1	2/24/2014 5:35:00 PM
Surr: Dibromofluoromethane	104	72.1-122		%REC	1	2/24/2014 5:35:00 PM
Surr: Toluene-d8	104	62.1-129		%REC	1	2/24/2014 5:35:00 PM
Surr: 1-Bromo-4-fluorobenzene	110	66.8-124		%REC	1	2/24/2014 5:35:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R12669		Analyst: GH
Nitrate	ND	0.100		mg/L	1	2/21/2014 6:28:00 PM
Sulfate	ND	0.300		mg/L	1	2/21/2014 6:28:00 PM
Total Metals by EPA Method 200.8				Batch ID: 6686		Analyst: MC
Iron	25,300	100		µg/L	1	2/24/2014 11:53:27 PM
Lead	3.17	1.00		µg/L	1	2/24/2014 11:53:27 PM
Ferrous Iron by SM3500-Fe B				Batch ID: R12676		Analyst: MC
Ferrous Iron	3.27	0.0300		mg/L	1	2/21/2014 4:17:29 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1402222-003
Client Sample ID: **MW-2**

Collection Date: 2/21/2014 1:15:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R12707		Analyst: GH
Gasoline	1,360	50.0		µg/L	1	2/24/2014 6:05:00 PM
Surr: 4-Bromofluorobenzene	118	65-135		%REC	1	2/24/2014 6:05:00 PM
Surr: Toluene-d8	105	65-135		%REC	1	2/24/2014 6:05:00 PM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R12705		Analyst: GH
Benzene	2.90	1.00		µg/L	1	2/24/2014 6:05:00 PM
Toluene	1.62	1.00		µg/L	1	2/24/2014 6:05:00 PM
Ethylbenzene	20.8	1.00		µg/L	1	2/24/2014 6:05:00 PM
m,p-Xylene	5.38	1.00		µg/L	1	2/24/2014 6:05:00 PM
o-Xylene	2.06	1.00		µg/L	1	2/24/2014 6:05:00 PM
Surr: Dibromofluoromethane	102	72.1-122		%REC	1	2/24/2014 6:05:00 PM
Surr: Toluene-d8	104	62.1-129		%REC	1	2/24/2014 6:05:00 PM
Surr: 1-Bromo-4-fluorobenzene	116	66.8-124		%REC	1	2/24/2014 6:05:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R12669		Analyst: GH
Nitrate	ND	0.100		mg/L	1	2/21/2014 6:45:00 PM
Sulfate	ND	0.300		mg/L	1	2/21/2014 6:45:00 PM
Total Metals by EPA Method 200.8				Batch ID: 6686		Analyst: MC
Iron	44,000	100		µg/L	1	2/25/2014 12:03:52 AM
Lead	8.10	1.00		µg/L	1	2/25/2014 12:03:52 AM
Ferrous Iron by SM3500-Fe B				Batch ID: R12676		Analyst: MC
Ferrous Iron	5.10	0.300	D	mg/L	10	2/21/2014 4:22:29 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Analytical Report

WO#: **1402222**
Date Reported: **2/28/2014**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1402222-004
Client Sample ID: **MW-5**

Collection Date: 2/21/2014 1:55:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R12707		Analyst: GH
Gasoline	30,300	5,000	D	µg/L	100	2/25/2014 11:41:00 AM
Surr: 4-Bromofluorobenzene	129	65-135		%REC	1	2/24/2014 6:35:00 PM
Surr: Toluene-d8	108	65-135		%REC	1	2/24/2014 6:35:00 PM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R12705		Analyst: GH
Benzene	193	100	D	µg/L	100	2/25/2014 11:41:00 AM
Toluene	122	100	D	µg/L	100	2/25/2014 11:41:00 AM
Ethylbenzene	796	100	D	µg/L	100	2/25/2014 11:41:00 AM
m,p-Xylene	2,380	100	D	µg/L	100	2/25/2014 11:41:00 AM
o-Xylene	1,290	100	D	µg/L	100	2/25/2014 11:41:00 AM
Surr: Dibromofluoromethane	94.3	72.1-122		%REC	1	2/24/2014 6:35:00 PM
Surr: Toluene-d8	107	62.1-129		%REC	1	2/24/2014 6:35:00 PM
Surr: 1-Bromo-4-fluorobenzene	112	66.8-124	D	%REC	100	2/25/2014 11:41:00 AM
Ion Chromatography by EPA Method 300.0				Batch ID: R12669		Analyst: GH
Nitrate	ND	0.100		mg/L	1	2/21/2014 7:02:00 PM
Sulfate	16.3	0.300		mg/L	1	2/21/2014 7:02:00 PM
Total Metals by EPA Method 200.8				Batch ID: 6686		Analyst: MC
Iron	17,700	100		µg/L	1	2/25/2014 12:14:16 AM
Lead	47.2	1.00		µg/L	1	2/25/2014 12:14:16 AM
Ferrous Iron by SM3500-Fe B				Batch ID: R12676		Analyst: MC
Ferrous Iron	7.10	0.300	D	mg/L	10	2/21/2014 4:27:29 PM

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required
E	Value above quantitation range	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: 2/28/2014

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Ferrous Iron by SM3500-Fe B

Sample ID: MB-R12676	SampType: MBLK			Units: mg/L		Prep Date: 2/21/2014			RunNo: 12676		
Client ID: MBLKW	Batch ID: R12676					Analysis Date: 2/21/2014			SeqNo: 253093		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	ND	0.0300									

Sample ID: LCS-R12676	SampType: LCS			Units: mg/L		Prep Date: 2/21/2014			RunNo: 12676		
Client ID: LCSW	Batch ID: R12676					Analysis Date: 2/21/2014			SeqNo: 253094		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	0.950	0.0300	1.000	0	95.0	90	110				

Sample ID: 1402222-001CDUP	SampType: DUP			Units: mg/L		Prep Date: 2/21/2014			RunNo: 12676		
Client ID: MW-4	Batch ID: R12676					Analysis Date: 2/21/2014			SeqNo: 253096		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	0.120	0.0300						0.1000	18.2	20	

Sample ID: 1402222-001CMS	SampType: MS			Units: mg/L		Prep Date: 2/21/2014			RunNo: 12676		
Client ID: MW-4	Batch ID: R12676					Analysis Date: 2/21/2014			SeqNo: 253097		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	1.07	0.0300	1.000	0.1000	97.0	85	115				

Sample ID: 1402222-001CMSD	SampType: MSD			Units: mg/L		Prep Date: 2/21/2014			RunNo: 12676		
Client ID: MW-4	Batch ID: R12676					Analysis Date: 2/21/2014			SeqNo: 253098		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	1.05	0.0300	1.000	0.1000	95.0	85	115	1.070	1.89	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: *2/28/2014*

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-R12669**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **2/21/2014**		RunNo: **12669**		
Client ID: **MBLKW**	Batch ID: **R12669**					Analysis Date: **2/21/2014**		SeqNo: **252848**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	ND	0.100									
Sulfate	ND	0.300									

Sample ID: **LCS-R12669**	SampType: **LCS**			Units: **mg/L**		Prep Date: **2/21/2014**		RunNo: **12669**		
Client ID: **LCSW**	Batch ID: **R12669**					Analysis Date: **2/21/2014**		SeqNo: **252849**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	5.96	0.100	6.000	0	99.3	90	110				
Sulfate	28.5	0.300	30.00	0	94.9	90	110				

Sample ID: **1402222-001CDUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **2/21/2014**		RunNo: **12669**		
Client ID: **MW-4**	Batch ID: **R12669**					Analysis Date: **2/21/2014**		SeqNo: **252851**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	ND	0.100						0		20	
Sulfate	18.9	0.300						18.26	3.20	20	

Sample ID: **1402222-001CMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **2/21/2014**		RunNo: **12669**		
Client ID: **MW-4**	Batch ID: **R12669**					Analysis Date: **2/21/2014**		SeqNo: **252852**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	6.07	0.100	6.000	0	101	80	120				
Sulfate	48.7	0.300	30.00	18.26	101	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: *2/28/2014*

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **1402222-001CMSD**	SampType: **MSD**	Units: **mg/L**	Prep Date: **2/21/2014**	RunNo: **12669**
Client ID: **MW-4**	Batch ID: **R12669**		Analysis Date: **2/21/2014**	SeqNo: **252853**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	5.98	0.100	6.000	0	99.6	80	120	6.072	1.61	20	
Sulfate	47.6	0.300	30.00	18.26	97.8	80	120	48.68	2.25	20	

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: *2/28/2014*

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **MB-6686**	SampType: **MBLK**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12702**		
Client ID: **MBLKW**	Batch ID: **6686**					Analysis Date: **2/24/2014**		SeqNo: **253671**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	ND	100									
Lead	ND	1.00									

Sample ID: **LCS-6686**	SampType: **LCS**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12702**		
Client ID: **LCSW**	Batch ID: **6686**					Analysis Date: **2/24/2014**		SeqNo: **253672**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	1,020	100	1,000	0	102	50	150				
Lead	46.8	1.00	50.00	0	93.6	85	115				

Sample ID: **1402222-001BDUP**	SampType: **DUP**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12702**		
Client ID: **MW-4**	Batch ID: **6686**					Analysis Date: **2/24/2014**		SeqNo: **253674**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	295	100						291.0	1.27	30	
Lead	ND	1.00						0		30	

Sample ID: **1402222-001BMS**	SampType: **MS**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12702**		
Client ID: **MW-4**	Batch ID: **6686**					Analysis Date: **2/24/2014**		SeqNo: **253675**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	5,030	100	5,000	291.0	94.9	50	150				
Lead	222	1.00	250.0	0.2165	88.5	70	130				

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: *2/28/2014*

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **1402222-001BMSD**	SampType: **MSD**			Units: **µg/L**			Prep Date: **2/24/2014**		RunNo: **12702**	
Client ID: **MW-4**	Batch ID: **6686**						Analysis Date: **2/24/2014**		SeqNo: **253676**	
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Iron	5,070	100	5,000	291.0	95.5	50	150	5,034	0.657	30	
Lead	218	1.00	250.0	0.2165	87.0	70	130	221.5	1.76	30	

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: 2/28/2014

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Gasoline by NWTPH-Gx

Sample ID: 1402222-004ADUP	SampType: DUP	Units: µg/L	Prep Date: 2/24/2014	RunNo: 12707
Client ID: MW-5	Batch ID: R12707		Analysis Date: 2/24/2014	SeqNo: 253840

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	53,400	50.0						54,120	1.34	30	E
Surr: Toluene-d8	53.7		50.00		107	65	135		0	0	
Surr: 4-Bromofluorobenzene	62.0		50.00		124	65	135		0	0	

Sample ID: LCS-R12707	SampType: LCS	Units: µg/L	Prep Date: 2/24/2014	RunNo: 12707
Client ID: LCSW	Batch ID: R12707		Analysis Date: 2/24/2014	SeqNo: 253857

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	399	50.0	500.0	0	79.8	65	135				
Surr: Toluene-d8	52.2		50.00		104	65	135				
Surr: 4-Bromofluorobenzene	57.2		50.00		114	65	135				

Sample ID: MB-R12707	SampType: MBLK	Units: µg/L	Prep Date: 2/24/2014	RunNo: 12707
Client ID: MBLKW	Batch ID: R12707		Analysis Date: 2/24/2014	SeqNo: 253858

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	ND	50.0									
Surr: Toluene-d8	51.9		50.00		104	65	135				
Surr: 4-Bromofluorobenzene	55.7		50.00		111	65	135				

Sample ID: CCV-R12707C	SampType: CCV	Units: µg/L	Prep Date: 2/25/2014	RunNo: 12707
Client ID: CCV	Batch ID: R12707		Analysis Date: 2/25/2014	SeqNo: 254457

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	425	50.0	500.0	0	85.0	80	120				
Surr: Toluene-d8	51.7		50.00		103	65	135				
Surr: 4-Bromofluorobenzene	58.0		50.00		116	65	135				

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: *2/28/2014*

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Gasoline by NWTPH-Gx

Sample ID: **CCV-R12707C** SampType: **CCV** Units: **µg/L** Prep Date: **2/25/2014** RunNo: **12707**
Client ID: **CCV** Batch ID: **R12707** Analysis Date: **2/25/2014** SeqNo: **254457**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: *2/28/2014*

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1402222-004ADUP**	SampType: **DUP**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12705**			
Client ID: **MW-5**	Batch ID: **R12705**					Analysis Date: **2/24/2014**		SeqNo: **253780**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	673	1.00						635.4	5.71	30	E
Toluene	229	1.00						219.8	4.22	30	E
Ethylbenzene	1,270	1.00						1,265	0.477	30	E
m,p-Xylene	3,660	1.00						3,674	0.366	30	E
o-Xylene	2,310	1.00						2,325	0.461	30	E
Surr: Dibromofluoromethane	47.6		50.00		95.1	72.1	122		0		
Surr: Toluene-d8	52.5		50.00		105	62.1	129		0		
Surr: 1-Bromo-4-fluorobenzene	61.8		50.00		124	66.8	124		0		

Sample ID: **LCS-R12705**	SampType: **LCS**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12705**			
Client ID: **LCSW**	Batch ID: **R12705**					Analysis Date: **2/24/2014**		SeqNo: **253796**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	18.3	1.00	20.00	0	91.6	76	123				
Toluene	18.3	1.00	20.00	0	91.7	71.5	130				
Ethylbenzene	17.9	1.00	20.00	0	89.4	72	130				
m,p-Xylene	36.1	1.00	40.00	0	90.3	73	131				
o-Xylene	17.8	1.00	20.00	0	89.2	72.1	131				
Surr: Dibromofluoromethane	51.3		50.00		103	72.1	122				
Surr: Toluene-d8	51.6		50.00		103	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	56.8		50.00		114	66.8	124				

Sample ID: **MB-R12705**	SampType: **MBLK**			Units: **µg/L**		Prep Date: **2/24/2014**		RunNo: **12705**			
Client ID: **MBLKW**	Batch ID: **R12705**					Analysis Date: **2/24/2014**		SeqNo: **253797**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	1.00									
Toluene	ND	1.00									

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **MB-R12705**	SampType: **MBLK**	Units: **µg/L**	Prep Date: **2/24/2014**	RunNo: **12705**
Client ID: **MBLKW**	Batch ID: **R12705**		Analysis Date: **2/24/2014**	SeqNo: **253797**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylbenzene	ND	1.00									
m,p-Xylene	ND	1.00									
o-Xylene	ND	1.00									
Surr: Dibromofluoromethane	54.1		50.00		108	72.1	122				
Surr: Toluene-d8	53.0		50.00		106	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	54.9		50.00		110	66.8	124				

Sample ID: **1402227-004AMS**	SampType: **MS**	Units: **µg/L**	Prep Date: **2/25/2014**	RunNo: **12705**
Client ID: **BATCH**	Batch ID: **R12705**		Analysis Date: **2/25/2014**	SeqNo: **253966**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	14.4	1.00	20.00	0	71.9	65.4	138				
Toluene	14.6	1.00	20.00	0.3900	71.0	64	139				
Ethylbenzene	14.0	1.00	20.00	0	70.2	64.5	136				
m,p-Xylene	28.1	1.00	40.00	0	70.2	63.3	135				
o-Xylene	13.6	1.00	20.00	0	68.2	65.4	134				
Surr: Dibromofluoromethane	51.0		50.00		102	72.1	122				
Surr: Toluene-d8	52.3		50.00		105	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	57.3		50.00		115	66.8	124				

Sample ID: **CCV-R12705B**	SampType: **CCV**	Units: **µg/L**	Prep Date: **2/25/2014**	RunNo: **12705**
Client ID: **CCV**	Batch ID: **R12705**		Analysis Date: **2/25/2014**	SeqNo: **253967**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	17.2	1.00	20.00	0	86.2	80	120				
Toluene	17.7	1.00	20.00	0	88.4	80	120				
Ethylbenzene	17.5	1.00	20.00	0	87.7	80	120				
m,p-Xylene	34.0	1.00	40.00	0	85.0	80	120				

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Date: 2/28/2014

Work Order: 1402222
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **CCV-R12705B**	SampType: **CCV**			Units: **µg/L**		Prep Date: **2/25/2014**		RunNo: **12705**			
Client ID: **CCV**	Batch ID: **R12705**					Analysis Date: **2/25/2014**		SeqNo: **253967**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
o-Xylene	17.3	1.00	20.00	0	86.6	80	120				
Surr: Dibromofluoromethane	51.6		50.00		103	72.1	122				
Surr: Toluene-d8	52.8		50.00		106	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	57.4		50.00		115	66.8	124				

Qualifiers:

B	Analyte detected in the associated Method Blank	D	Dilution was required	E	Value above quantitation range
H	Holding times for preparation or analysis exceeded	J	Analyte detected below quantitation limits	ND	Not detected at the Reporting Limit
R	RPD outside accepted recovery limits	RL	Reporting Limit	S	Spike recovery outside accepted recovery limits

Fremont Analytical

Sample Log-In Check List

Client Name:	**SW**	Work Order Number:	**1402222**
Logged by:	**Chelsea Ward**	Date Received:	**2/21/2014 3:00:00 PM**

Chain of Custody

1.	Is Chain of Custody complete?	Yes ☑	No ☐	Not Present ☐
2.	How was the sample delivered?	Client		

Log In

3.	Coolers are present?	Yes ☑	No ☐	NA ☐
4.	Shipping container/cooler in good condition?	Yes ☑	No ☐	
5.	Custody seals intact on shipping container/cooler?	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☑	No ☐	NA ☐
7.	Were all coolers received at a temperature of >0°C to 10.0°C	Yes ☑	No ☐	NA ☐
8.	Sample(s) in proper container(s)?	Yes ☑	No ☐	
9.	Sufficient sample volume for indicated test(s)?	Yes ☑	No ☐	
10.	Are samples properly preserved?	Yes ☑	No ☐	
11.	Was preservative added to bottles?	Yes ☐	No ☑	NA ☐
12.	Is the headspace in the VOA vials?	Yes ☐	No ☑	NA ☐
13.	Did all samples containers arrive in good condition(unbroken)?	Yes ☑	No ☐	
14.	Does paperwork match bottle labels?	Yes ☑	No ☐	
15.	Are matrices correctly identified on Chain of Custody?	Yes ☑	No ☐	
16.	Is it clear what analyses were requested?	Yes ☑	No ☐	
17.	Were all holding times able to be met?	Yes ☑	No ☐	

Special Handling (if applicable)

18.	Was client notified of all discrepancies with this order?	Yes ☐	No ☐	NA ☑

Person Notified:		Date:	
By Whom:		Via:	☐ eMail ☐ Phone ☐ Fax ☐ In Person
Regarding:			
Client Instructions:			

19. Additional remarks:

Item Information

Item #	Temp °C	Condition
Cooler	8.1	Good
Sample	9.6	Good

Fremont Analytical

Chain of Custody Record

3600 Fremont Ave N. Tel: 206-352-3790
Seattle, WA 98103 Fax: 206-352-7178

Laboratory Project No (internal): 1402222

Date: 2/21/14 Page: 1 of: 1

Client: Shannon & Wilson Inc.
Address: 400 N 34th St. Suite 100
City, State, Zip: Seattle WA 98103 Tel: 206-632-8020
Reports To (PM): Michael Rudds Fax: 206-695-6777

Project Name: Seattle Hilton
Location: 6th Ave
Collected by: EVP
Email: mrs@shanwil.com Project No: 21-1-12341-004

*Matrix Codes: A = Air, AQ = Aqueous, B = Bulk, O = Other, P = Product, S = Soil, SD = Sediment, SL = Solid, W = Water, DW = Drinking Water, GW = Ground Water, WW = Waste Water

	Sample Name	Sample Date	Sample Time	Sample Type (Matrix)*	VOC (EPA 8260)	GX/BTEX	BTEX	Gasoline Range Organics (GX)	Hydrocarbon Identification (HCID)	Diesel/Heavy Oil Range Organics (DX)	SEMI VOL (EPA 8270)	PAH (EPA 8270 - SIM)	PCBs (EPA 8082)	Metals** (6020 / 200.8)	Total (T) / Dissolved (D)	Anions (IC)***	EDB (8011)	Remove Iron			Comments/Depth
1	MW-4	2/21/14	1150	water		X								X	T	X		X			
2	MW-3		1235			X								X	T	X		X			
3	MW-2		1315			X								X	T	X		X			
4	MW-5		1355			X								X	T	X		X			
5																					
6																					
7																					
8																					
9																					
10																					

**Metals Analysis (Circle): MTCA-5 RCRA-8 Priority Pollutants TAL Individual: Ag Al As B Ba Be Ca Cd Co Cr Cu Fe Hg K Mg Mn Mo Na Ni Pb Sb Se Sr Sn Ti Tl U V Zn

***Anions (Circle): Nitrate Nitrite Chloride Sulfate Bromide O-Phosphate Fluoride Nitrate+Nitrite

Special Remarks:

Sample Disposal: ☐ Return to Client ☑ Disposal by Lab (A fee may be assessed if samples are retained after 30 days.)

