NW 2491

Hilton Seattle Hotel
Eighth Quarter Groundwater Monitoring Report
Seattle, Washington

August 4, 2015

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GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

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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 No. 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 to the east of the Site and in-situ groundwater treatment using oxygen release compounds. This report summarizes monitoring activities performed for the period December 2014 to February 2015, considered to be the eighth quarter of monitoring.

2.0 BACKGROUND

The Site is located at 1301 Sixth Avenue in downtown Seattle, Washington (Figure 1, Vicinity Map). 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, Site Plan). 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 (see 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, Inc., 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 up-gradient monitoring well MW-5. Gasoline-range hydrocarbons; benzene, toluene, ethylbenzene, and xylenes (BTEX); and lead were detected in groundwater at down-gradient monitoring wells MW-2, MW-3, and MW-4 above the Washington Model Toxics Cleanup Act (MTCA) Method A cleanup criterion 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 up-gradient 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 down-gradient 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:

- 0.015 foot/foot in February 2015,
- 0.017 foot/foot in November 2014,
- 0.022 foot/foot in July 2014,
- 0.023 foot/foot in May 2014,
- 0.017 foot/foot in February 2014,
- 0.017 foot/foot in November 2013,
- 0.015 foot/foot in August 2013,
- 0.018 foot/foot in August 2011, and
- 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 up-gradient of the location of the closed USTs, monitoring well MW-2 is cross-gradient, and monitoring wells MW-3 and MW-4 are down-gradient. 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 down-gradient 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 readily accumulating in monitoring well MW-5. Product was not observed through the third quarter (February 2014) monitoring event, but has been seasonally observed in monitoring well MW-5. The minor volumes of product were removed using either a submersible pump or a bailer. The extraction system remains turned off. To date, approximately 126 total gallons of

product have been removed by the system, and 129 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 installed at monitoring well MW-5 to remove minor amounts of free product from the groundwater surface as treatment continued. The socks were removed from the monitoring wells and not reinstalled during the eighth quarter monitoring event so an evaluation of subsurface conditions upon cessation of remedial activity can be made for closure planning.

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 up-gradient 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 down-gradient of the source, within the contaminated groundwater plume. Eighth 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 June 1, 2015, 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 to allow for subsurface conditions to equilibrate. The absorbent sock was also removed from monitoring well MW-5 prior to sampling.

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 collected by emptying the bailer contents into the YSI flow cell. 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 continue evaluation of 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 eighth 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, eighth quarter results for geochemical indicators are shown in Table 3, with available historical results shown for comparison. The analytical laboratory report for the eighth quarter results is provided in Appendix A.

5.4.1 Contaminants of Concern

In the eighth quarter, the samples collected from the monitoring wells had detectable concentrations of gasoline, BTEX, and/or lead. Source well MW-5 had detections of all COCs above their respective MTCA Method A groundwater cleanup criteria, except for toluene. Down-gradient monitoring well MW-2 had a detection of gasoline above the MTCA Method A groundwater cleanup criterion as well as detections of toluene, ethylbenzene, and xylenes below their respective MTCA Method A groundwater cleanup criterion. Gasoline and xylenes were detected at monitoring well MW-3 below their respective MTCA cleanup criterion. No COCs were detected at monitoring well MW-4.

The concentrations of all COCs except lead in the groundwater at source well MW-5 increased from the seventh quarter to the eighth quarter. Concentrations of all COCs at monitoring wells MW-2 and MW-3 remained relatively stable over seventh quarter results. Benzene was not detected at monitoring well MW-2 for the second consecutive quarter.

The estimated extents of gasoline and benzene in groundwater for the four most recent quarters (fifth through eighth quarters) of monitoring at the Site are shown on Figures 3 and 4, respectively. The leading edge of groundwater contaminated with gasoline extended past monitoring well MW-4 prior to cleanup and receded through the third quarter but expanded slightly through the sixth quarter (Figure 3). The leading edge again receded in the seventh quarter and has remained stable in the eighth quarter. The estimated extent of gasoline at concentrations above its MTCA cleanup criterion (i.e., 800 micrograms per liter [µg/L]) had been relatively stable in the central portion of the Site but receded in the seventh and eighth quarters. 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, which was beyond monitoring well MW-4, and remained stable through the eighth