Relinquished	Date/Time	Received	Date/Time
x	2/21/14 1500	x	2/21/14 1500
Relinquished	Date/Time	Received	Date/Time
x		x	

TAT -> SameDay^ NextDay^ 2 Day 3 Day STD

^Please coordinate with the lab in advance

Distribution: White - Lab, Yellow - File, Pink - Originator

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Appendix B

Appendix B

APPENDIX B

NATURAL ATTENUATION ANALYSIS OUTPUT

Module1: Mann-Kendall Trend Test for Plume Stability (Non-parametric Statistical Test)

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

Well (Sampling) Location?	**MW-2**
Level of Confidence (Decision Criteria)?	**85%**

1. Monitoring Well Information: Contaminant Concentration at a well: Quarterly sampling recommended.

		Hazardous Substances (unit is ug/L)					
Sampling Event	Date Sampled	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
#1	9/25/1997	4700	6700	210	670	590	
#2	8/25/2011	2950	76.1	2.19	863	22	
#3	8/22/2013	5000	3.07	2.01	408	10.8	
#4	11/21/2013	1760	1.4	1.57	83	6.9	
#5	2/21/2014	1360	2.9	1.62	21	7.4	
#6							
#7							
#8							
#9							
#10							
#11							
#12							
#13							
#14							
#15							
#16							

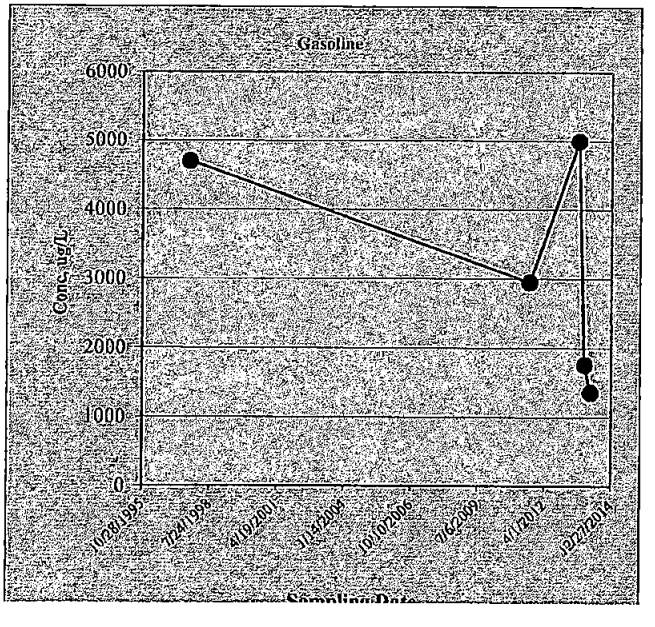
2. Mann-Kendall Non-parametric Statistical Test Results

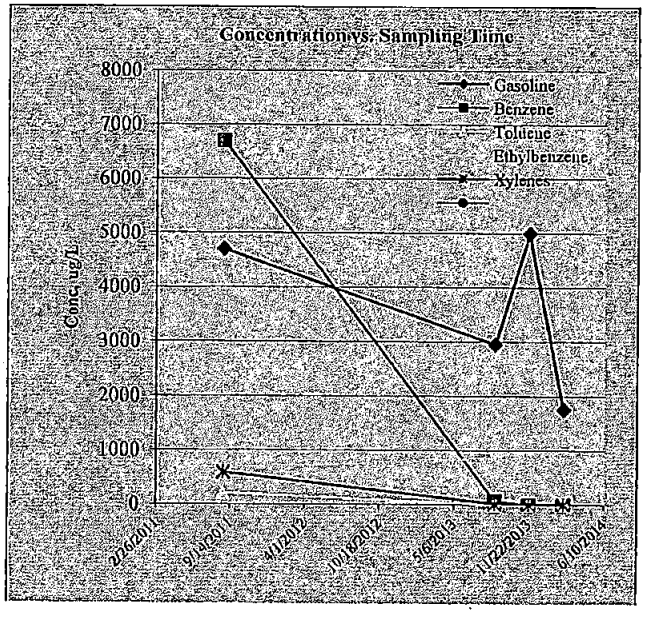
Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	88.30%	95.80%	95.80%	95.80%	95.80%	NA
Plume Stability?	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking	NA
Coefficient of Variation?						n<4
Mann-Kendall Statistic "S" value?	-6	-8	-8	-8	-8	0
Number of Sampling Rounds?	5	5	5	5	5	0
Average Concentration?	3154.00	1356.69	43.48	409.00	127.42	NA
Standard Deviation?	1658.40	2987.17	93.09	364.37	258.66	NA
Coefficient of Variation?	0.53	2.20	2.14	0.89	2.03	NA
Blank if No Errors found						n<4

3. Temporal Trend: Plot of Concentration vs. Sampling Time

Hazardous substance? **Gasoline**

Plume Stability? **Shrinking**





Module1: Mann-Kendall Trend Test for Plume Stability (Non-parametric Statistical Test)

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

Well (Sampling) Location?	**MW-3**
Level of Confidence (Decision Criteria)?	**85%**

1. Monitoring Well Information: Contaminant Concentration at a well: Quarterly sampling recommended.

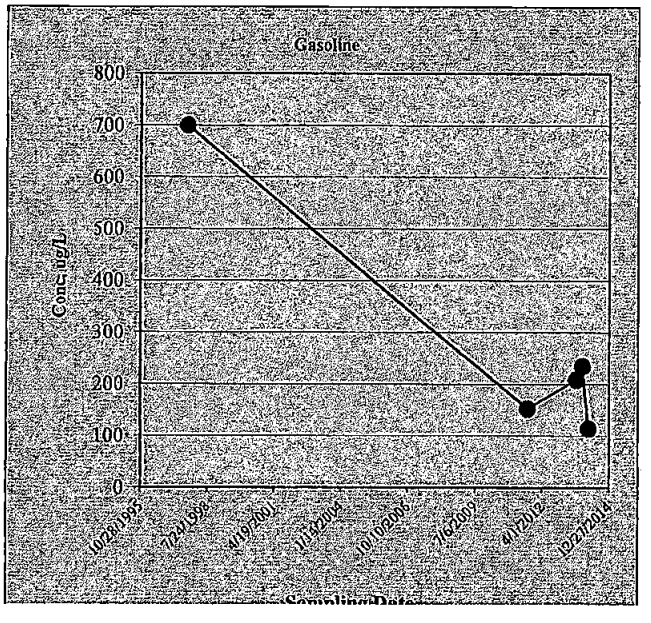
		Hazardous Substances (unit is ug/L)					
Sampling Event	Date Sampled	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
#1	9/25/1997	700	7200	10	74	97	
#2	8/25/2011	153	0.5	0.5	0.5	1.35	
#3	8/22/2013	209	0.5	0.5	0.5	1	
#4	11/21/2013	235	0.5	0.5	0.5	1	
#5	2/21/2014	114	0.5	0.5	0.5	1	
#6							
#7							
#8							
#9							
#10							
#11							
#12							
#13							
#14							
#15							
#16							

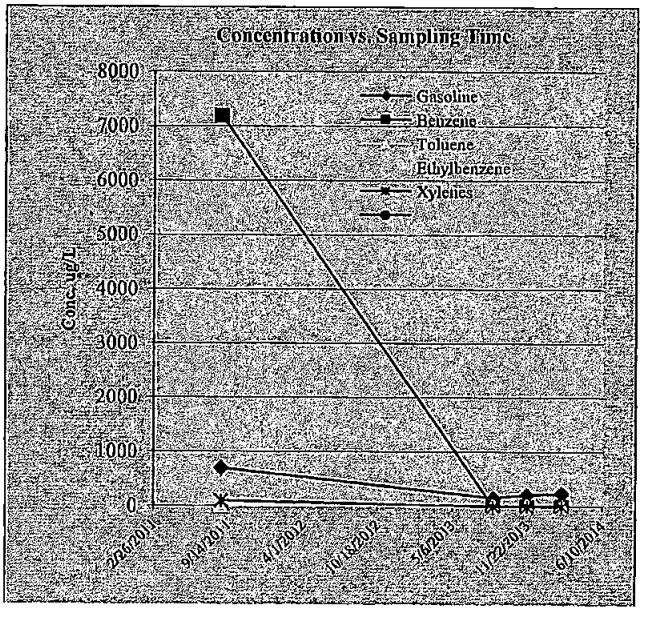
2. Mann-Kendall Non-parametric Statistical Test Results

Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	75.80%	75.80%	75.80%	75.80%	88.30%	NA
Plume Stability?	Stable	Undetermined	Undetermined	Undetermined	Shrinking	NA
Coefficient of Variation?	CV <= 1	CV > 1	CV > 1	CV > 1		n<4
Mann-Kendall Statistic "S" value?	-4	-4	-4	-4	-7	0
Number of Sampling Rounds?	5	5	5	5	5	0
Average Concentration?	282.20	1440.40	2.40	15.20	20.27	NA
Standard Deviation?	238.29	3219.71	4.25	32.87	42.89	NA
Coefficient of Variation?	0.84	2.24	1.77	2.16	2.12	NA
Blank if No Errors found						n<4

3. Temporal Trend: Plot of Concentration vs. Sampling Time

Hazardous substance?	**Gasoline**
Plume Stability?	**Stable**





Module1: Mann-Kendall Trend Test for Plume Stability (Non-parametric Statistical Test)

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

Well (Sampling) Location?	**MW-4**
Level of Confidence (Decision Criteria)?	**85%**

1. Monitoring Well Information: Contaminant Concentration at a well: Quarterly sampling recommended.

		Hazardous Substances (unit is ug/L)					
Sampling Event	Date Sampled	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
#1	11/14/1997	25	0.5	0.5	0.5	1.5	
#2	8/26/2011	135	0.5	0.5	0.5	1.5	
#3	8/22/2013	25	0.5	0.5	0.5	1.5	
#4	11/21/2013	25	0.5	0.5	0.5	1.5	
#5	2/21/2014	25	0.5	0.5	0.5	1.5	
#6							
#7							
#8							
#9							
#10							
#11							
#12							
#13							
#14							
#15							
#16							

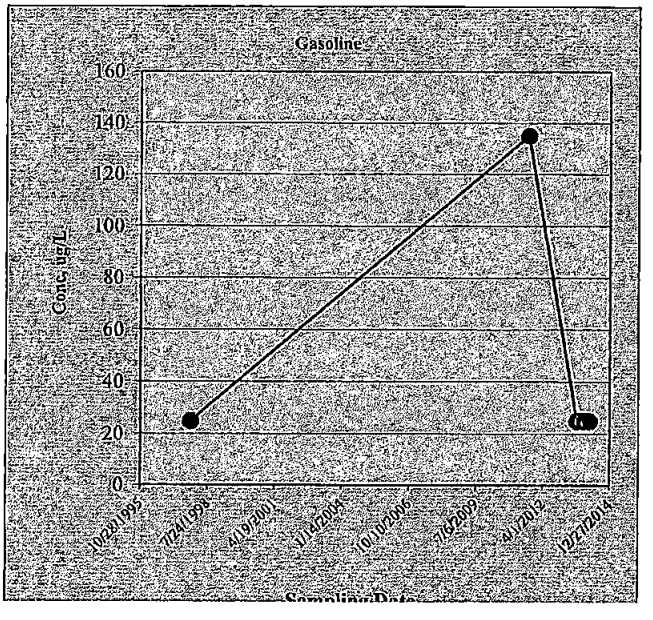
2. Mann-Kendall Non-parametric Statistical Test Results

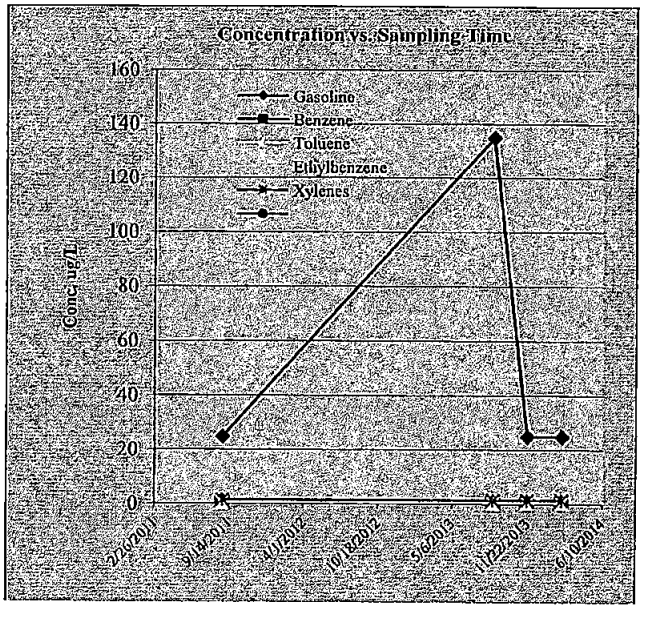
Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	59.20%	40.80%	40.80%	40.80%	40.80%	NA
Plume Stability?	Undetermined	Stable	Stable	Stable	Stable	NA
Coefficient of Variation?	CV > 1	CV <= 1	CV <= 1	CV <= 1	CV <= 1	n<4
Mann-Kendall Statistic "S" value?	-2	0	0	0	0	0
Number of Sampling Rounds?	5	5	5	5	5	0
Average Concentration?	47.00	0.50	0.50	0.50	1.50	NA
Standard Deviation?	49.19	0.00	0.00	0.00	0.00	NA
Coefficient of Variation?	1.05	0.00	0.00	0.00	0.00	NA
Blank if No Errors found						n<4

3. Temporal Trend: Plot of Concentration vs. Sampling Time

Hazardous substance? **Gasoline**

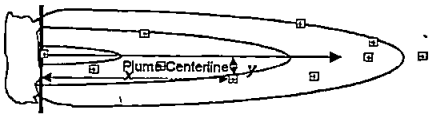
Plume Stability? **Undetermined**





Module 2: Inputs: Enter Historical Ground Water Data

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*
Hazardous Substance	*Gasoline*



1. Monitoring Well information: Contaminant Concentration at a well: Note: relationship of "y/x ≤ 0.33" is preferred

Well Location:		Unit	MW-5	MW-2	MW-3	MW-4												
Dist from source, x-direction		ft	0.001	44	78	128												
Off-centerline dist, y-direction		ft	0.001	18	13	0.001												
Sampling Event	Date sampled	day	Unit of concentration is ug/L															
#1	9/25/97	0		4700	700	25												
#2	8/25/11	5082		2950	153	135												
#3	8/22/13	5810		5000	209	25												
#4	11/21/13	5901	98100	1760	235	25												
#5	2/21/14	5993	30300	1360	114	25												
#6																		
#7																		
#8																		
#9																		
#10																		
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			64200.0	3154.0	282.2	47.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Concentration			98100	5000	700	135	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			30300	1360	114	25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	139.1												
#6																		
#7																		
#8																		
#9																		
#10																		
#11																		
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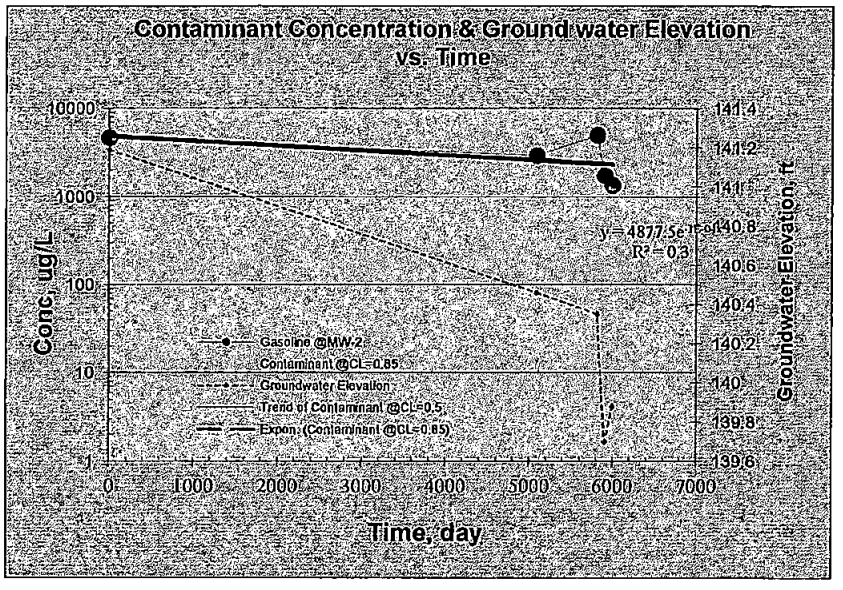
#17																		
#18																		
#19																		
#20																		

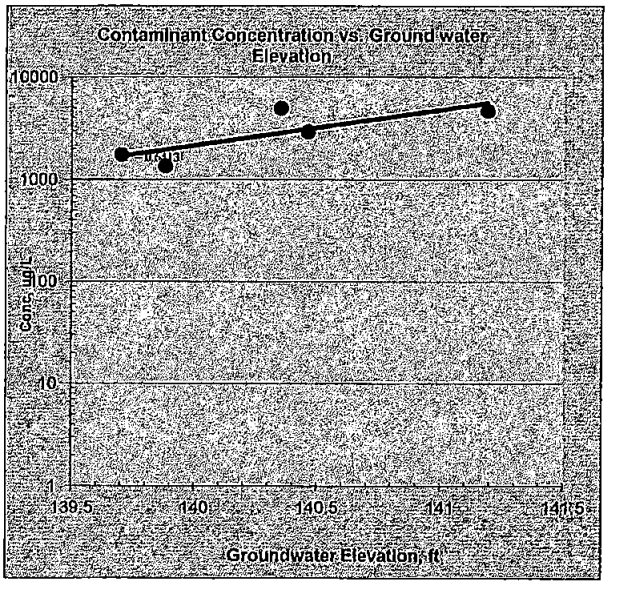
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Gasoline*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

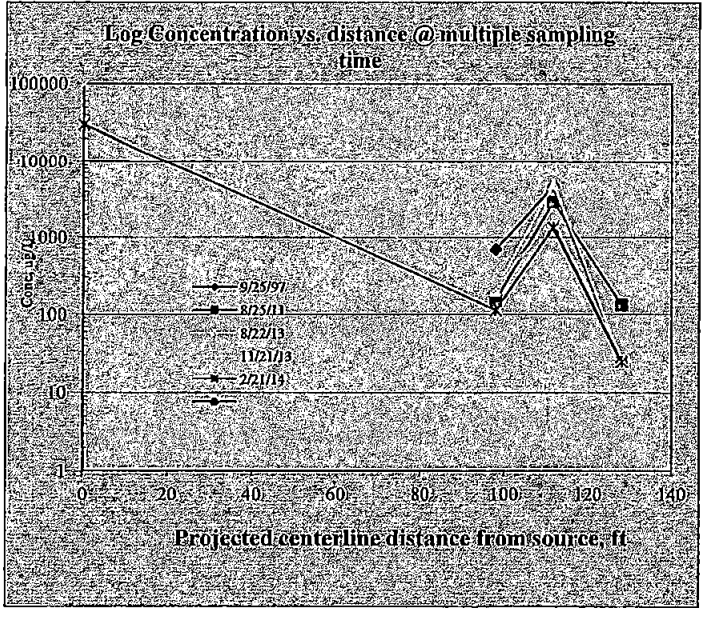
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*66.072%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.045* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*15.391* @50% C.L.;	*NA* @85% C.L.	

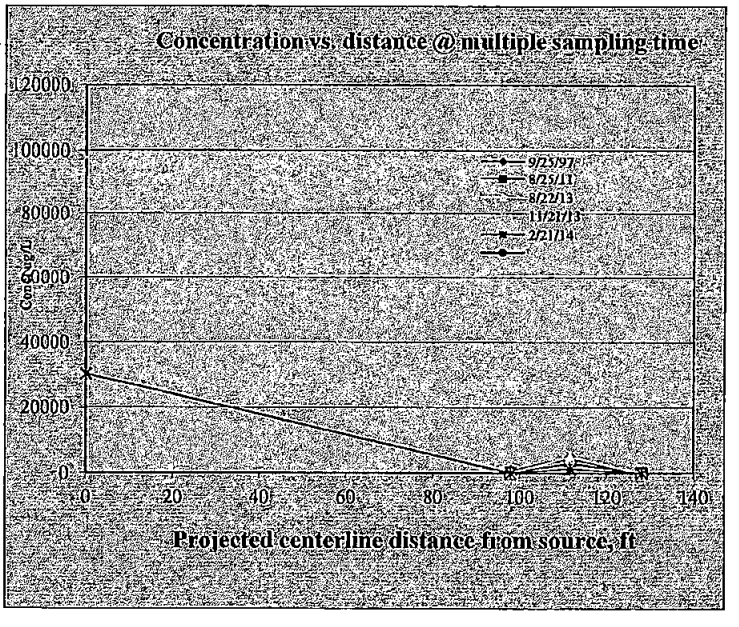




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



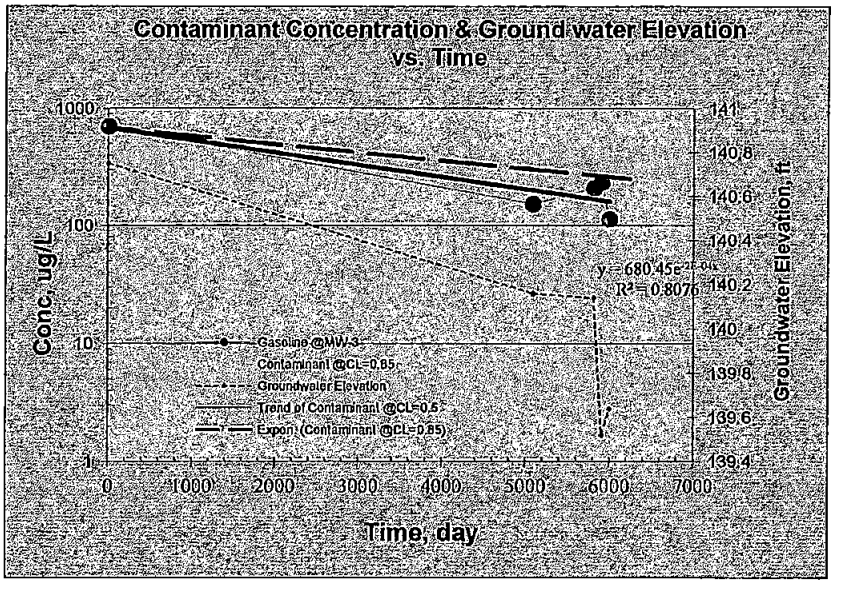


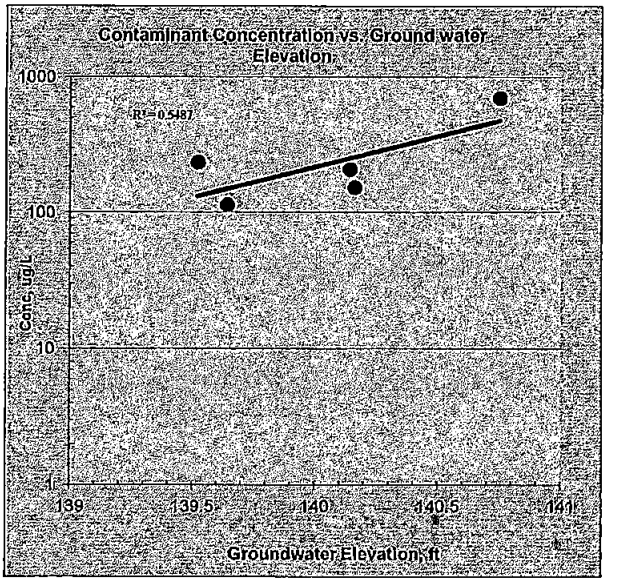
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Gasoline*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

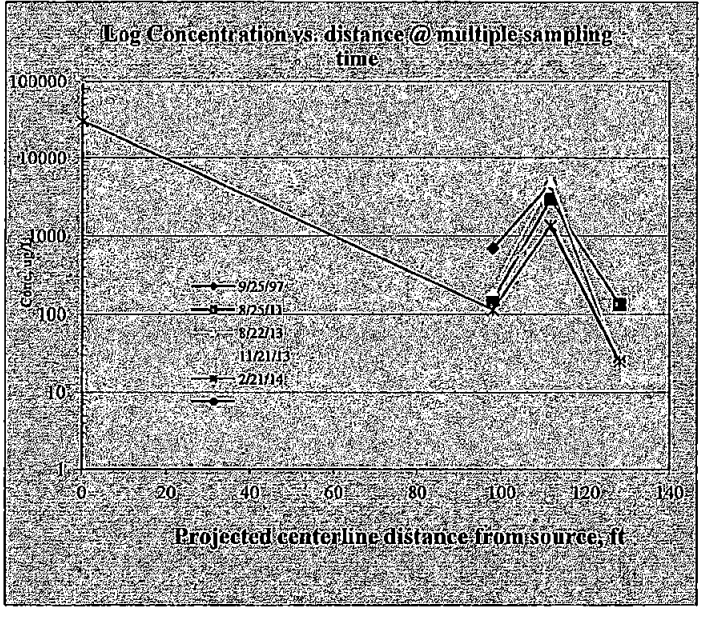
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*96.188%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.088* @50% C.L.;	*0.059* @85% C.L.	
Half Life for k_{point}, yr	*7.876* @50% C.L.;	*11.847* @85% C.L.	

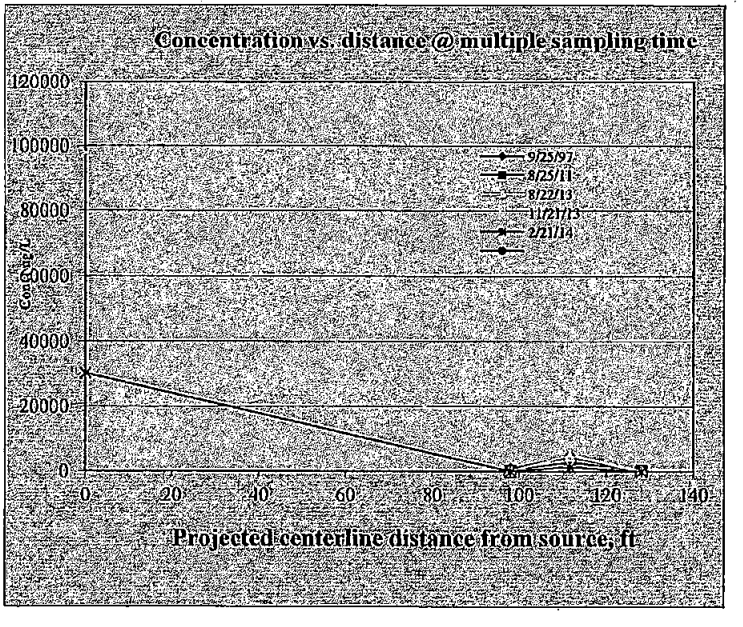




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



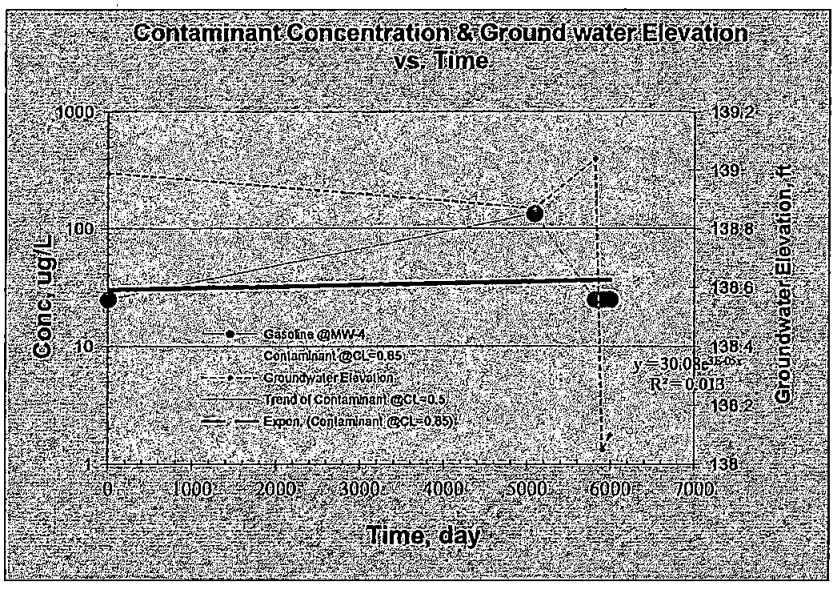


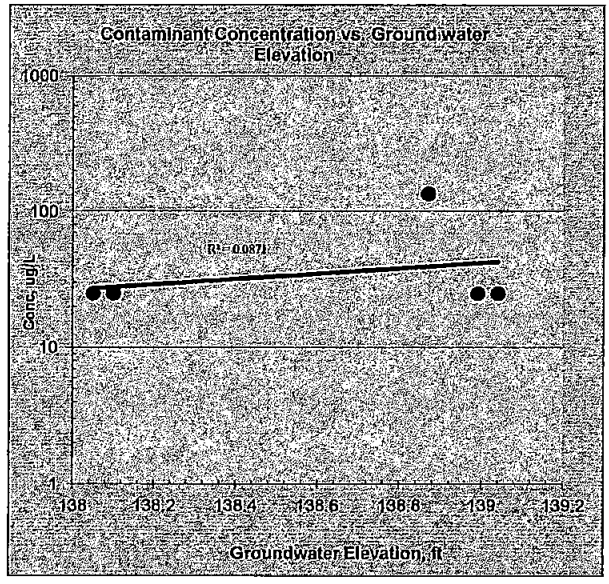
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Gasoline*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

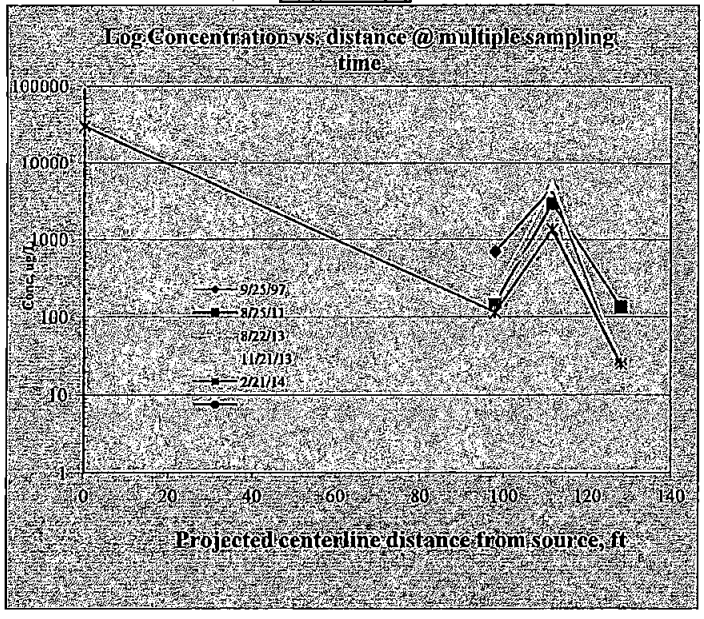
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*14.486%*		
Plume Stability?	UD	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*NA* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*NA* @50% C.L.;	*NA* @85% C.L.	

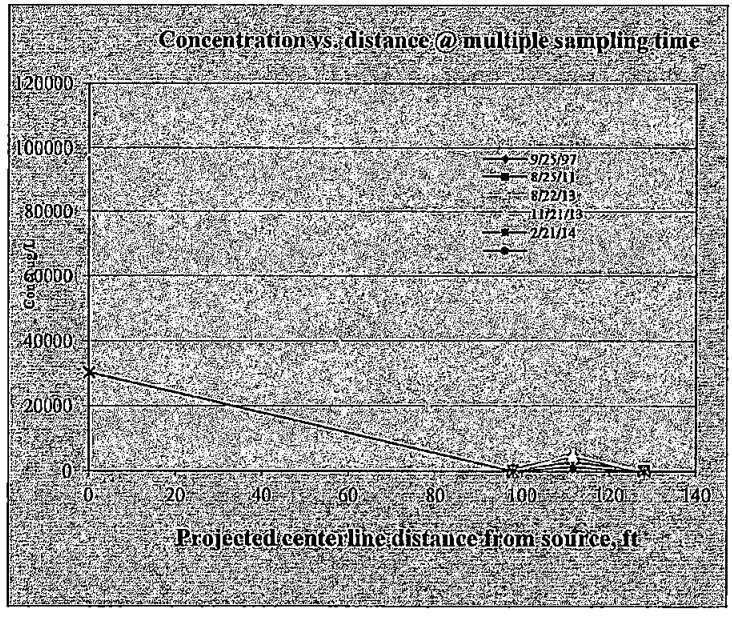




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	





Module 2: Temporal Analysis: Concentration of contaminant vs. time (Regression Analysis at each well)

Site Name: Hilton Seattle Hotel
Site Address: Seattle, WA
Additional Description: NA Evaluation
Hazardous Substance Gasoline

1. Level of Confidence (Decision Criteria)? 85%

2. Prediction: Calculation of Restoration Time and Predicted Concentration at Wells

Well Location		MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A. Cleanup Level (Criterion) to be achieved?	ug/L	800	800	800	800												
A.1 Average (@50% CL[1] best-fitting values)																	
Time to reach the criterion	yr	NA	NA	-1.84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	NA	11/23/95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A.2 Boundary (@85% CL)																	
Time to reach the criterion[2]	yr	NA	NA	-2.77	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	NA	12/20/94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/14	9/30/14	9/30/14	9/30/14												
B.1 Average conc predicted (@50% CL)	ug/L	#DIV/0!	NA	152.09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	#DIV/0!	NA	251.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	1.000	0.300	0.808	0.013	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	-1.000	-0.548	-0.899	0.114	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	2	5	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

4. Statistical Inference on the Slope of the Log-Linear Regression Line with t-statistics

One-tailed Confidence Level calculated, %		NA	66.072%	96.188%	14.486%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sufficient evidence to support that the slope of the regression line is significantly different from zero?		NA	NO!	YES!	NO!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		NA	0.526	NA	1.047	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		NA	Stable	Shrinking	UD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

5. Calculation of Point Decay Rate Constant (k_{point})

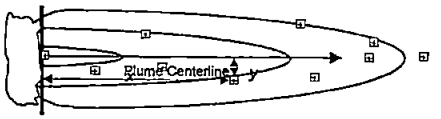
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	NA	0.045	0.088	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	NA	0.059	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	NA	15.391	7.876	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	NA	11.847	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: 1. CL : Confidence Level; UD= Undetermined

2. The length of time that will actually be required is estimated to be no more than years calculated (@ 85% of confidence level.)

Module 2: Inputs: Enter Historical Ground Water Data

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*
Hazardous Substance	*Benzene*



1. Monitoring Well information: Contaminant Concentration at a well: Note: relationship of "y/x ≤ 0.33" is preferred

Well Location:		Unit	MW-5	MW-2	MW-3	MW-4												
Dist from source, x-direction		ft	0.001	44	78	128												
Off-centerline dist, y-direction		ft	0.001	18	13	0.001												
Sampling Event	Date sampled	day	Unit of concentration is ug/L															
#1	9/25/97	0		6700	7200	0.5												
#2	8/25/11	5082		76.1	0.5	0.5												
#3	8/22/13	5810		3.07	0.5	0.5												
#4	11/21/13	5901	230	1.4	0.5	0.5												
#5	2/21/14	5993	193	2.9	0.5	0.5												
#6																		
#7																		
#8																		
#9																		
#10																		
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			211.5	1356.7	1440.4	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Concentration			230	6700	7200	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			193	1.4	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

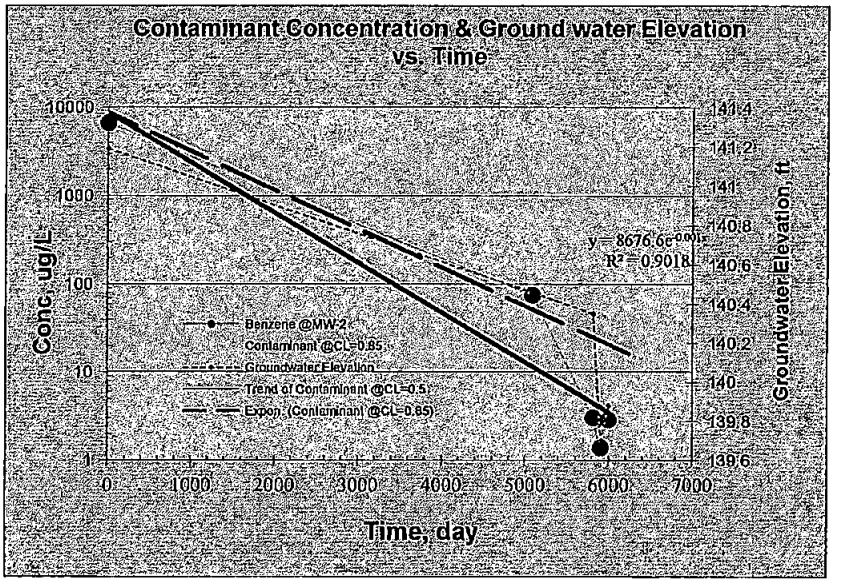
Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
#6																		
#7																		
#8																		
#9																		
#10																		
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		

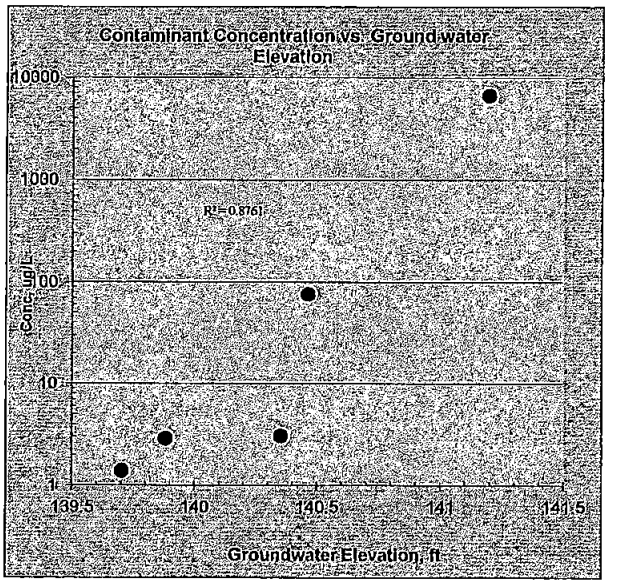
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Benzene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

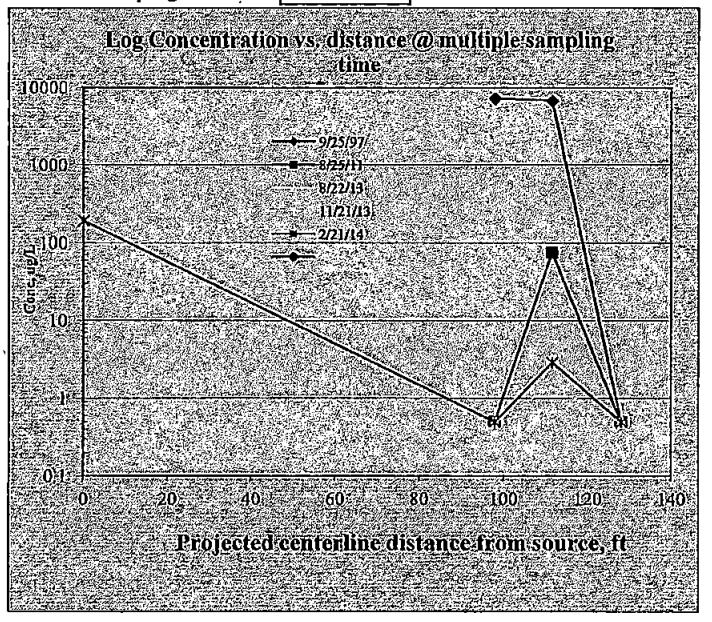
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*98.654%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{polut}), yr^{-1}	*0.475* @50% C.L.;	*0.368* @85% C.L.	
Half Life for k_{polut}, yr	*1.458* @50% C.L.;	*1.885* @85% C.L.	

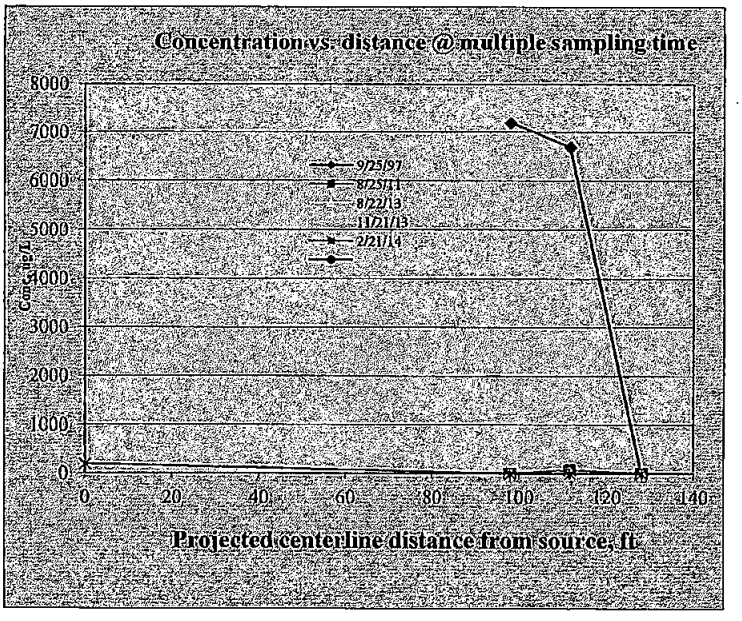




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



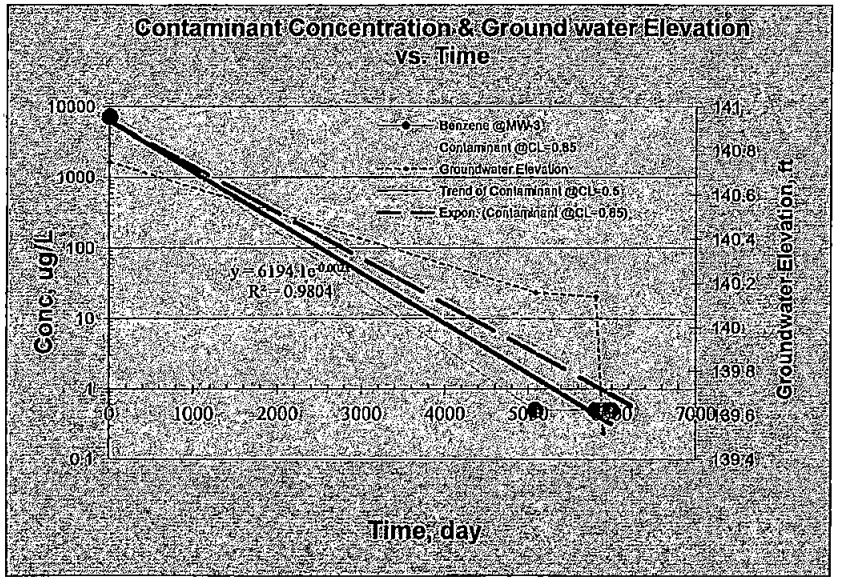


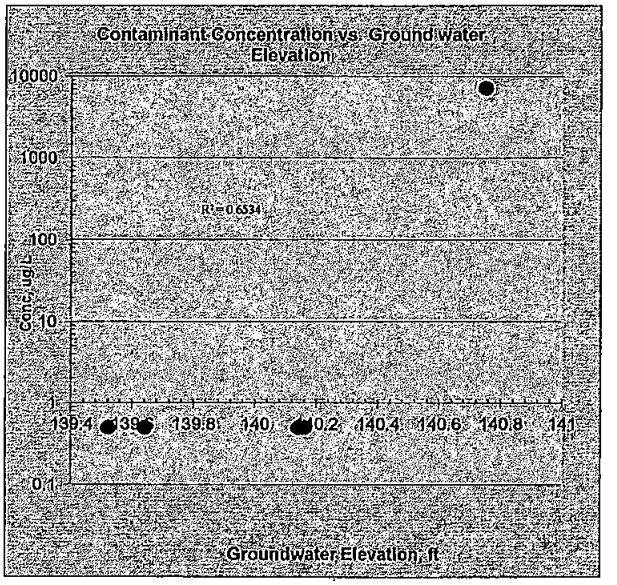
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Benzene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

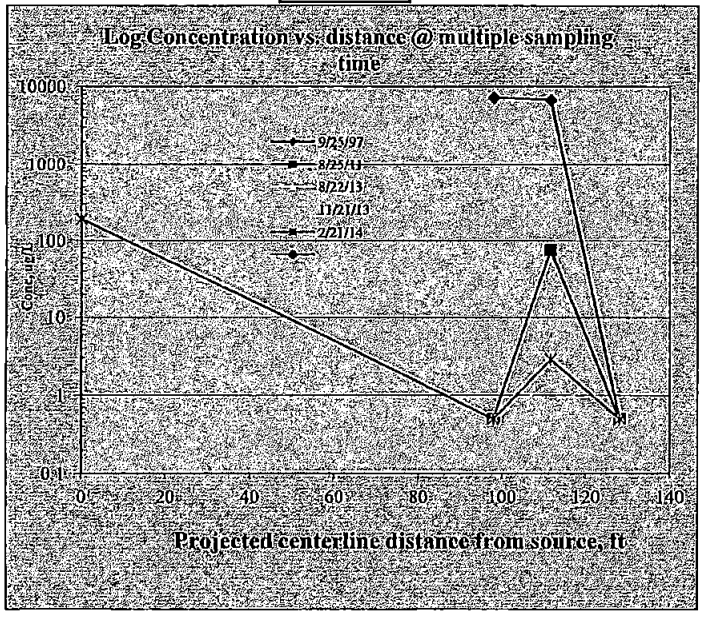
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.882%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.601* @50% C.L.;	*0.543* @85% C.L.	
Half Life for k_{point}, yr	*1.152* @50% C.L.;	*1.277* @85% C.L.	