quarter, with the leading edge receding to a point up-gradient of monitoring well MW-2 for the second consecutive quarter (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, 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 eighth quarter, DO was depleted at 0.58 and 1.04 mg/L at monitoring wells MW-2 and MW-3, respectively, while DO was elevated at 2.11 and 2.87 mg/L at monitoring wells MW-4 and MW-5, respectively. The elevated DO measurement at monitoring well MW-5 is likely due to aeration of groundwater during transfer from bailer to water quality flow cell. Relatively low concentrations of ferrous iron was measured at 600 micrograms per liter (ug/L) at monitoring well MW-2. Ferrous iron was non-detect at monitoring well MW-4. Wells MW-3 and MW-5 had relatively elevated ferrous iron concentrations for the second consecutive at 1,750 and 4,200 ug/L, respectively, after both being non-detect in the sixth quarter. Low concentrations of nitrate were detected at all monitoring well locations, ranging from 96.5 and 201 ug/L. Sulfate was elevated at 33,300 ug/L at monitoring well MW-4 but non-detect at all other locations. The 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 20.1 to 21.1 degrees Celsius in monitoring wells MW-2 through MW-4 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. The elevated temperature measured at monitoring well MW-5 is likely due to exposure to ambient temperatures during bailing and parameter measurement.

5.5 Water Level Monitoring

Table 4 presents water level data for the eighth quarter monitoring event and historical sampling events. Figure 5 shows approximate groundwater elevation contours for the eighth 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 eighth quarter monitoring event included purge water from groundwater monitoring and disposable sampling equipment (nitrile gloves, bailers, etc.). Approximately 10 gallons of purge water from groundwater sampling and 57 gallons of purge water from product removal at monitoring well MW-5 were added to the system storage tank during groundwater sampling in the eighth quarter for an approximate cumulative total of 97.5 gallons of waste in the tank. Shannon & Wilson will again coordinate disposal once the 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 shrinking with high levels of confidence. The Mann-Kendall method shows gasoline concentrations as stable at monitoring well MW-3 and undetermined for BTEX, while linear regression shows gasoline and BTEX concentrations as shrinking. The results for monitoring well MW-3 are reported with moderate-to-high levels of confidence for the Mann-Kendall method and are reported with high levels of confidence using linear regression. While benzene and toluene at monitoring well MW-3 are undetermined by the Mann-Kendall method, the parameters have been non-detect for the past nine sampling events and therefore do not show a strong decreasing trend. Ethylbenzene and xylenes at monitoring well MW-3 are undetermined but recent low level detections have reduced the certainty of the model result. Trend analyses are again limited in their application at monitoring well MW-4 because parameter concentrations are predominantly non-detect. The Mann-Kendall method shows gasoline and BTEX as stable at monitoring well MW-4 and linear regression shows gasoline and xylenes as stable with benzene, toluene and ethylbenzene 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. Furthermore, because concentrations of gasoline and BTEX at monitoring wells MW-2, MW-3, and MW-4 are generally below their respective cleanup criterion, estimating the time to achieve cleanup is also not appropriate. However, gasoline at monitoring well MW-2 is above the cleanup criterion in the eighth quarter and has point decay rates of 0.076 and 0.037 per year at 50 and 85 percent confidence levels, respectively. Half-life results for gasoline at monitoring well MW-2 were calculated to be 9.166 and 18.695 years at 50 and 85 percent confidence levels, respectively.

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 (e.g., 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 was depleted at down-gradient monitoring wells MW-2 and MW-3, but was elevated at monitoring well MW-4 and MW-5. The elevated DO measurement at MW-5 is likely due to aeration of the sampled groundwater during transfer from the bailer to the monitoring flow cell. Nitrate was depleted at all monitoring well locations. Concentrations of ferrous iron, a metabolic by-product of reactions involving ferric iron, have historically decreased with distance from source well MW-5; however, in the eighth quarter ferrous iron was detected at low levels at monitoring wells MW-2 and MW-4 with relatively elevated levels measured at monitoring wells MW-3 and MW-5. Sulfate was depleted in the source well MW-5 and monitoring wells MW-2 and MW-3, but was elevated in monitoring wells MW-4. Overall, ORP and pH field measurements correlate well with the observed detections.

Groundwater contaminant concentrations for gasoline and benzene were also plotted along with groundwater levels for each monitoring well location to evaluate potential trends in the data (Figures 6 through 9). Data from August 2013 to present were plotted for each location to show potential seasonal variation since the start of cleanup activities. Increasing groundwater levels at the Site during spring months have historically resulted in a corresponding increase in gasoline concentrations at monitoring well MW-2, while benzene concentrations are low and do not show

much variation (Figure 6). The increases of gasoline concentration at monitoring well MW-2 have decreased over the past three seasons. A similar trend is observed at monitoring well MW-3 but the concentration of gasoline lags behind the groundwater fluctuation due to its proximity to source well MW-5 (Figure 7). No trends are observed in the data from monitoring well MW-4 because gasoline and benzene concentrations are non-detect (Figure 8).