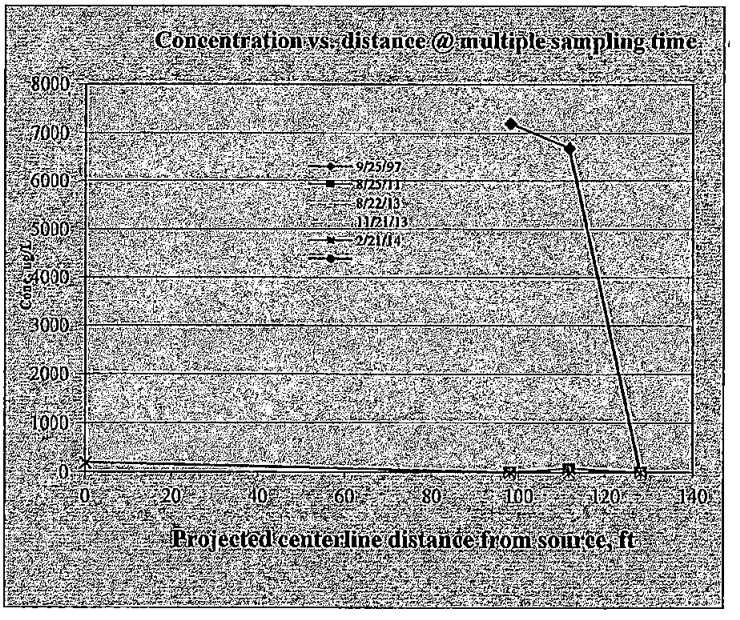




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



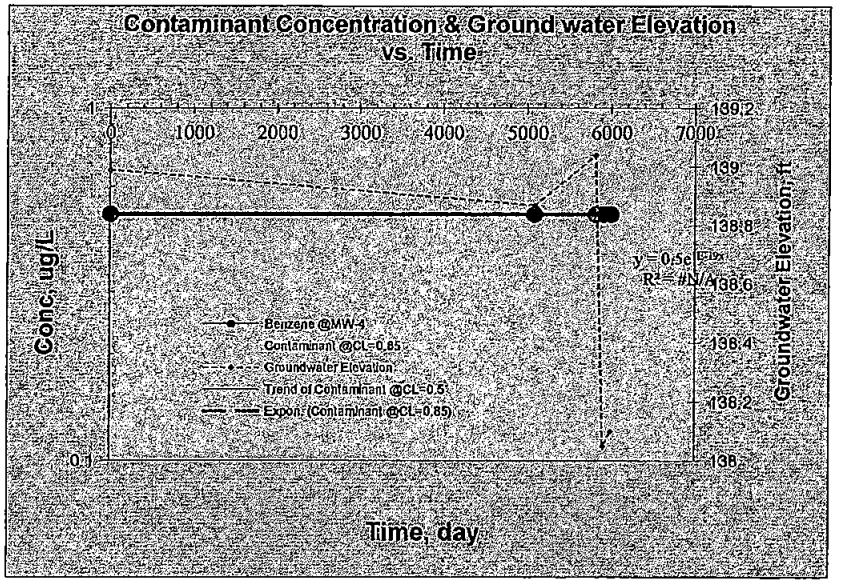


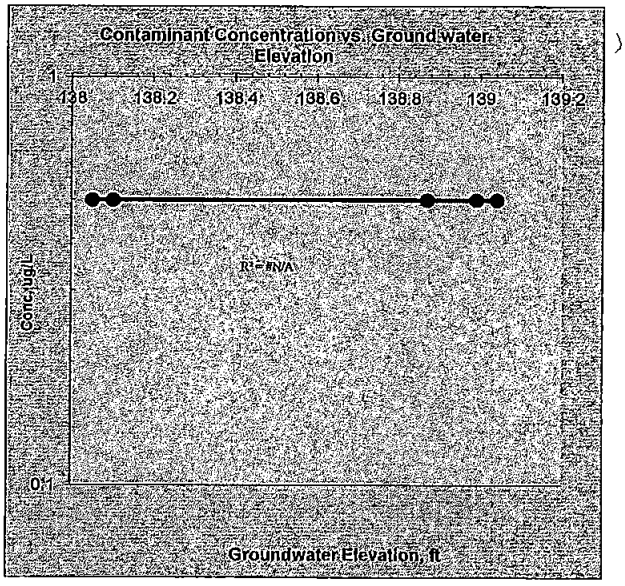
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Benzene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

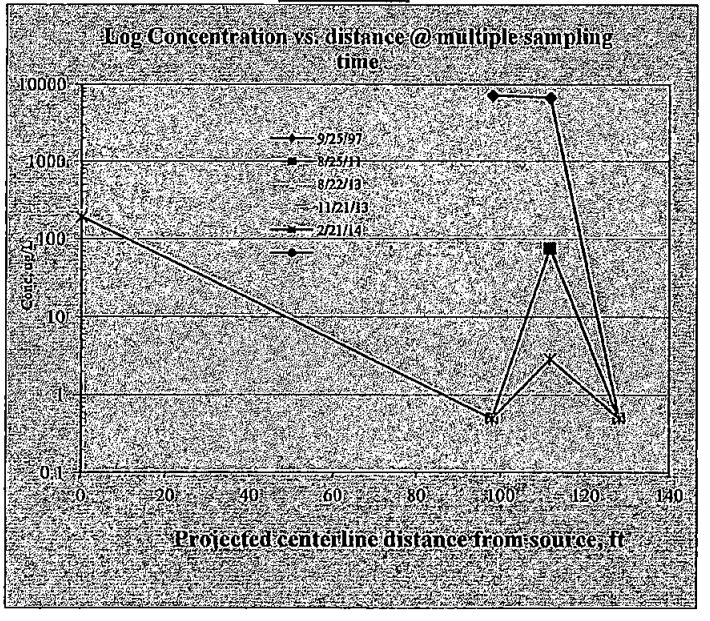
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?		*NA*	
Plume Stability?	NA	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}		*NA* @50% C.L.;	*NA* @85% C.L.
Half Life for k_{point}, yr		*NA* @50% C.L.;	*NA* @85% C.L.

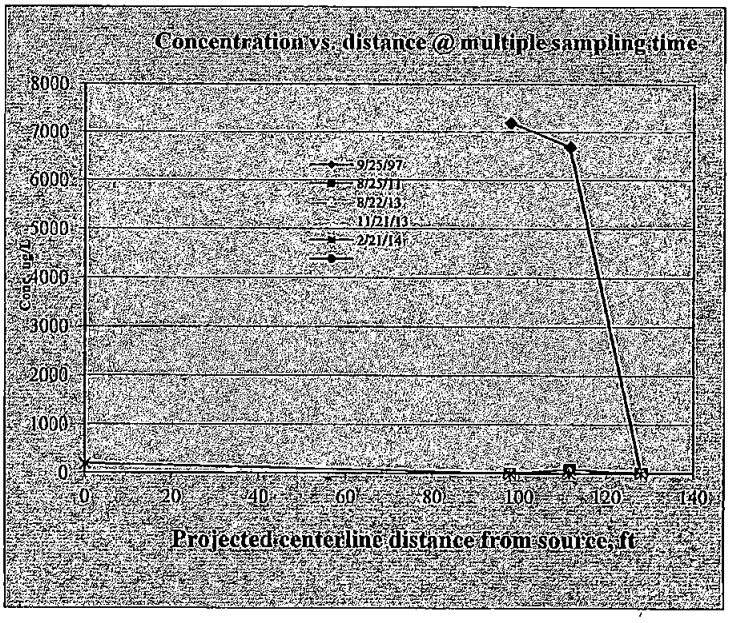




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	





Module 2: Temporal Analysis: Concentration of contaminant vs. time (Regression Analysis at each well)

Site Name: Hilton Seattle Hotel
Site Address: Seattle, WA
Additional Description: NA Evaluation
Hazardous Substance Benzene

1. Level of Confidence (Decision Criteria)? 85%

2. Prediction: Calculation of Restoration Time and Predicted Concentration at Wells

Well Location		MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A. Cleanup Level (Criterion) to be achieved?	ug/L	5	5	5	5												
A.1 Average (@50% CL[1] best-fitting values)																	
Time to reach the criterion	yr	NA	15.69	11.84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	5/30/13	7/25/09	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A.2 Boundary (@85% CL)																	
Time to reach the criterion[2]	yr	NA	20.29	13.12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	1/2/18	11/3/10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/14	9/30/14	9/30/14	9/30/14												
B.1 Average conc predicted (@50% CL)	ug/L	#DIV/0!	2.65	0.22	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	#DIV/0!	16.59	0.60	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	1.000	0.902	0.980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	-1.000	-0.950	-0.990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	2	5	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

4. Statistical Inference on the Slope of the Log-Linear Regression Line with t-statistics

One-tailed Confidence Level calculated, %		NA	98.654%	99.882%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sufficient evidence to support that the slope of the regression line is significantly different from zero?		NA	YES!	YES!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		NA	Shrinking	Shrinking	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

5. Calculation of Point Decay Rate Constant (k_{point})

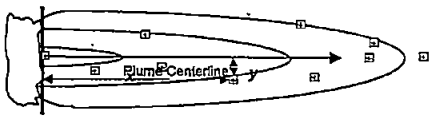
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	NA	0.475	0.601	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	0.368	0.543	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	NA	1.458	1.152	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	1.885	1.277	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: 1. CL : Confidence Level; UD= Undetermined

2. The length of time that will actually be required is estimated to be no more than years calculated (@ 85% of confidence level.)

Module 2: Inputs: Enter Historical Ground Water Data

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*
Hazardous Substance	*Ethylbenzene*



1. Monitoring Well information: Contaminant Concentration at a well: Note: relationship of "y/x ≤ 0.33" is preferred

Well Location:		Unit	MW-5	MW-2	MW-3	MW-4												
Dist from source, x-direction		ft	0.001	44	78	128												
Off-centerline dist, y-direction		ft	0.001	18	13	0.001												
Sampling Event	Date sampled	day	Unit of concentration is ug/L															
#1	9/25/97	0		670	74	0.5												
#2	8/25/11	5082		863	0.5	0.5												
#3	8/22/13	5810		408	0.5	0.5												
#4	11/21/13	5901	1070	83	0.5	0.5												
#5	2/21/14	5993	796	21	0.5	0.5												
#6																		
#7																		
#8																		
#9																		
#10																		
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			933.0	409.0	15.2	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Concentration			1070	863	74	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			796	21	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
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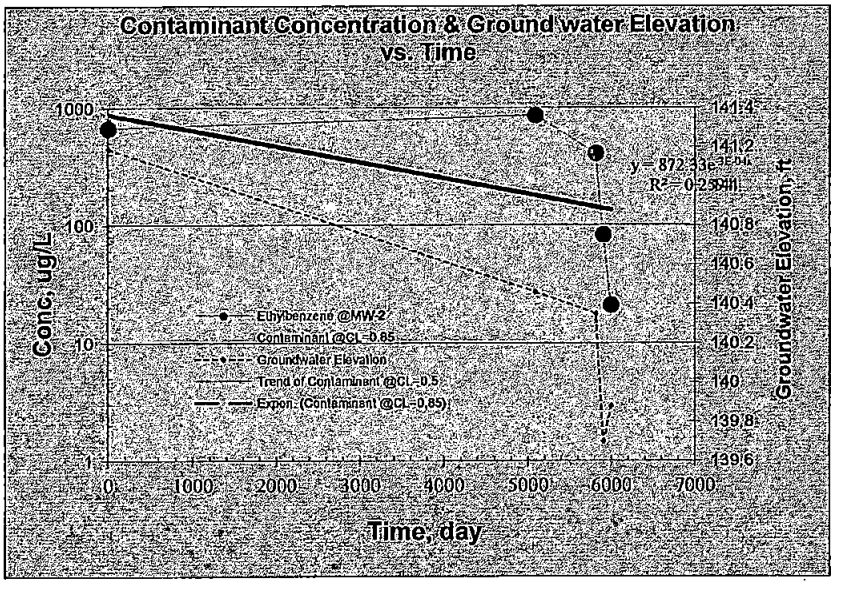
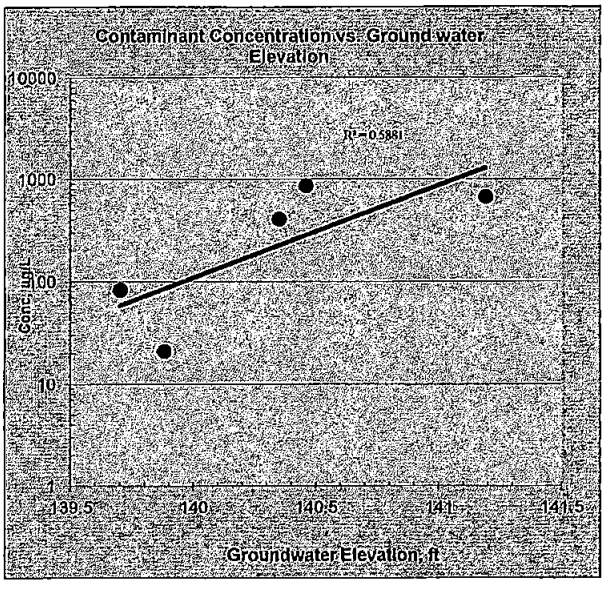
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Ethylbenzene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

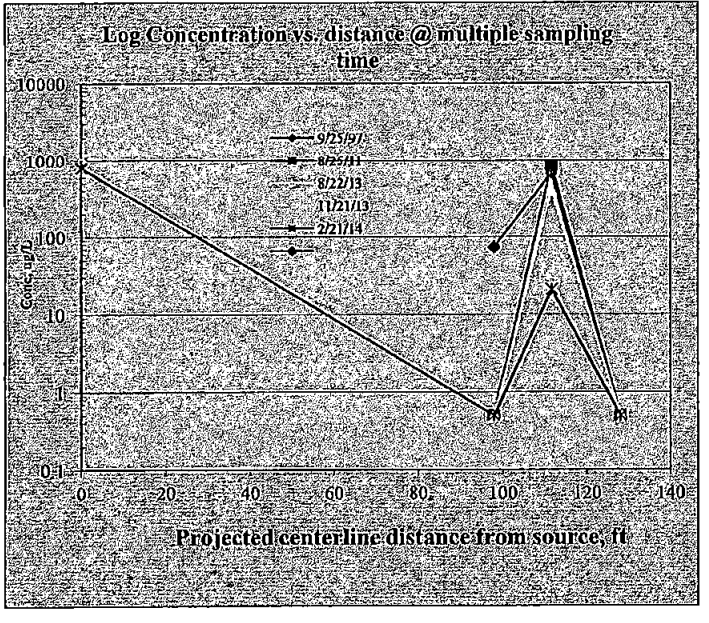
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*61.926%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{polut}), yr^{-1}	*0.114* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{polut}, yr	*6.083* @50% C.L.;	*NA* @85% C.L.	

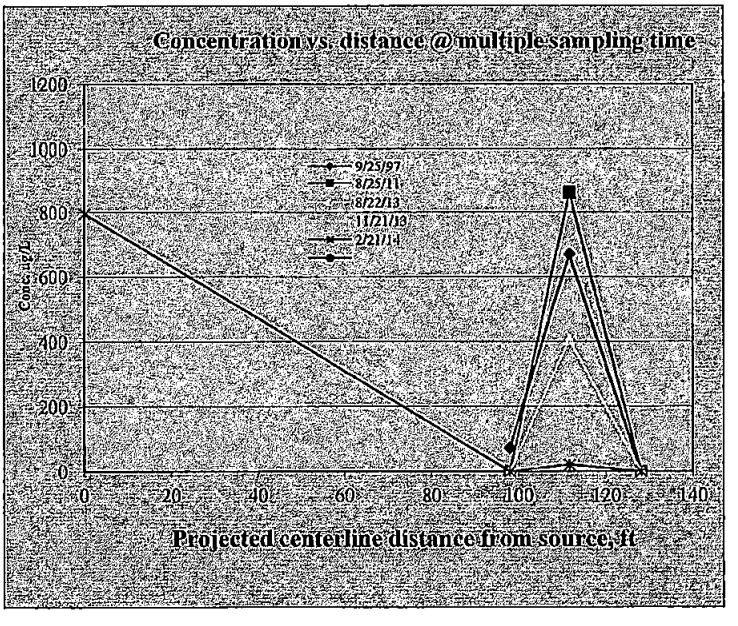




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	**25-Sep-97**
Plot #2:	Sampling date #2	**25-Aug-11**
Plot #3:	Sampling date #3	**22-Aug-13**
Plot #4:	Sampling date #4	**21-Nov-13**
Plot #5:	Sampling date #5	**21-Feb-14**
Plot #6:	Sampling date #6	



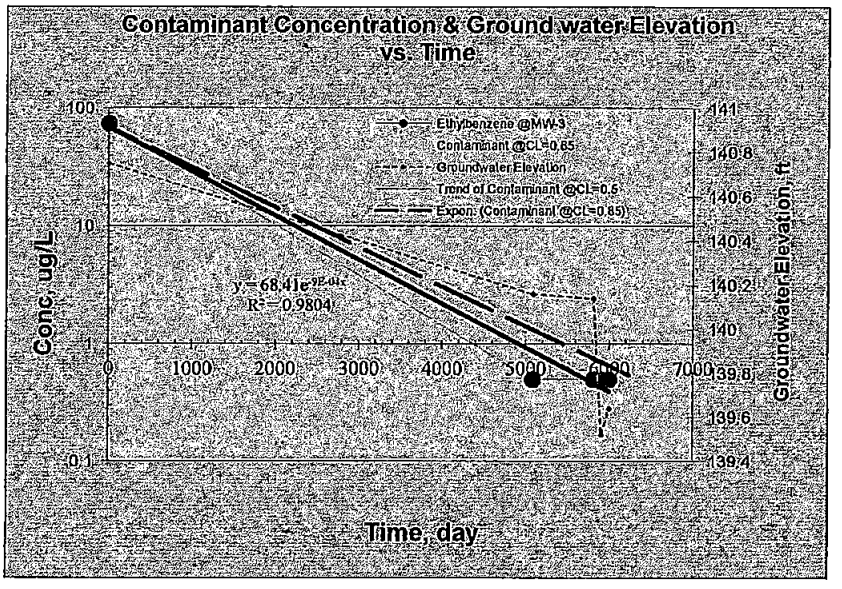


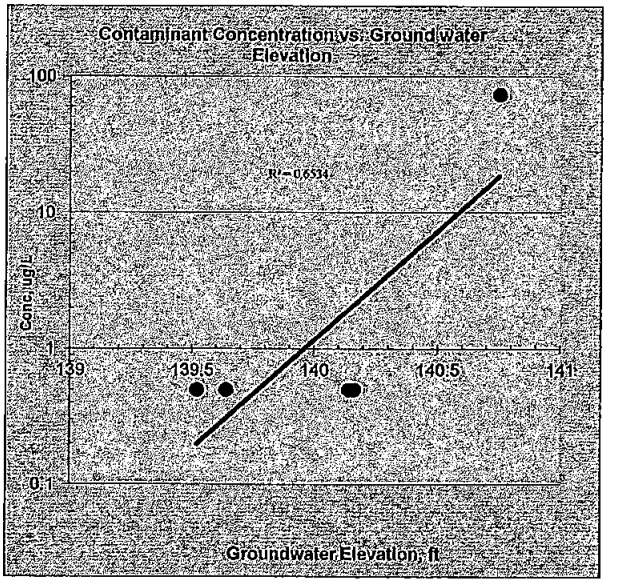
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Ethylbenzene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

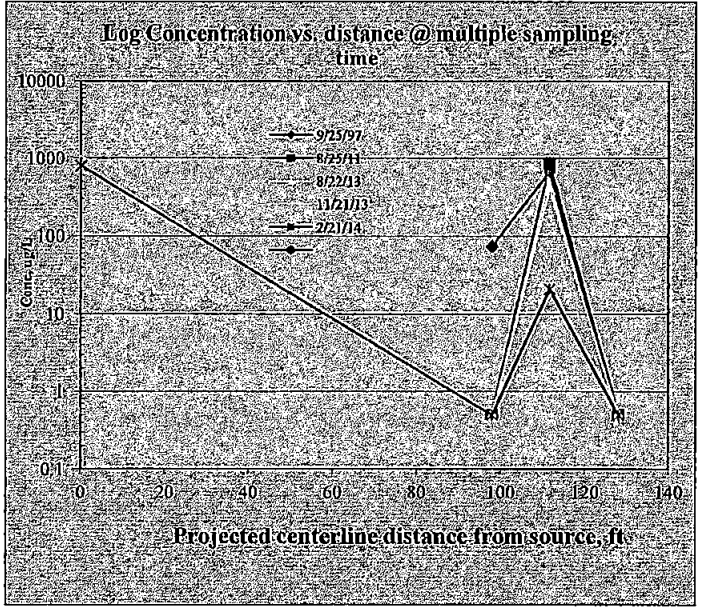
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.882%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.314* @50% C.L.;	*0.283* @85% C.L.	
Half Life for k_{point}, yr	*2.208* @50% C.L.;	*2.446* @85% C.L.	

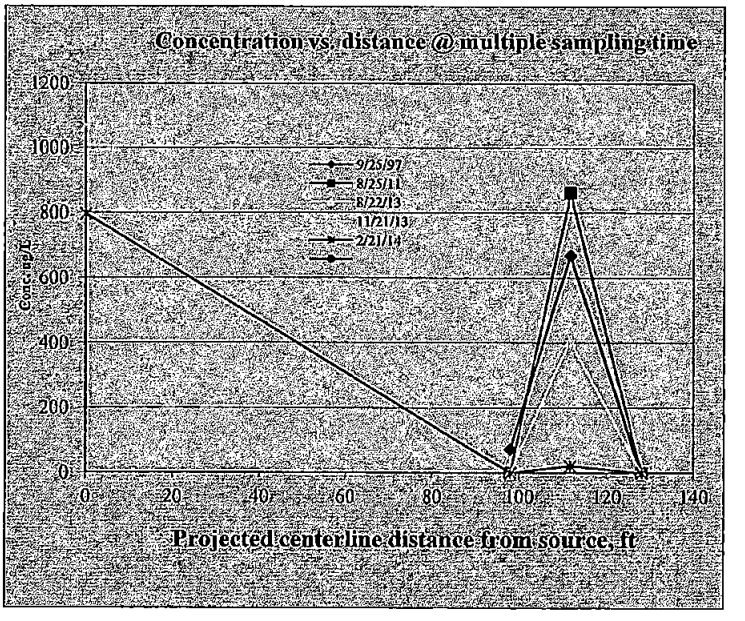




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



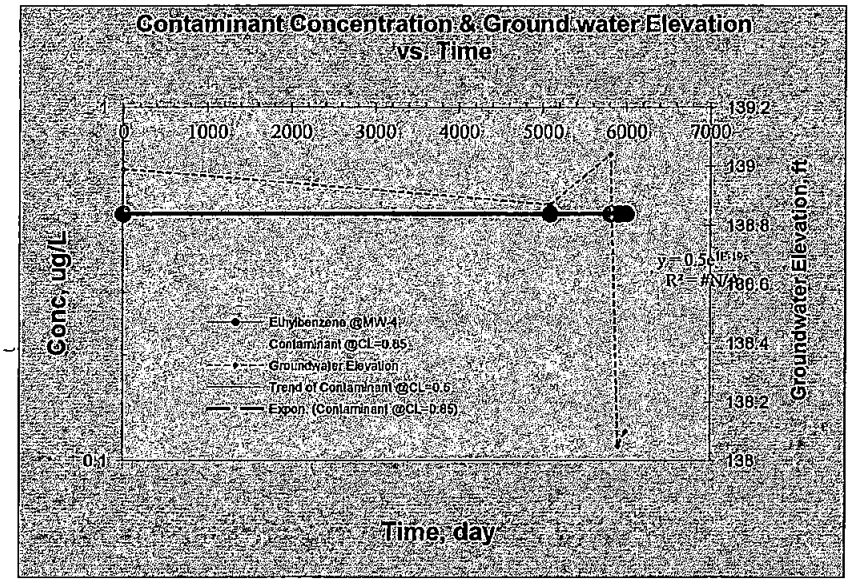


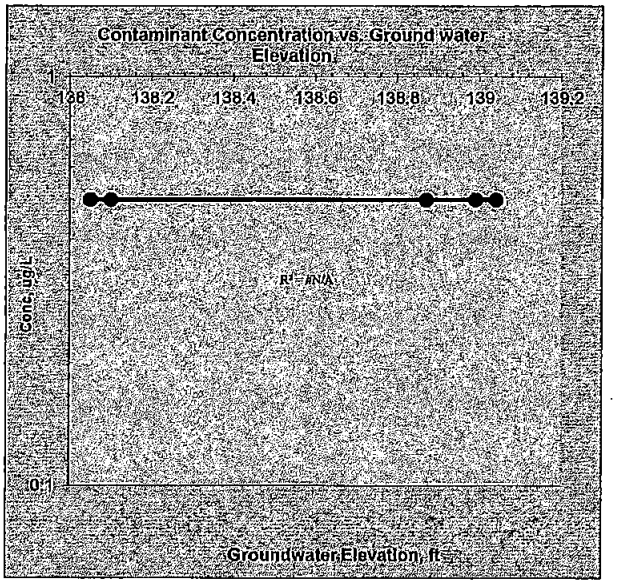
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Ethylbenzene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

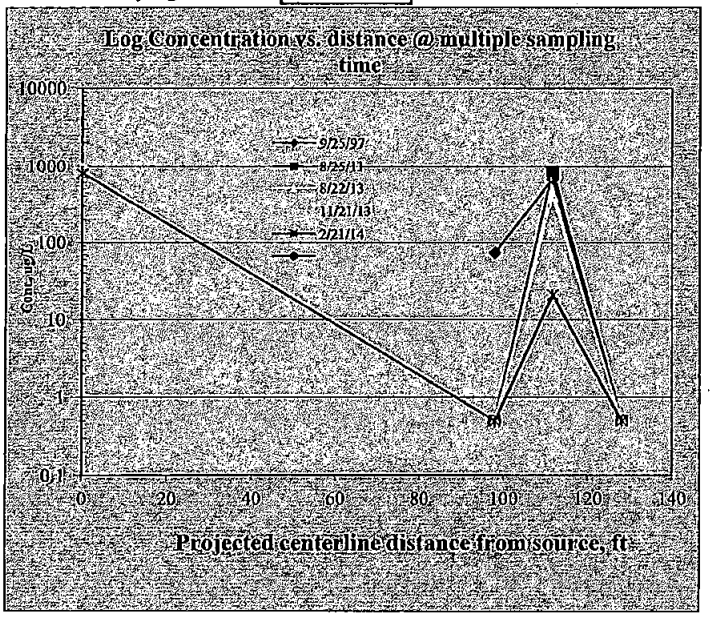
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*NA*		
Plume Stability?	NA	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*NA* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*NA* @50% C.L.;	*NA* @85% C.L.	

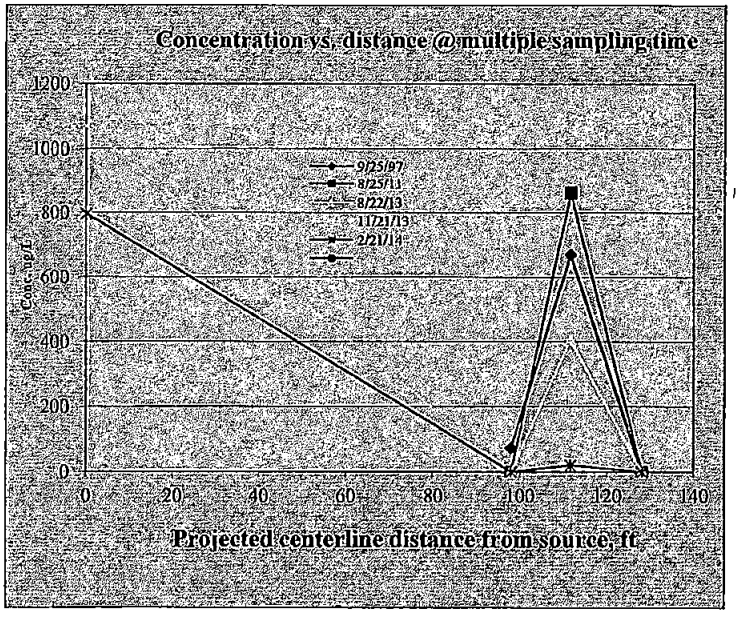




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	





Module 2: Temporal Analysis: Concentration of contaminant vs. time (Regression Analysis at each well)

Site Name: Hilton Seattle Hotel
Site Address: Seattle, WA
Additional Description: NA Evaluation
Hazardous Substance Ethylbenzene

1. Level of Confidence (Decision Criteria)? 85%

2. Prediction: Calculation of Restoration Time and Predicted Concentration at Wells

Well Location		MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A. Cleanup Level (Criterion) to be achieved?	ug/L	700	700	700	700												
A.1 Average (@50% CL[1] best-fitting values)																	
Time to reach the criterion	yr	NA	NA	-7.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	NA	4/30/90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A.2 Boundary (@85% CL)																	
Time to reach the criterion[2]	yr	NA	NA	-8.21	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	NA	7/13/89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/14	9/30/14	9/30/14	9/30/14												
B.1 Average conc predicted (@50% CL)	ug/L	#DIV/0!	NA	0.33	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	#DIV/0!	NA	0.55	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	1.000	0.259	0.980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	-1.000	-0.509	-0.990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	2	5	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

4. Statistical Inference on the Slope of the Log-Linear Regression Line with t-statistics

One-tailed Confidence Level calculated, %		NA	61.926%	99.882%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sufficient evidence to support that the slope of the regression line is significantly different from zero?		NA	NO!	YES!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		NA	0.891	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		NA	Stable	Shrinking	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

5. Calculation of Point Decay Rate Constant (k_{point})

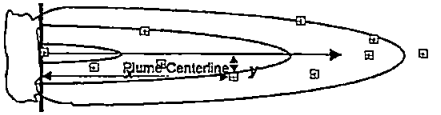
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	NA	0.114	0.314	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	NA	0.283	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	NA	6.083	2.208	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	NA	2.446	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: 1. CL : Confidence Level; UD= Undetermined

2. The length of time that will actually be required is estimated to be no more than years calculated (@ 85% of confidence level.)

Module 2: Inputs: Enter Historical Ground Water Data

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*
Hazardous Substance	*Toluene*



1. Monitoring Well information: Contaminant Concentration at a well: Note: relationship of "y/x ≤ 0.33" is preferred

Well Location:		Unit	MW-5	MW-2	MW-3	MW-4												
Dist from source, x-direction		ft	0.001	44	78	128												
Off-centerline dist, y-direction		ft	0.001	18	13	0.001												
Sampling Event	Date sampled	day	Unit of concentration is ug/L															
#1	9/25/97	0		210	10	0.5												
#2	8/25/11	5082		2.19	0.5	0.5												
#3	8/22/13	5810		2.01	0.5	0.5												
#4	11/21/13	5901	179	1.57	0.5	0.5												
#5	2/21/14	5993	122	1.62	0.5	0.5												
#6																		
#7																		
#8																		
#9																		
#10																		
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			150.5	43.5	2.4	0.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Concentration			179	210	10	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			122	1.57	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
#6																		
#7																		
#8																		
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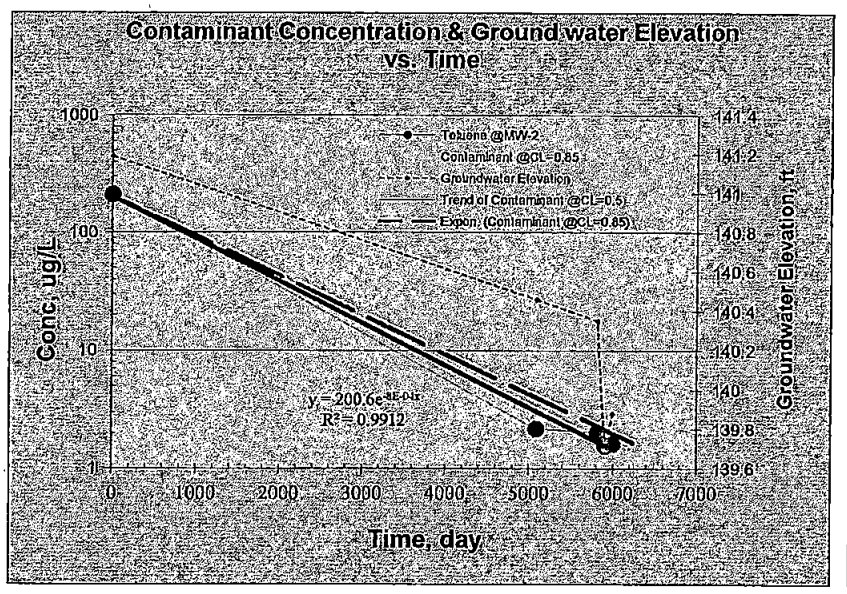
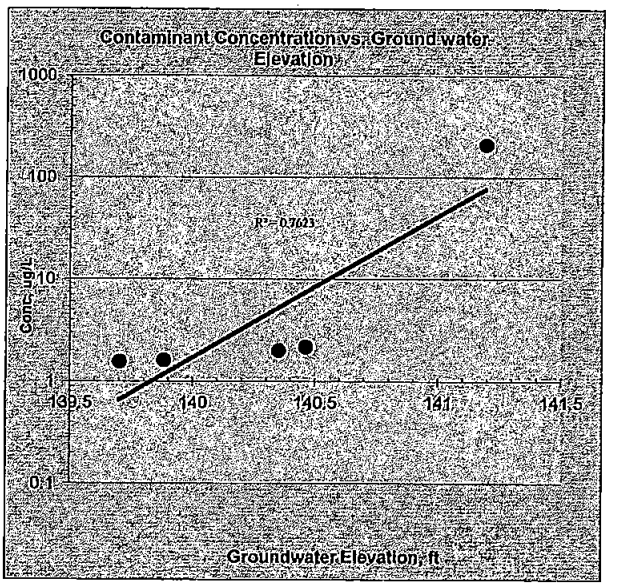
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Toluene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

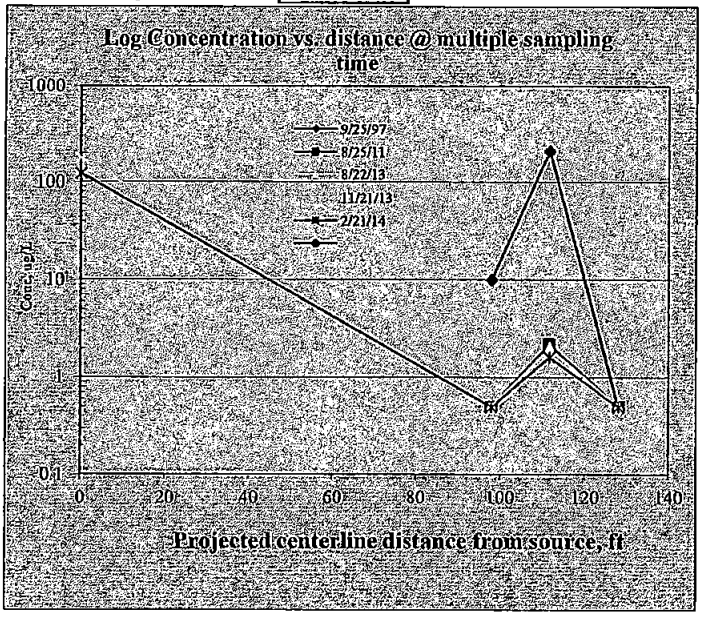
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.965%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.300* @50% C.L.;	*0.281*	@85% C.L.
Half Life for k_{point}, yr	*2.309* @50% C.L.;	*2.468*	@85% C.L.

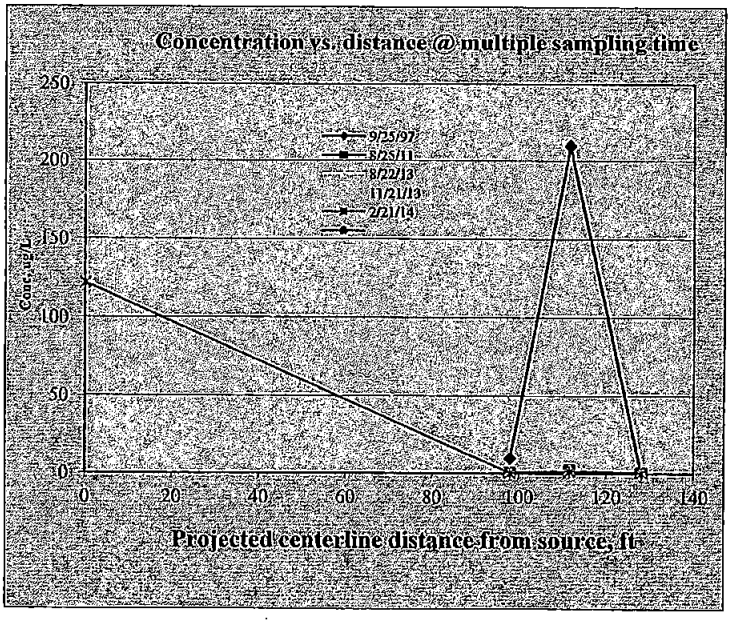




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



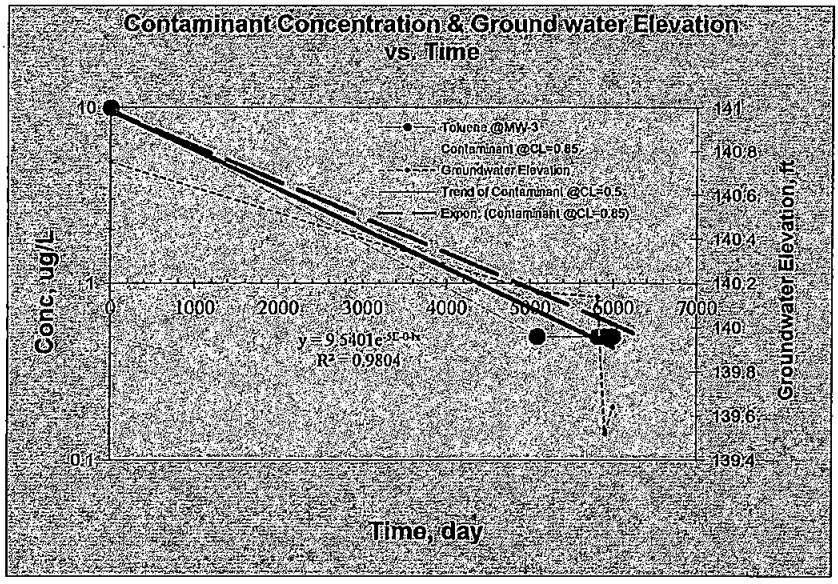


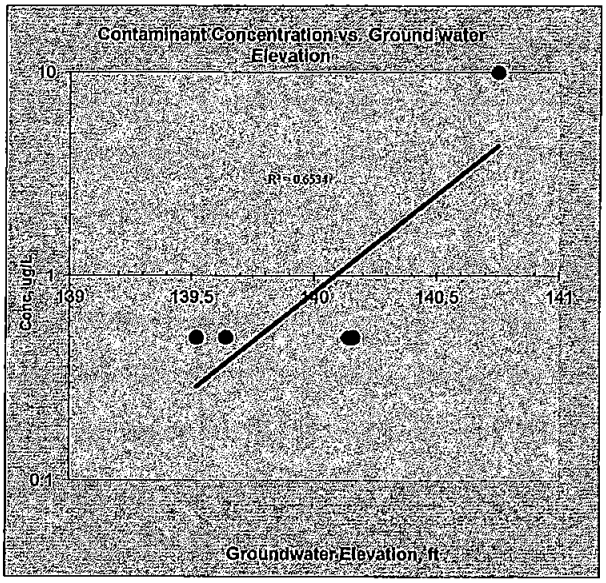
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Toluene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

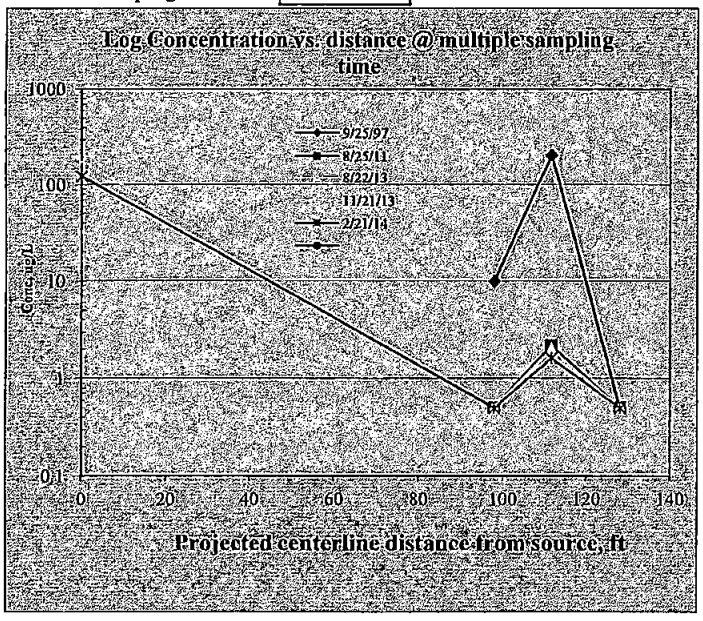
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.882%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.188* @50% C.L.;	*0.170* @85% C.L.	
Half Life for k_{point}, yr	*3.683* @50% C.L.;	*4.080* @85% C.L.	