Source monitoring well MW-5 shows a trend similar to monitoring wells MW-2 and MW-3 for gasoline, but also shows an increase in benzene concentrations as groundwater levels increase in spring 2014 and so far in 2015 (Figure 9). This seasonal rise in contaminant concentrations is associated with rising groundwater levels and residual petroleum product in the smear zone (or region of water table fluctuation). Figure 10 shows that the presence of product in source well MW-5 occurs during periods of rising groundwater levels. Product thickness appears to show a decreasing trend over the past two seasons. Further, as shown in Figures 11 and 12, the presence of product corresponds to increases in dissolved gasoline and benzene concentrations at source well MW-5, respectively.

7.0 CONCLUSIONS

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

- Observed occurrences of product returning to source well MW-5 appears to be in response to rising groundwater levels contacting and providing a pathway of transport for residual contamination in the smear zone. Increases in dissolved contaminant concentrations subsequently follow the product observations.
- Source monitoring well MW-5 had detected concentrations of all COCs and, except for toluene, the concentrations exceeded their respective MTCA Method A cleanup criterion. Concentrations of COCs except for lead increased over seventh quarter results. Concentrations at this location are expected to continue on an overall decreasing trend as residual petroleum in the smear zone is removed.
- Down-gradient monitoring well MW-2 had a detected concentration of gasoline above its MTCA Method A cleanup criterion. The gasoline concentration had been below the cleanup criterion in the fifth quarter, but rebounded above the criterion in the sixth quarter. Gasoline at this location has shown a decreasing trend over the past three quarters. Toluene, ethlybenzene and xylenes were detected at monitoring well MW-2 but below their respective MTCA Method A cleanup criteria; benzene and lead were non-detect. The concentrations of all detected parameters remained relatively stable over seventh quarter results.

- Gasoline and xylenes were detected below their respective cleanup criterion in down-gradient monitoring well MW-3. The gasoline detection represented a minor increase over the seventh quarter result. Xylenes have been detected for the previous five quarters after being non-detect for three quarters prior. The eighth quarter xylenes detection also represents a minor increase over seventh quarter results. Ethylbenzene had been detected for the first at this location since before cleanup started in the sixth quarter, but was again not detected in the seventh and eighth quarters.
- No COCs were detected at down-gradient monitoring well MW-4. Lead had been previously detected at this location at concentrations below its MTCA Method A cleanup criterion in the fourth and fifth quarters.
- 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 continue to suggest that biodegradation is occurring at the Site and monitored natural attenuation appears to be a viable long-term remediation alternative.

The ninth quarter groundwater monitoring event is scheduled to be conducted August 2015. The ninth quarter will be the first quarter of monitoring without active remediation (e.g., product removal and/or in situ treatment with ORC sock) since cleanup began. These activities will be the subject of the next quarterly groundwater monitoring report.

8.0 LIMITATIONS

This report was prepared for the exclusive use of the R.C. Hedreen Company and its representatives, and in no way guarantees that any agency or its staff will reach the same conclusions as Shannon & Wilson. 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 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, PE
Principal Environmental Engineer

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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	6/1/2015	6/1/2015	6/1/2015	6/1/2015
Time Water Level Measured	11:55	11:00	9:30	12:30
Measuring Point (MP) Elevation, Feet	162.55	161.24	154.30	174.35
Depth to Water Below MP, Feet	22.45	21.21	15.30	33.21
Water Level Elevation, Feet	140.10	140.03	139.00	141.14
Purging/Sampling Data				
Date Sampled	6/1/2015	6/1/2015	6/1/2015	6/1/2015
Time Sampled	12:25	11:35	10:30	12:50
Depth to Water Below MP, Feet	22.45	21.21	15.30	33.21
Total Depth of Well Below MP, Feet	29.40	29.23	20.61	38.50
Water Column in Well, Feet	6.95	8.02	5.31	5.10
Gallons per Foot	0.16	0.16	0.16	0.16
Gallons in Well	1.05	1.28	0.68	0.82
Total Gallons Pumped/Bailed	2.0	2.0	3.0	3.0
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[B]				
Temperature, °C	20.1	20.3	21.1	24.0
Dissolved Oxygen, mg/L	0.58	1.04	2.11	2.87
Specific Conductance, µS/cm	0.841	0.811	0.599	0.899
pH, standard units	6.98	6.87	8.61	6.95
Oxidation-Reduction Potential, mV	-74.9	-80.8	99.4	-134.8
Remarks	No free product observed. Strong hydrocarbon odor.	No free product observed. Hydrocarbon odor.	No free product observed.	0.20 feet of free product observed. Strong hydrocarbon odor.