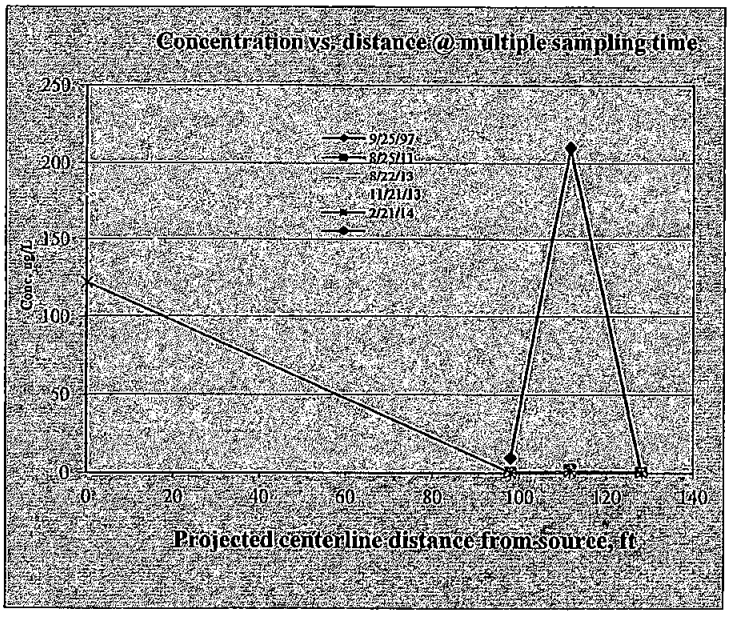




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



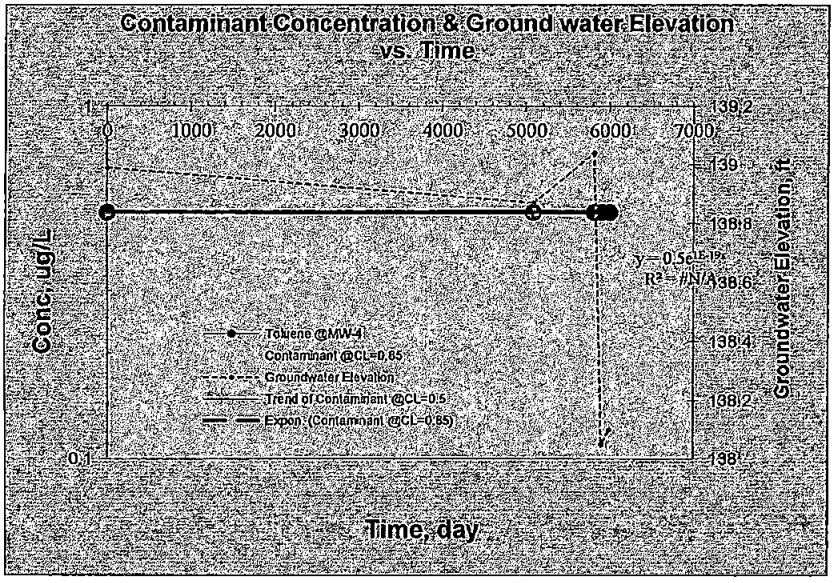


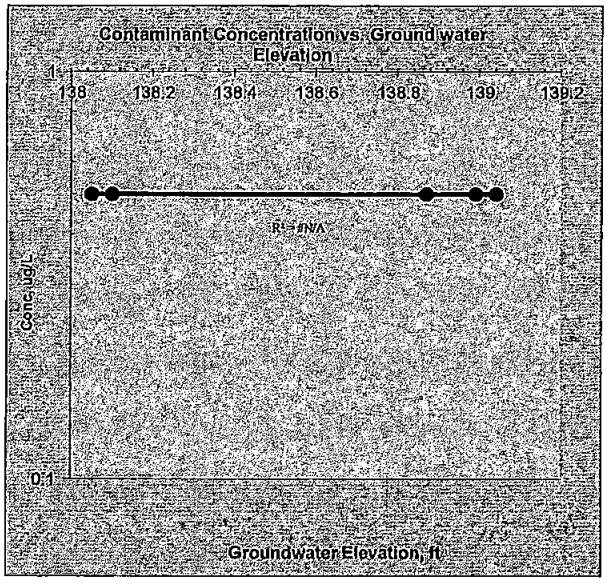
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Toluene*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

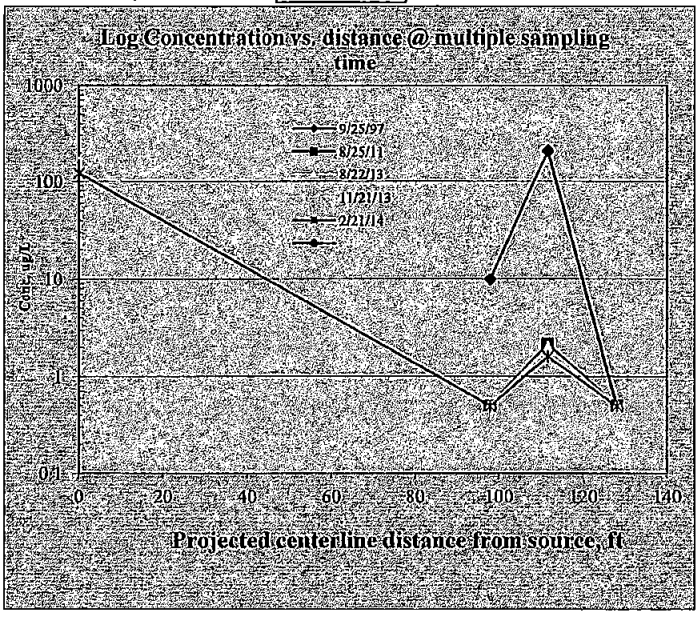
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*NA*		
Plume Stability?	NA	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*NA* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*NA* @50% C.L.;	*NA* @85% C.L.	

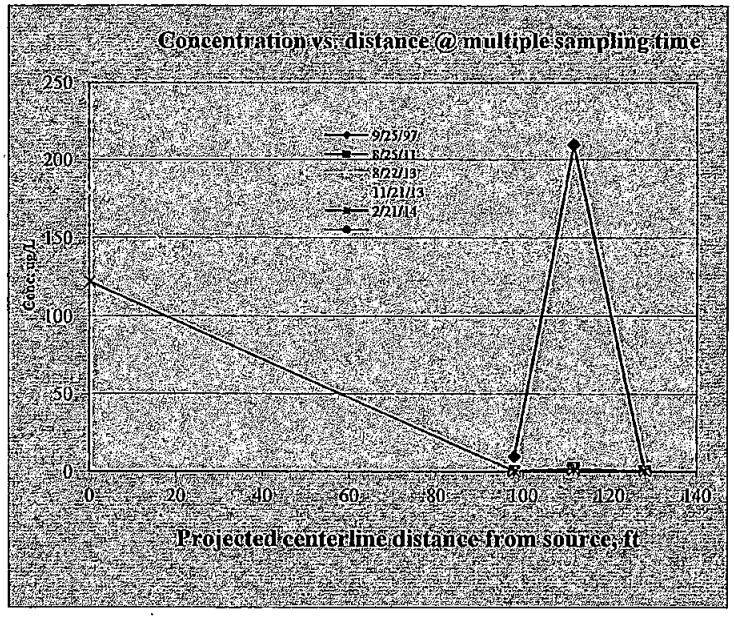




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	





Module 2: Temporal Analysis: Concentration of contaminant vs. time (Regression Analysis at each well)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Toluene*

1. Level of Confidence (Decision Criteria)? 85%

2. Prediction: Calculation of Restoration Time and Predicted Concentration at Wells

Well Location		MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A. Cleanup Level (Criterion) to be achieved?	ug/L	1000	1000	1000	1000												
A.1 Average (@50% CL[1] best-fitting values)																	
Time to reach the criterion	yr	NA	-5.35	-24.72	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	5/21/92	1/10/73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A.2 Boundary (@85% CL)																	
Time to reach the criterion[2]	yr	NA	-5.72	-27.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	1/7/92	5/14/70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/14	9/30/14	9/30/14	9/30/14												
B.1 Average conc predicted (@50% CL)	ug/L	#DIV/0!	1.21	0.39	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	#DIV/0!	1.68	0.53	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	1.000	0.991	0.980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	-1.000	-0.996	-0.990	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	2	5	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

4. Statistical Inference on the Slope of the Log-Linear Regression Line with t-statistics

One-tailed Confidence Level calculated, %		NA	99.965%	99.882%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sufficient evidence to support that the slope of the regression line is significantly different from zero?		NA	YES!	YES!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		NA	Shrinking	Shrinking	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

5. Calculation of Point Decay Rate Constant (k_{point})

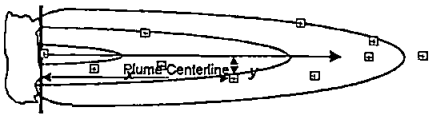
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	NA	0.300	0.188	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	0.281	0.170	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	NA	2.309	3.683	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	2.468	4.080	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: 1. CL : Confidence Level; UD= Undetermined

2. The length of time that will actually be required is estimated to be no more than years calculated (@ 85% of confidence level.)

Module 2: Inputs: Enter Historical Ground Water Data

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*
Hazardous Substance	*Xylenes*



1. Monitoring Well information: Contaminant Concentration at a well: Note: relationship of "y/x ≤ 0.33" is preferred

Well Location:		Unit	MW-5	MW-2	MW-3	MW-4												
Dist from source, x-direction		ft	0.001	44	78	128												
Off-centerline dist, y-direction		ft	0.001	18	13	0.001												
Sampling Event	Date sampled	day	Unit of concentration is ug/L															
#1	9/25/97	0		590	97	1.5												
#2	8/25/11	5082		22	1.35	1.5												
#3	8/22/13	5810		10.8	1	1.5												
#4	11/21/13	5901	6100	6.9	1	1.5												
#5	2/21/14	5993	3670	7.4	1	1.5												
#6																		
#7																		
#8																		
#9																		
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#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			4885.0	127.4	20.3	1.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Maximum Concentration			6100	590	97	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			3670	6.9	1	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
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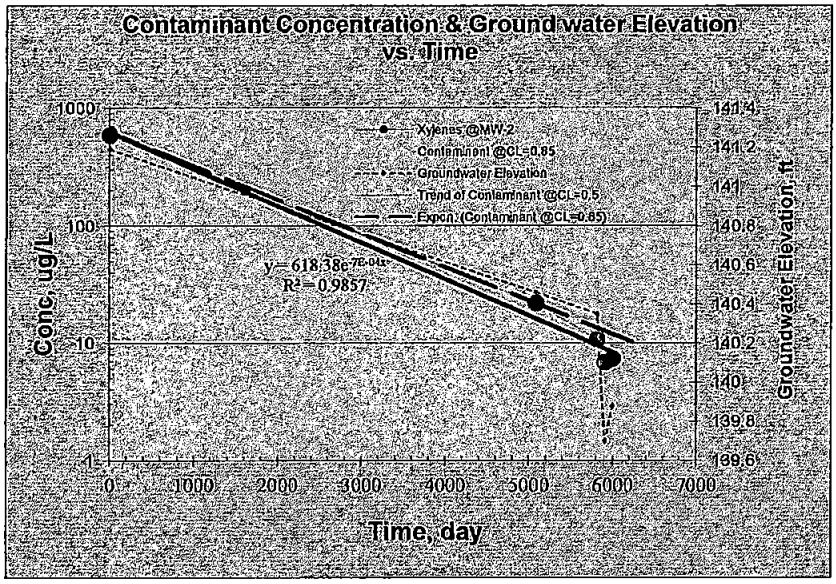
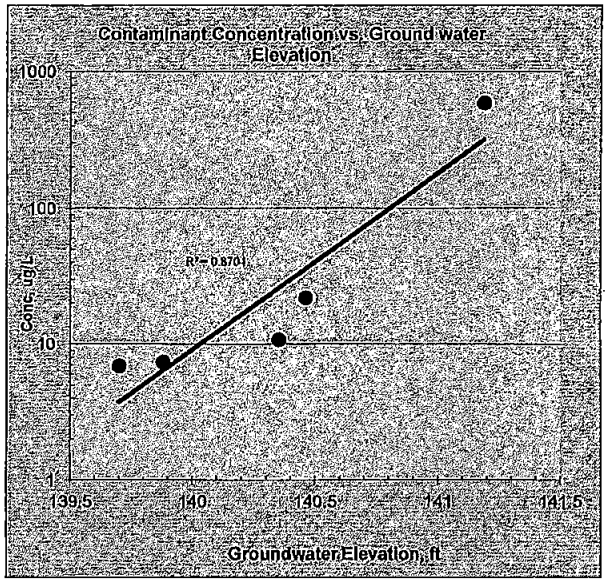
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Xylenes*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

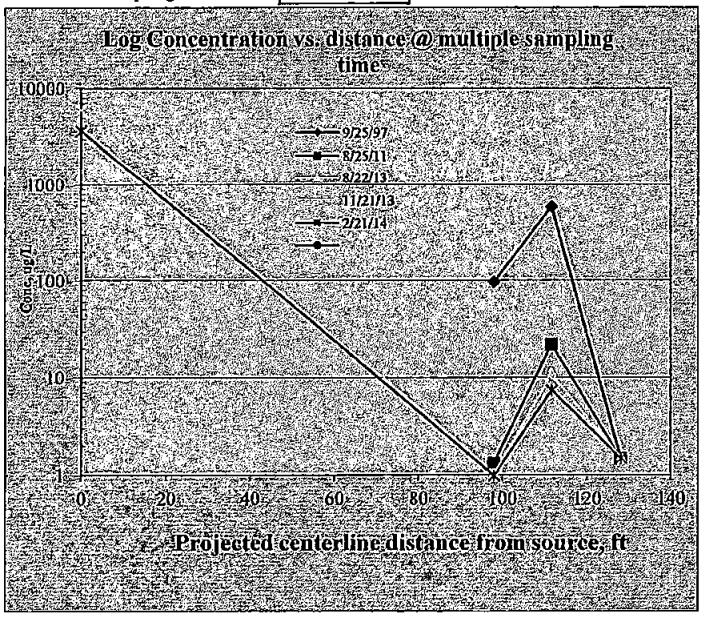
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.927%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.262* @50% C.L.;	*0.240* @85% C.L.	
Half Life for k_{point}, yr	*2.646* @50% C.L.;	*2.885* @85% C.L.	

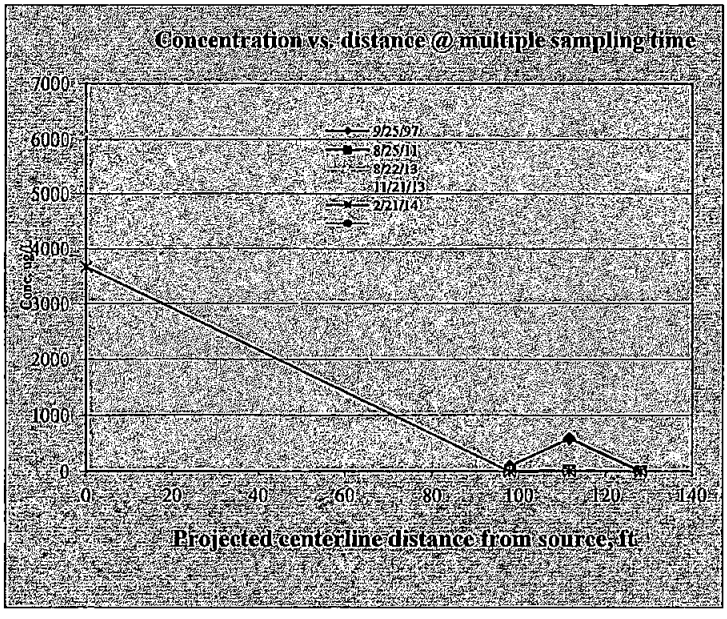




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



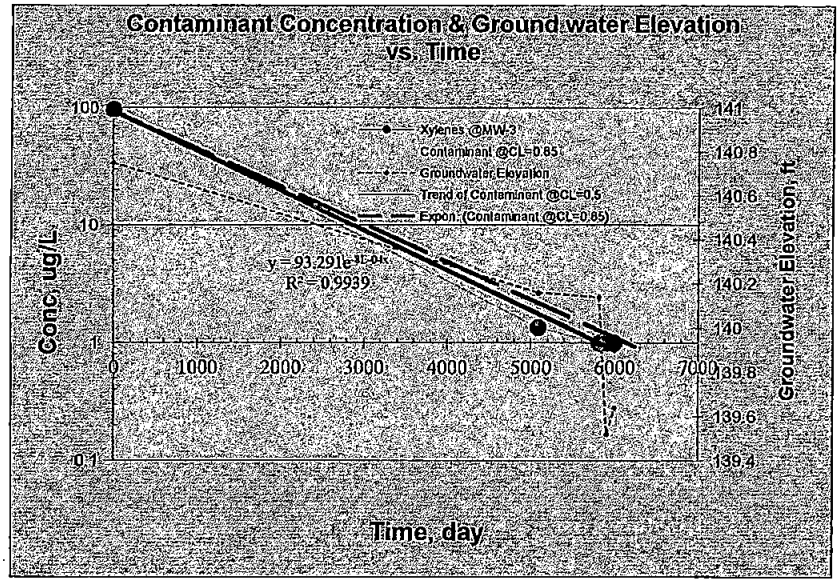


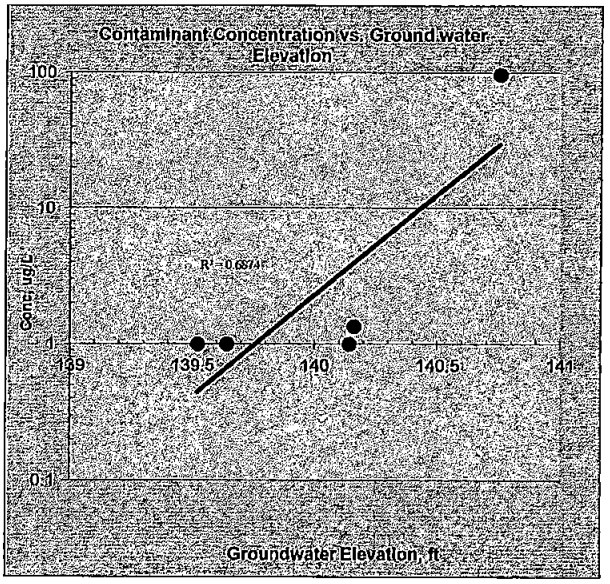
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Xylenes*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

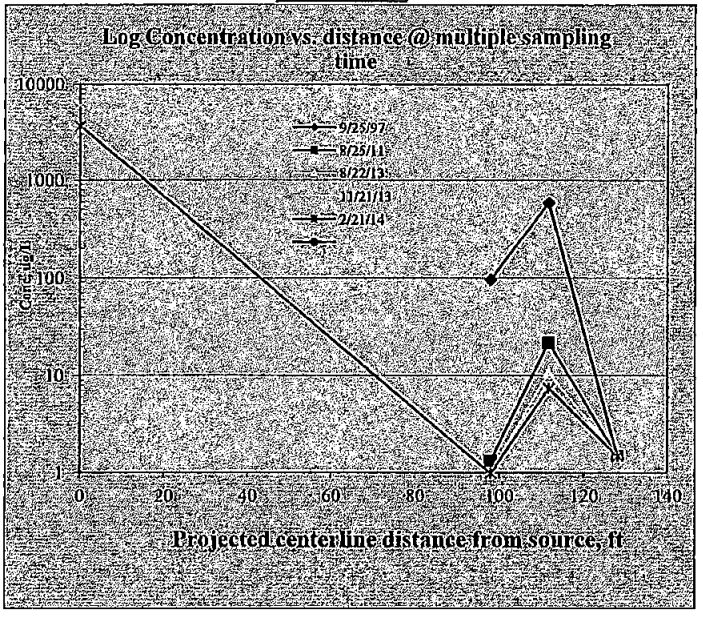
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?		*99.980%*	
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}		*0.285* @50% C.L.;	*0.270* @85% C.L.
Half Life for k_{point}, yr		*2.430* @50% C.L.;	*2.568* @85% C.L.