Notes:

[A]Water level was adjusted to account for free product observed.

[B]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

SHANNON & WILSON, INC.

Monitoring Well	Sample Date	Quarter	Product Thickness (feet)	Sampling Results (µg/L)					
				Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	Lead
MTCA Method A Groundwater Cleanup Levels:				*800*	*5*	*1,000*	*700*	*1,000*	*15*
MW-2	9/25/1997	Historical	--	4,700	6,700	210	670	590	8.00
	8/25/2011	Historical	--	2,950	76.1	2.19	863	22.0	< 1.0
	8/22/2013	Q1	--	5,000	3.07	2.01	408	10.8	8.14
	11/21/2013	Q2	--	1,760	1.40	1.57	83.3	6.89	< 1.0
	2/21/2014	Q3	--	1,360	2.90	1.62	20.8	7.44	8.10
	5/30/2014	Q4	--	2,070	1.82	2.00	36.5	8.47	2.71
	7/11/2014	Q5	--	642	1.22	< 1.0	4.80	3.07	< 1.0
	11/25/2014	Q6	--	1,350	1.01	1.63	6.53	8.19	< 1.0
	2/25/2015	Q7	--	1,170	< 1.0	1.33	3.36	4.52	< 1.0
	6/1/2015	Q8	--	1,030	< 1.0	1.52	1.96	4.48	< 1.0
MW-3	9/25/1997	Historical	--	700	7,200	10.0	74.0	97.0	9.00
	8/25/2011	Historical	--	153	< 1.0	< 1.0	< 1.0	1.35	< 1.0
	8/22/2013	Q1	--	209	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	11/21/2013	Q2	--	235	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	2/21/2014	Q3	--	114	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	5/30/2014	Q4	--	187	< 1.0	< 1.0	< 1.0	3.59	3.42
	7/11/2014	Q5	--	397	< 1.0	< 1.0	< 1.0	1.31	< 1.0
	11/25/2014	Q6	--	208	< 1.0	< 1.0	1.34	5.04	< 1.0
	2/25/2015	Q7	--	140	< 1.0	< 1.0	< 1.0	1.16	< 1.0
	6/1/2015	Q8	--	152	< 1.0	< 1.0	< 1.0	1.21	< 1.0
MW-4	11/14/1997	Historical	--	< 50	< 1.0	< 1.0	< 1.0	< 3.0	< 4.0
	8/26/2011	Historical	--	135	< 1.0	< 1.0	< 1.0	< 2.0	5.57
	8/22/2013	Q1	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	11/21/2013	Q2	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	2/21/2014	Q3	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	5/30/2014	Q4	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	11.1
	7/11/2014	Q5	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	2.40
	11/25/2014	Q6	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	2/25/2015	Q7	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0
	6/1/2015	Q8	--	< 50	< 1.0	< 1.0	< 1.0	< 2.0	< 1.0

TABLE 2
GROUNDWATER MONITORING RESULTS

SHANNON & WILSON, INC.

Monitoring Well	Sample Date	Quarter	Product Thickness (feet)	Sampling Results (µg/L)					
				Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	Lead
MTCA Method A Groundwater Cleanup Levels:				*800*	*5*	*1,000*	*700*	*1,000*	*15*
MW-5	12/22/1997	Historical	1.69	NS	NS	NS	NS	NS	NS
	8/11/2011	Historical	2.33	NS	NS	NS	NS	NS	NS
	8/22/2013	Q1	--	NS	NS	NS	NS	NS	NS
	11/21/2013	Q2	--	**98,100**	**230**	**179**	**1,070**	**6,100**	**26.1**
	2/21/2014	Q3	--	**30,300**	**193**	**122**	**796**	**3,670**	**47.2**
	5/30/2014	Q4	0.36	**51,400**	**927**	**552**	**1,820**	**7,610**	**9.97**
	7/11/2014	Q5	0.44	**59,300**	**1,050**	**837**	**1,940**	**9,960**	**44.9**
	11/25/2014	Q6	--	**53,500**	**566**	**204**	**1,480**	**7,610**	**47.0**
	2/25/2015	Q7	0.10	**43,900**	**605**	**262**	**1,320**	**6,680**	**39.0**
	6/1/2015	Q8	0.20	**60,900**	**1,080**	**570**	**1,990**	**10,390**	**22.8**

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	Quarter	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	Historical	--	--	--	--	--	--	--	--
	8/25/2011	Historical	0.25	-86.0	6.94	0.701	20.5	--	--	--
	8/22/2013	Q1	0.10	40.8	8.33	0.833	22.4	< 100	980	970
	11/21/2013	Q2	0.29	-136.2	6.88	0.759	19.0	< 100	3,150	< 300
	2/21/2014	Q3	0.21	-154.1	6.95	0.845	17.8	< 100	5,100	< 300
	5/30/2014	Q4	0.19	-153.9	6.89	0.840	17.9	< 100	1,150	304
	7/11/2014	Q5	2.01	-70.4	7.06	0.831	20.5	393	< 30	428
	11/25/2014	Q6	0.41	89.4	7.63	0.647	20.0	346	60	1,340
	2/25/2015	Q7	0.27	-148.7	7.21	0.805	19.8	< 200	290	< 600
	6/1/2015	Q8	0.58	-74.9	6.98	0.841	20.1	178	600	< 1,500
MW-3	9/25/1997	Historical	--	--	--	--	--	--	--	--
	8/25/2011	Historical	1.87	-92.8	6.95	0.718	20.5	--	--	--
	8/22/2013	Q1	0.27	-99.8	6.37	0.739	21.5	< 100	2,430	< 300
	11/21/2013	Q2	0.31	-152.1	6.91	0.717	20.0	< 100	4,900	< 300
	2/21/2014	Q3	0.23	-142.1	7.07	0.791	18.4	< 100	3,270	< 300
	5/30/2014	Q4	0.14	-149.2	7.15	0.728	18.4	< 100	600	< 300
	7/11/2014	Q5	0.28	-118.7	6.94	0.824	21.1	528	2,940	< 300
	11/25/2014	Q6	2.43	214.3	6.90	0.703	21.0	< 100	< 30	< 300
	2/25/2015	Q7	0.24	-131.4	7.27	0.772	20.1	41	1,600	< 600
	6/1/2015	Q8	1.04	-80.8	6.87	0.819	20.3	118	1,750	< 1,500
MW-4	11/14/1997	Historical	--	--	--	--	--	--	--	--
	8/26/2011	Historical	1.26	-85.1	7.56	0.447	21.2	--	--	--
	8/22/2013	Q1	0.10	51.3	9.22	0.599	21.5	< 100	80	39,100
	11/21/2013	Q2	0.51	-150.2	7.69	0.602	20.8	< 100	80	30,900
	2/21/2014	Q3	0.39	-105.6	7.80	0.680	19.3	< 100	160	18,300
	5/30/2014	Q4	0.41	-81.4	7.77	0.675	19.3	< 100	2,380	31,500
	7/11/2014	Q5	2.11	-43.1	7.58	0.654	21.3	249	< 30	34,600
	11/25/2014	Q6	1.50	209.4	7.59	0.561	21.5	222	80	26,200
	2/25/2015	Q7	5.98	-132.4	8.80	0.546	21.0	< 200	30	24,000
	6/1/2015	Q8	2.11	99.4	8.61	0.599	21.1	201	< 30	33,300

TABLE 3
GEOCHEMICAL INDICATORS

Monitoring Well	Sample Date	Quarter	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-5	11/21/2013	Q2	–	–	–	–	–	< 100	5,300	3,860
	2/21/2014	Q3	–	–	–	–	–	< 100	7,100	16,300
	5/30/2014	Q4	–	–	–	–	–	< 100	3,180	2,360
	7/11/2014	Q5	2.23	-121.9	6.68	0.801	24.7	497	3,600	1,170
	11/25/2014	Q6	1.42	-71.4	7.10	0.697	23.8	< 100	< 30	962
	2/25/2015	Q7	6.53	-131.4	6.72	0.811	24.5	473	3,100	< 600
	6/1/2015	Q8	2.87	-134.8	6.95	0.899	24.0	96.5	4,200	< 1,500