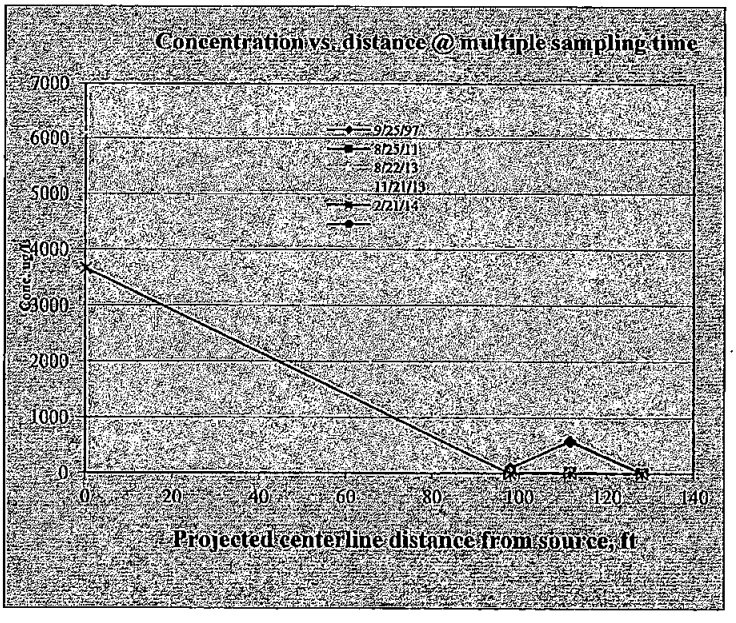




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	



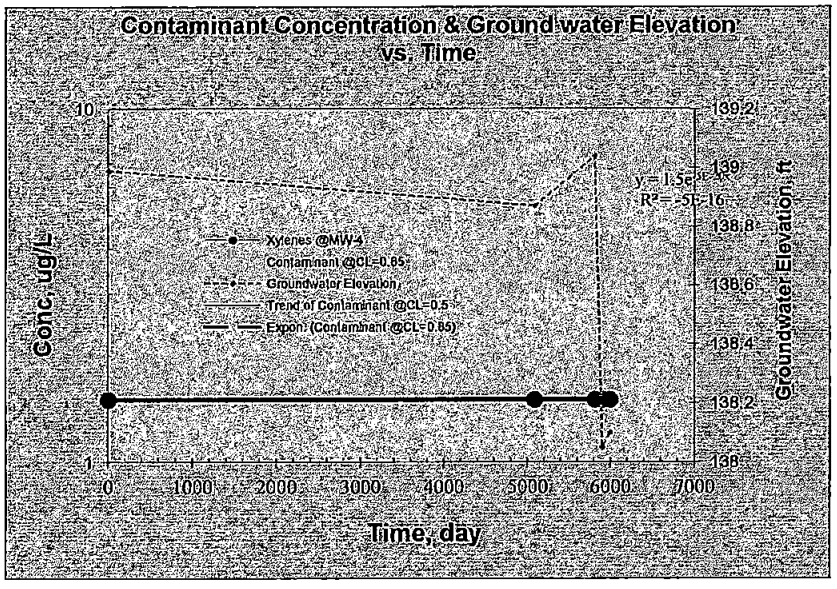


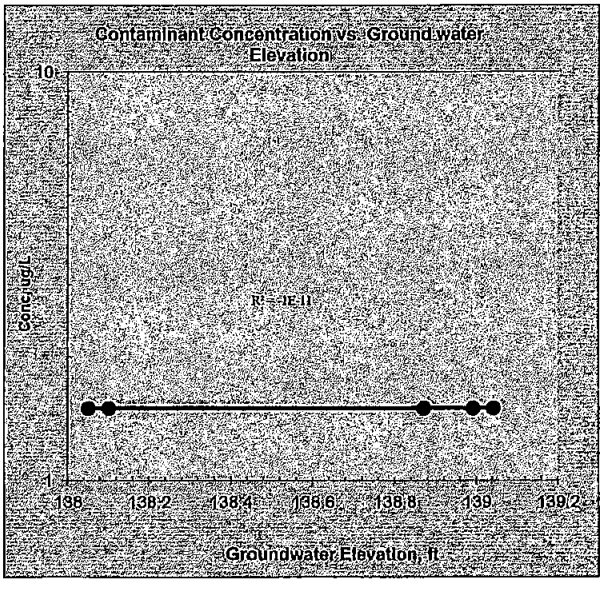
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Xylenes*

1. Temporal Trend at a Well (Concentration vs. Time & Groundwater Elevation : well-to-well analysis)

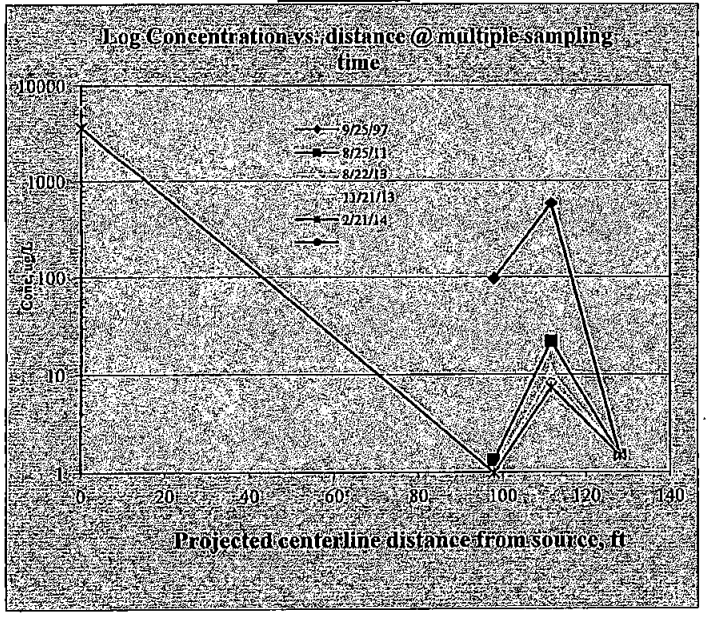
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*0.000%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.000* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	###### @50% C.L.;	*NA* @85% C.L.	

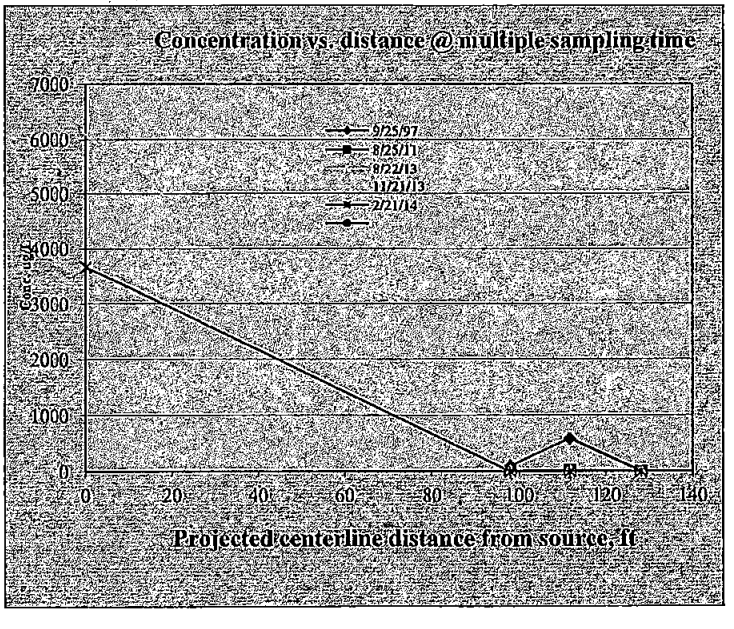




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	25-Sep-97
Plot #2:	Sampling date #2	25-Aug-11
Plot #3:	Sampling date #3	22-Aug-13
Plot #4:	Sampling date #4	21-Nov-13
Plot #5:	Sampling date #5	21-Feb-14
Plot #6:	Sampling date #6	





Module 2: Temporal Analysis: Concentration of contaminant vs. time (Regression Analysis at each well)

Site Name: *Hilton Seattle Hotel*
Site Address: *Seattle, WA*
Additional Description: *NA Evaluation*
Hazardous Substance *Xylenes*

1. Level of Confidence (Decision Criteria)? 85%

2. Prediction: Calculation of Restoration Time and Predicted Concentration at Wells

Well Location		MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A. Cleanup Level (Criterion) to be achieved?	ug/L	1000	1000	1000	1000												
A.1 Average (@50% CL[1] best-fitting values)																	
Time to reach the criterion	yr	NA	-1.84	-8.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	11/25/95	6/3/89	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
A.2 Boundary (@85% CL)																	
Time to reach the criterion[2]	yr	NA	-2.00	-8.79	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	9/25/95	12/12/88	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/14	9/30/14	9/30/14	9/30/14												
B.1 Average conc predicted (@50% CL)	ug/L	#DIV/0!	7.15	0.73	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	#DIV/0!	10.34	0.94	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	1.000	0.986	0.994	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	-1.000	-0.993	-0.997	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	2	5	5	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

4. Statistical Inference on the Slope of the Log-Linear Regression Line with t-statistics

One-tailed Confidence Level calculated, %		NA	99.927%	99.980%	0.000%	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sufficient evidence to support that the slope of the regression line is significantly different from zero?		NA	YES!	YES!	NO!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		NA	NA	NA	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		NA	Shrinking	Shrinking	Stable	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

5. Calculation of Point Decay Rate Constant (k_{point})

Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	NA	0.262	0.285	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	0.240	0.270	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	NA	2.646	2.430	#########	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	2.885	2.568	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note: 1. CL : Confidence Level; UD= Undetermined

2. The length of time that will actually be required is estimated to be no more than years calculated (@ 85% of confidence level.)

Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

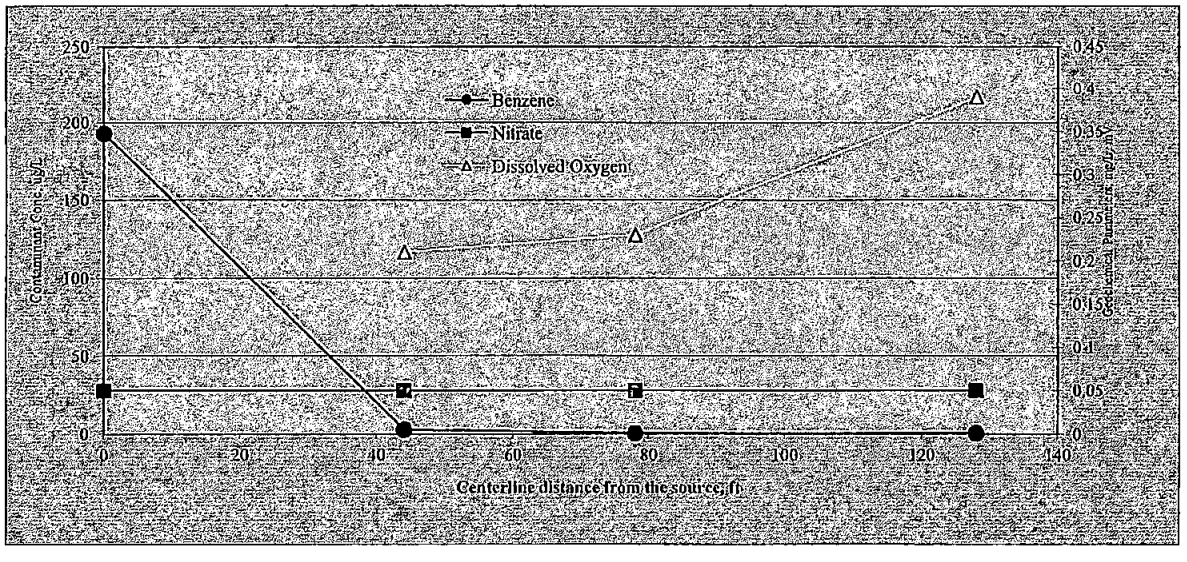
Contaminant for UF Selection: **Benzene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.33	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.22	N/A	N/A	N/A	0.0	-0.4	3.6	3.6	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.047	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.3	3.3	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Benzene
Geochemical Indicator?	Dissolved Oxygen
Geochemical Indicator?	Nitrate



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name: Hilton Seattle Hotel
Site Address: Seattle, WA
Additional Description: NA Evaluation

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit					MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft					0	44	78	128					
Benzene	ug/L					193	2.9	0.5	0.5					
Toluene	ug/L					122	1.62	0.5	0.5					
Ethylbenzene	ug/L					796	21	0.5	0.5					
Xylenes	ug/L					3670	7.4	1	1					
Gasoline	ug/L					30300	1360	114	25					
User-specified chemical1	ug/L													
User-specified chemical3	ug/L													

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

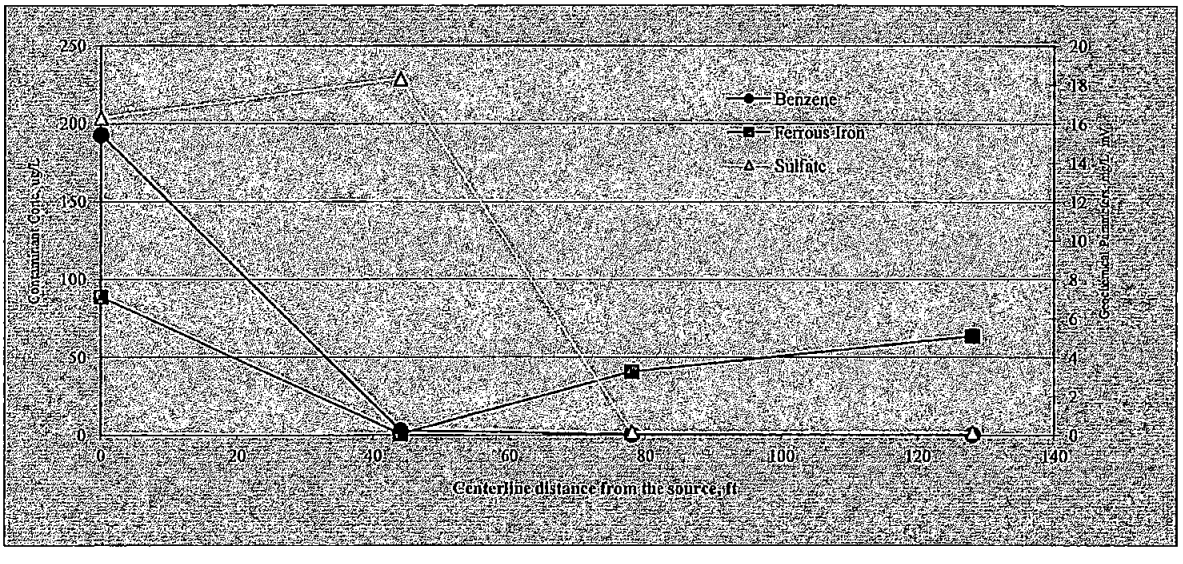
Contaminant for UF Selection: **Benzene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.33	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.22	N/A	N/A	N/A	0.0	-0.4	3.6	3.6	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.047	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.3	3.3	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Benzene
Geochemical Indicator?	Sulfate
Geochemical Indicator?	Ferrous Iron



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

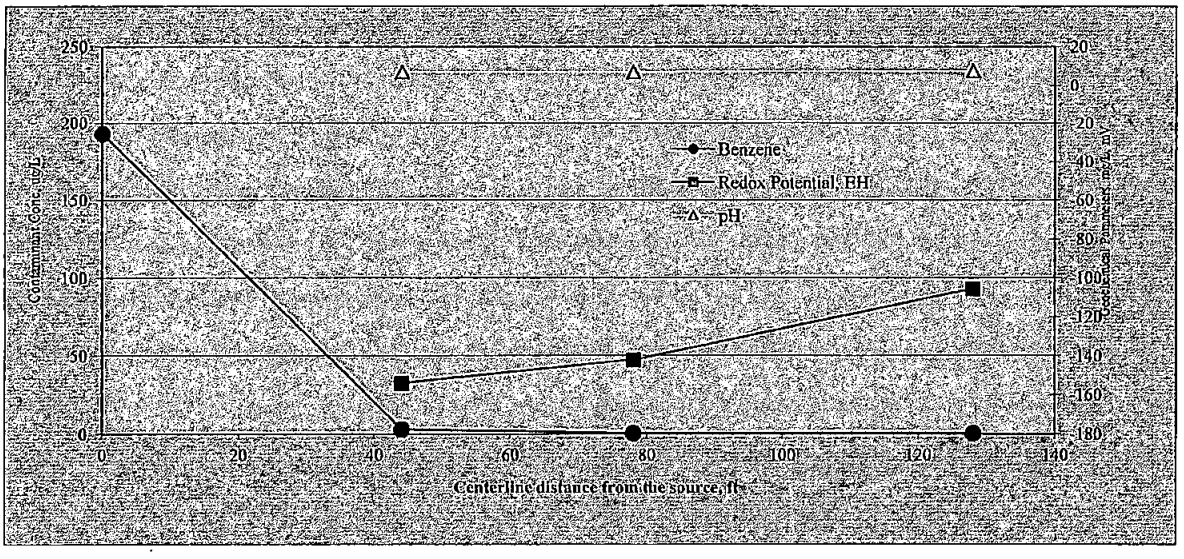
Contaminant for UF Selection: **Benzene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.33	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.22	N/A	N/A	N/A	0.0	-0.4	3.6	3.6	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.047	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.3	3.3	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Benzene
Geochemical Indicator?	pH
Geochemical Indicator?	Redox Potential, EH



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name: Hilton Seattle Hotel
Site Address: Seattle, WA
Additional Description: NA Evaluation

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

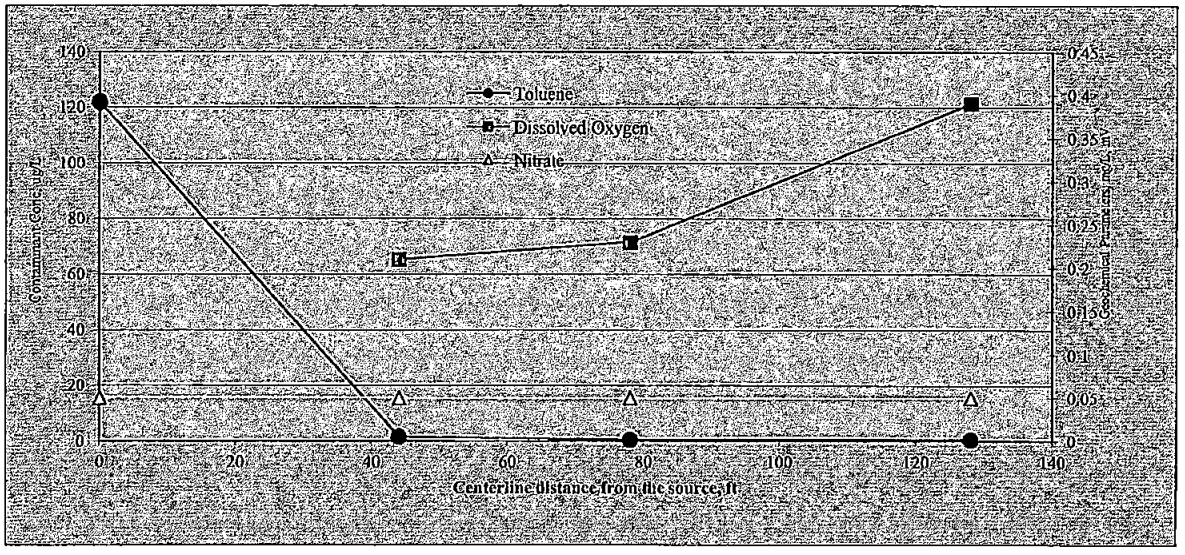
Contaminant for UF Selection: **Toluene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.046	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Toluene
Geochemical Indicator?	Nitrate
Geochemical Indicator?	Dissolved Oxygen



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

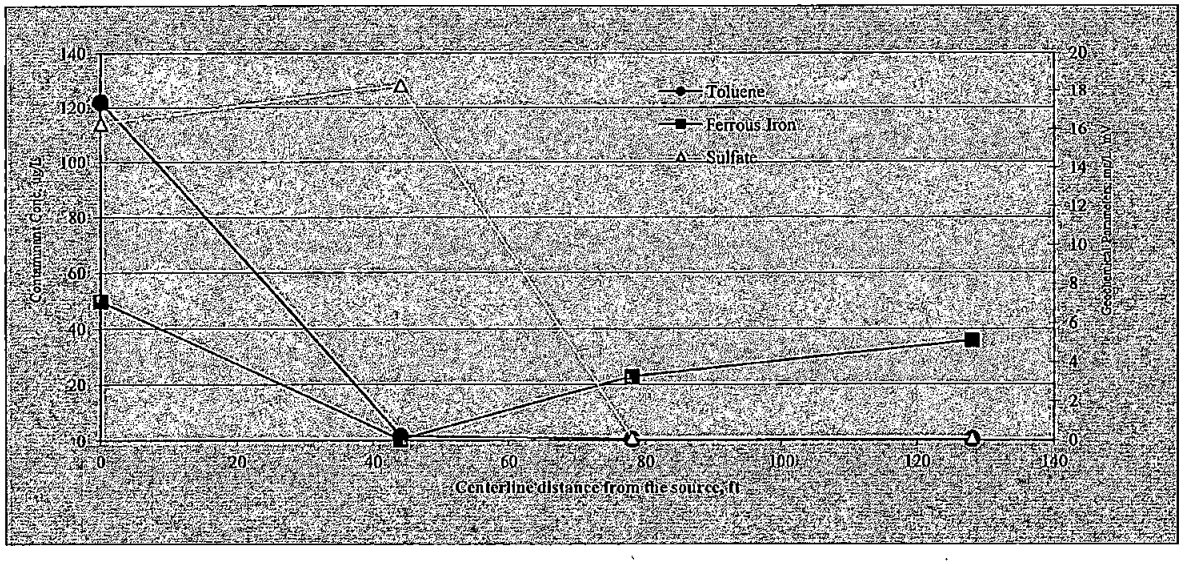
Contaminant for UF Selection: **Toluene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.046	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Toluene
Geochemical Indicator?	Sulfate
Geochemical Indicator?	Ferrous Iron