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	Quarter	Top of Casing Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
MW-2	9/25/1997	Historical	162.55	21.36	141.19
	8/25/2011	Historical	162.55	22.09	140.46
	8/22/2013	Q1	162.55	22.20	140.35
	11/21/2013	Q2	162.55	22.85	139.70
	2/21/2014	Q3	162.55	22.67	139.88
	5/30/2014	Q4	162.55	21.90	140.65
	7/11/2014	Q5	162.55	22.45	140.10
	11/25/2014	Q6	162.55	22.83	139.72
	2/25/2015	Q7	162.55	22.37	140.18
	6/1/2015	Q8	162.55	22.45	140.10
MW-3	9/25/1997	Historical	161.24	20.49	140.75
	8/25/2011	Historical	161.24	21.08	140.16
	8/22/2013	Q1	161.24	21.10	140.14
	11/21/2013	Q2	161.24	21.72	139.52
	2/21/2014	Q3	161.24	21.60	139.64
	5/30/2014	Q4	161.24	20.92	140.32
	7/11/2014	Q5	161.24	22.25	138.99
	11/25/2014	Q6	161.24	21.80	139.44
	2/25/2015	Q7	161.24	21.35	139.89
	6/1/2015	Q8	161.24	21.21	140.03
MW-4	11/14/1997	Historical	154.30	15.31	138.99
	8/26/2011	Historical	154.30	15.43	138.87
	8/22/2013	Q1	154.30	15.26	139.04
	11/21/2013	Q2	154.30	16.25	138.05
	2/21/2014	Q3	154.30	16.20	138.10
	5/30/2014	Q4	154.30	14.98	139.32
	7/11/2014	Q5	154.30	16.16	138.14
	11/25/2014	Q6	154.30	16.32	137.98
	2/25/2015	Q7	154.30	15.71	138.59
	6/1/2015	Q8	154.30	15.30	139.00

TABLE 4
WATER LEVEL DATA

Monitoring Well	Date	Quarter	Top of Casing Elevation (feet)	Depth to Groundwater (feet)	Groundwater Elevation (feet)
MW-5	11/14/1997	Historical	175.38	32.79	142.59
	8/26/2011	Historical	175.38	34.21	141.17
	8/14/2013	Q1	174.35	33.51	140.84
	11/21/2013	Q2	174.35	34.17	140.18
	2/21/2014	Q3	174.35	34.10	140.25
	5/30/2014	Q4	174.35	33.40	140.95
	7/11/2014	Q5	174.35	33.40	140.95
	11/25/2014	Q6	174.35	34.17	140.18
	2/25/2015	Q7	174.35	33.90	140.45
	6/1/2015	Q8	174.35	33.21	141.14

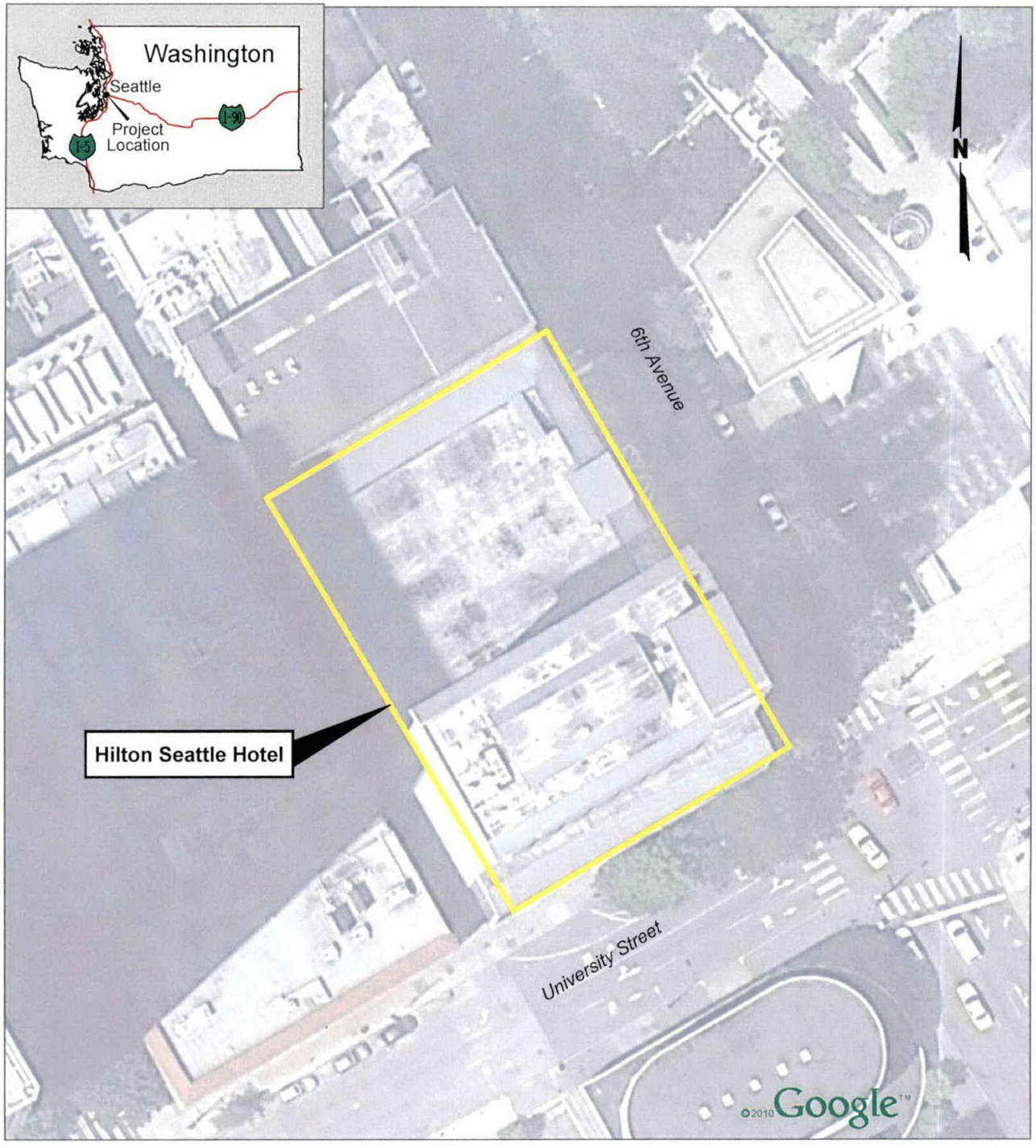
Notes:
Elevations were estimated from King County iMap (Aug 2011).
Depth to groundwater for 1997, 2011, May 2014, and July 2014 for MW-5 were adjusted to account for floating product.
Top of casing elevation for MW-5 modified during system installation in 2012.

TABLE 5
DATA ANALYSIS SUMMARY

SHANNON & WILSON, INC.

Monitoring Well	Analysis		Parameter				
			Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes
MW-2	Mann-Kendall	Plume Stability	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking
		CL	99.8%	100.0%	99.2%	100.0%	99.5%
	Linear Regression	Plume Stability	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking
		CL	93.7%	100.0%	100.0%	93.6%	100.0%
		Point Decay Rate at 50% CL, yr^{-1}	0.076	0.525	0.294	0.259	0.274
		Point Decay Rate at 85% CL, yr^{-1}	0.037	0.458	0.264	0.126	0.249
		Half Life at 50% CL, yr	9.166	1.321	2.354	2.676	2.532
		Half Life at 85% CL, yr	18.695	1.513	2.625	5.485	2.788
MW-3	Mann-Kendall	Plume Stability	Shrinking	Undetermined	Undetermined	Undetermined	Undetermined
		CL	85.4%	75.8%	75.8%	63.6%	50.0%
	Linear Regression	Plume Stability	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking
		CL	98.8%	100.0%	100.0%	100.0%	99.9%
		Point Decay Rate at 50% CL, yr^{-1}	0.076	0.599	0.175	0.282	0.238
		Point Decay Rate at 85% CL, yr^{-1}	0.050	0.515	0.161	0.247	0.189
		Half Life at 50% CL, yr	9.099	1.241	3.966	2.455	2.915
		Half Life at 85% CL, yr	13.847	1.347	4,304.000	2.806	3.669
MW-4	Mann-Kendall	Plume Stability	Stable	Stable	Stable	Stable	Stable
		CL	70.0%	-900.0%	-900.0%	-900.0%	-900.0%
	Linear Regression	Plume Stability	Stable	NA	NA	NA	Stable
		CL	13.0%	NA	NA	NA	0.0%
		Point Decay Rate at 50% CL, yr^{-1}	0.006	NA	NA	NA	NA
		Point Decay Rate at 85% CL, yr^{-1}	NA	NA	NA	NA	NA
		Half Life at 50% CL, yr	116.2	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

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Hilton Seattle Hotel
Seattle, Washington