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct mensurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

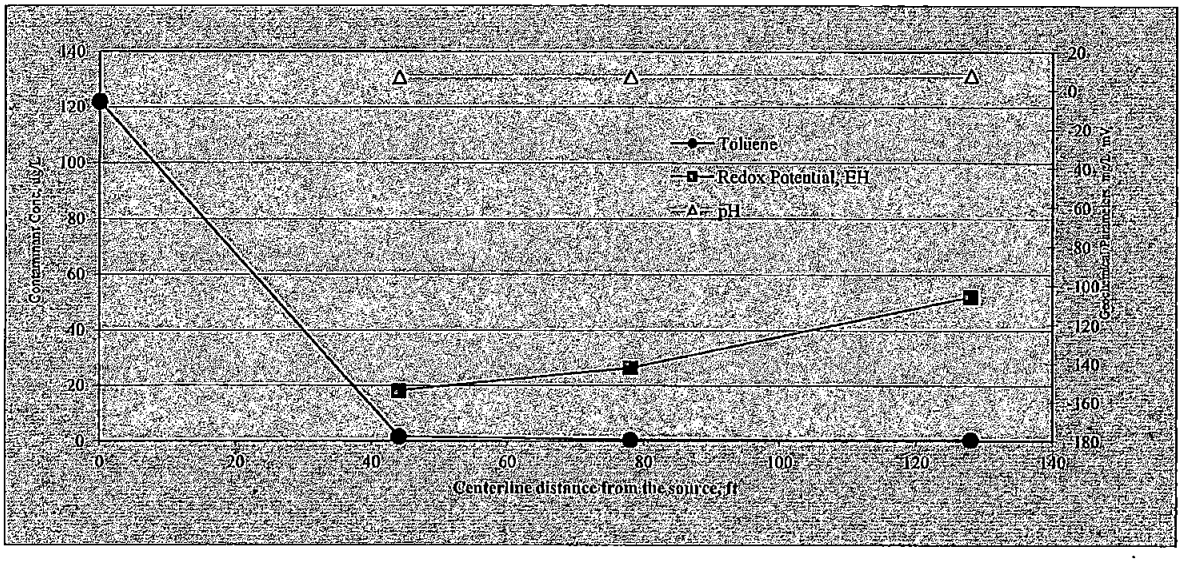
Contaminant for UF Selection: **Toluene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.046	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.28	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Toluene
Geochemical Indicator?	pH
Geochemical Indicator?	Redox Potential, EH



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

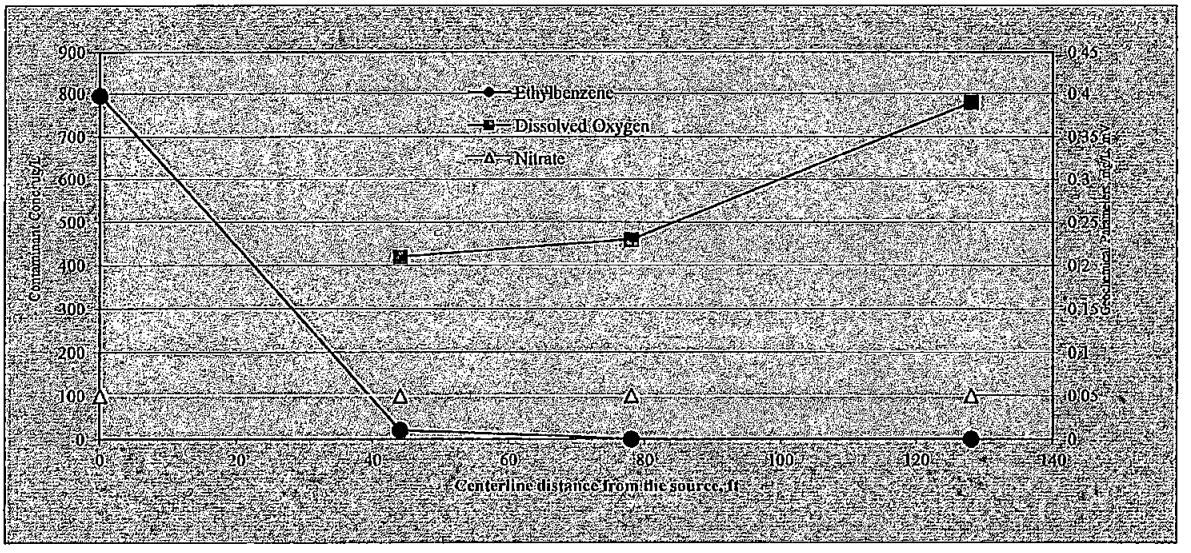
Contaminant for UF Selection: **Ethylbenzene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.2	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.045	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Ethylbenzene
Geochemical Indicator?	Nitrate
Geochemical Indicator?	Dissolved Oxygen



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

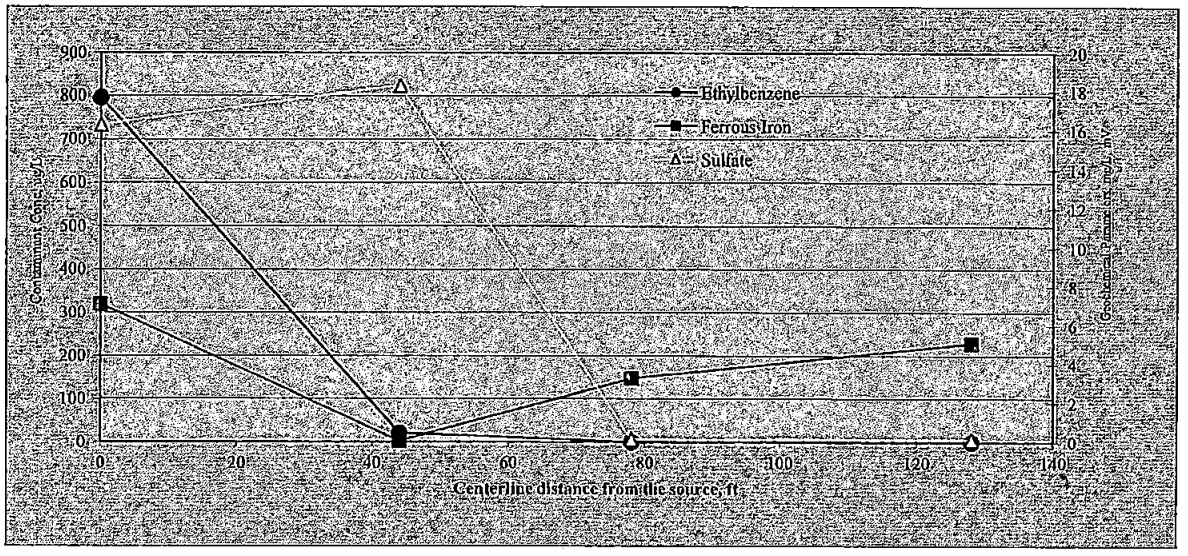
Contaminant for UF Selection: **Ethylbenzene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.2	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.045	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Ethylbenzene
Geochemical Indicator?	Sulfate
Geochemical Indicator?	Ferrous Iron



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

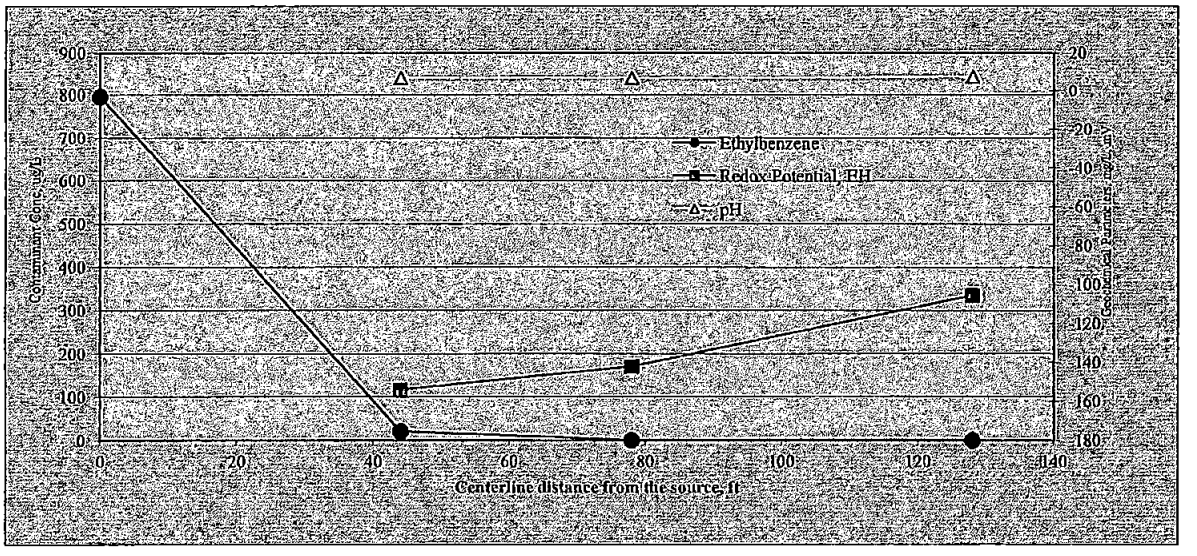
Contaminant for UF Selection: **Ethylbenzene**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.2	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.045	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Ethylbenzene
Geochemical Indicator?	pH
Geochemical Indicator?	Redox Potential, EH



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

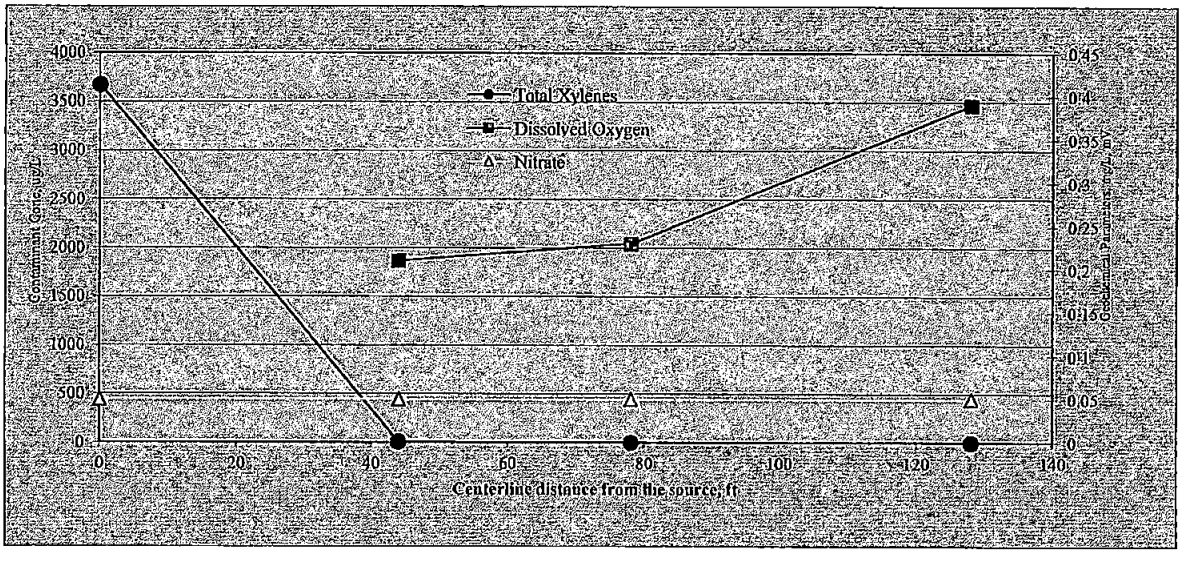
Contaminant for UF Selection: **Total Xylenes**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.2	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.045	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Total Xylenes
Geochemical Indicator?	Nitrate
Geochemical Indicator?	Dissolved Oxygen



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name:	*Hilton Seattle Hotel*
Site Address:	*Seattle, WA*
Additional Description:	*NA Evaluation*

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

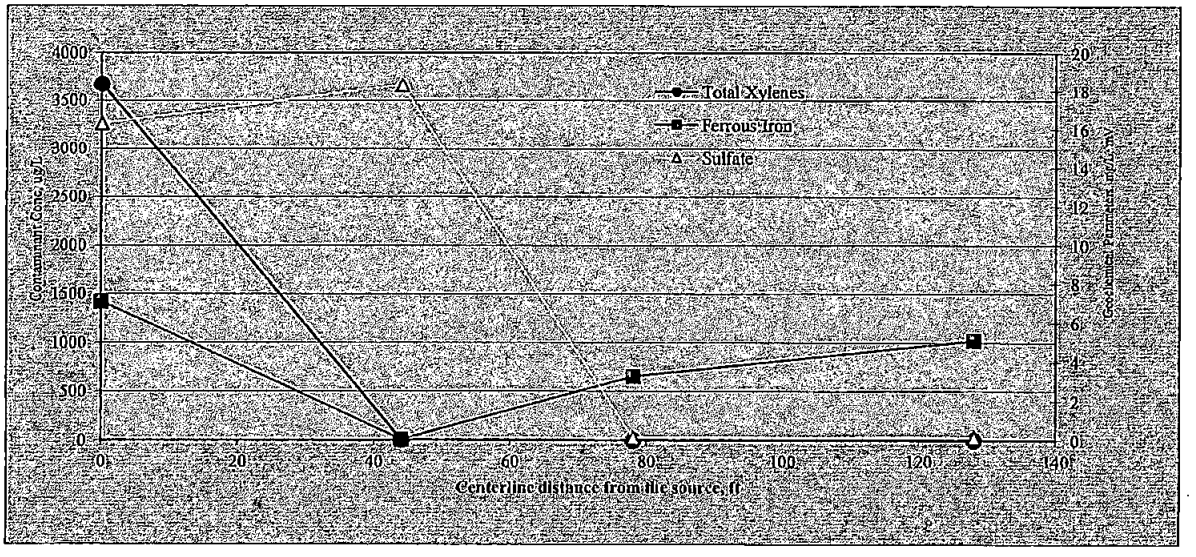
Contaminant for UF Selection: **Total Xylenes**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.2	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.045	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Total Xylenes
Geochemical Indicator?	Sulfate
Geochemical Indicator?	Ferrous Iron



Module 3: Assimilative Capacity and Geochemical Indicator Plot

Site Name: Hilton Seattle Hotel
Site Address: Seattle, WA
Additional Description: NA Evaluation

1. Monitoring Well information: Enter Average Contaminant Concentrations at the Monitoring Wells

Sampling Location:	Unit				MW-5	MW-2	MW-3	MW-4					
Centerline Distance from source	ft				0	44	78	128					
Benzene	ug/L				193	2.9	0.5	0.5					
Toluene	ug/L				122	1.62	0.5	0.5					
Ethylbenzene	ug/L				796	21	0.5	0.5					
Total Xylenes	ug/L				3670	7.4	1	1					
Gasoline	ug/L				30300	1360	114	25					
User-specified chemical1	ug/L												
User-specified chemical3	ug/L												

2. Enter Average Geochemical Indicator's Concentrations (direct measurement) at the Monitoring Wells.

	Unit	Background	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	mg/L						0.21	0.23	0.39					
Nitrate	mg/L	0.05				0.05	0.05	0.05	0.05					
Sulfate	mg/L	16.3				16.3	18.3	0.15	0.15					
Manganese	mg/L													
Ferrous Iron	mg/L	7.1				7.1	0.05	3.27	5.1					
Methane	mg/L													
Redox Potential, E_H	mV						-154.1	-142.1	-105.6					
Alkalinity	mg/L													
pH	unitless						6.95	7.07	7.8					

3. Expressed Assimilative Capacity Calculation: Utilization Factor (UF)

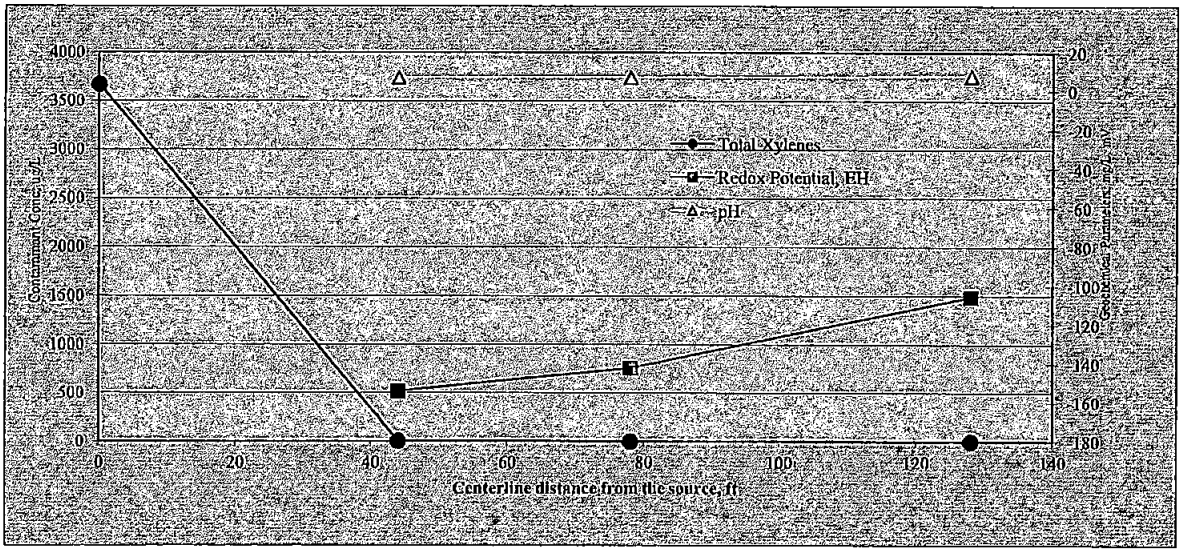
Contaminant for UF Selection: **Total Xylenes**

Equivalent Contaminant Degradation

		Unit	UF	NA	NA	NA	MW-5	MW-2	MW-3	MW-4	NA	NA	NA	NA	NA
Dissolved Oxygen	utilized	mg/L	0.32	N/A	N/A	N/A	N/A	-0.1	-0.1	-0.1	N/A	N/A	N/A	N/A	N/A
Nitrate	utilized	mg/L	0.2	N/A	N/A	N/A	0.0	0.0	0.0	0.0	N/A	N/A	N/A	N/A	N/A
Sulfate	utilized	mg/L	0.21	N/A	N/A	N/A	0.0	-0.4	3.4	3.4	N/A	N/A	N/A	N/A	N/A
Manganese	produced	mg/L	0.09	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ferrous Iron	produced	mg/L	0.045	N/A	N/A	N/A	0.0	-0.3	-0.2	-0.1	N/A	N/A	N/A	N/A	N/A
Methane	produced	mg/L	1.27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total		mg/L		N/A	N/A	N/A	N/A	-0.8	3.1	3.2	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance: Total Xylenes
Geochemical Indicator?: pH
Geochemical Indicator?: Redox Potential, EH



APPENDIX C

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 21-1-12341-004

Date: May 2014
To: Mr. Zahoor Ahmed
R.C. Hedreen Company

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS
ALASKA • COLORADO • FLORIDA • MISSOURI • OREGON • WASHINGTON

400 N. 34TH STREET, SUITE 100
P.O. BOX 300303
SEATTLE, WASHINGTON 98103
206•632•8020 FAX 206•695•6777

TRANSMITTAL

TO	Ms. Diane Escobedo	DATE	6/4/14
COMPANY	WA State Department of Ecology Voluntary Cleanup Program	PHONE	425-649-7097
ADDRESS	3160 160th Avenue SE Bellevue, WA 98008-5452	FAX	425-649-7098
		JOB NO.	21-1-12341-004
PROJECT	**HILTON SEATTLE HOTEL** **THIRD QUARTER GROUNDWATER MONITORING REPORT**		

THE FOLLOWING ITEMS ARE TRANSMITTED:

DATE	NO. COPIES	DESCRIPTION
MAY 2014	1	Electronic copy of Third Quarter Groundwater Monitoring Report for the Hilton Seattle Hotel (Facility Site ID# 56642815)

☐ Per your request ☐ For your approval ☐ For your information ☒ For your files
☐ For your review ☐ For your action ☐ Return with comments ☐ Other

Comments:

Ms. Escobedo,

We are submitting to the VCP our Third Quarter Groundwater Monitoring Report for the Hilton Seattle Hotel to document cleanup progress at the site.

If you have any questions or require anything further, please don't hesitate to contact me at 503-210-4788.

Regards,

-Mike

By: Michael Reynolds, PE MRK

Title: Senior Environmental Engineer

c: _____