VICINITY MAP

June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1

Filename: I:\WP\Projects\21-1 Seattle\21-1-12341-004 Seattle Hilton Hotel\Graphics\Cad\ForSurfer\21-1-12341-004 Fig 1.dwg Date: 06-18-2015 Login: ath

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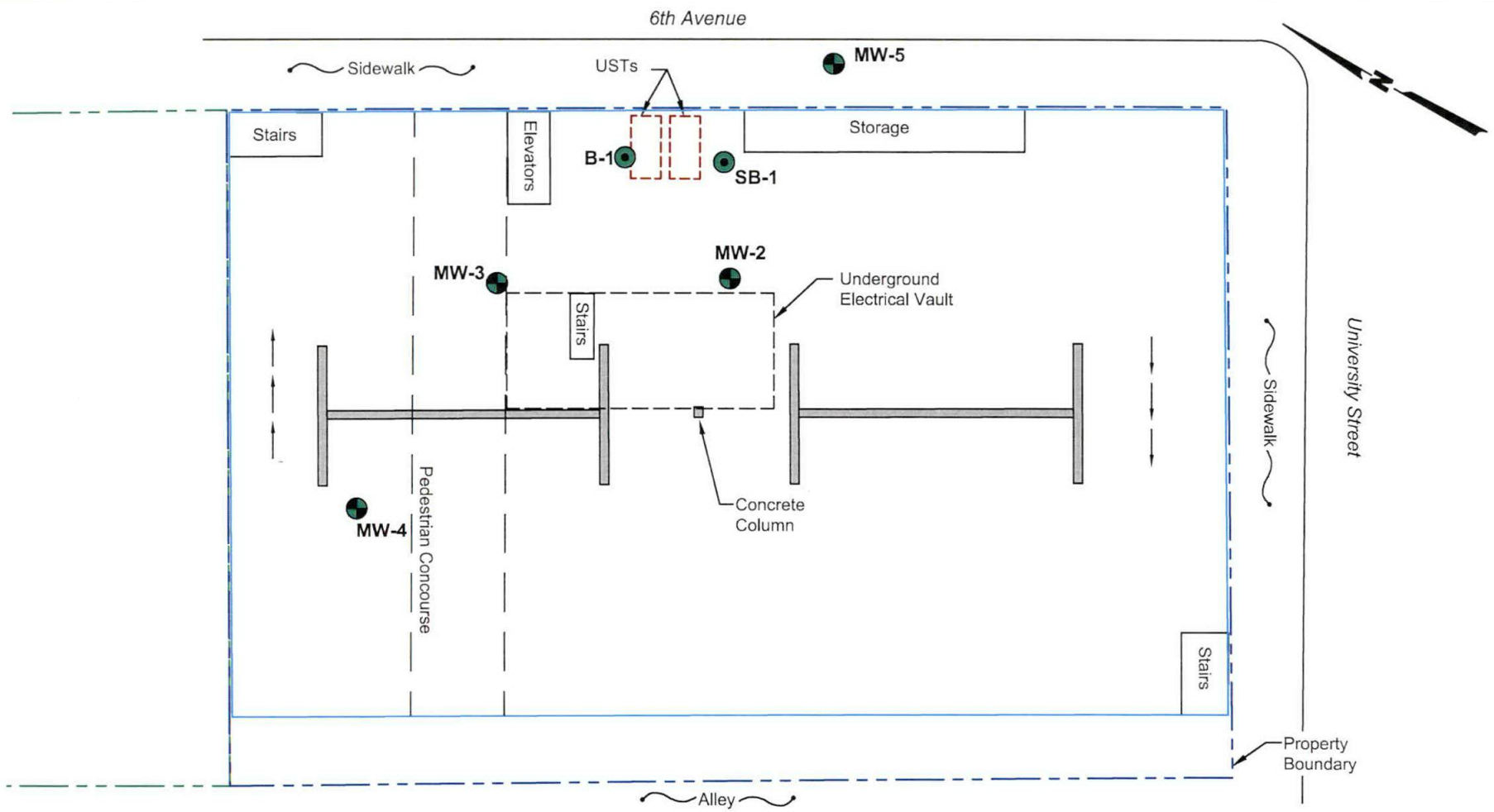

0 30 60

Scale in Feet

LEGEND

Monitoring Well Designation and Approximate Location

Historical Boring Designation and Approximate Location

NOTE

Locations of site features shown are approximate.

Hilton Seattle Hotel
Seattle, Washington

SITE PLAN

June 2015 21-1-12341-004

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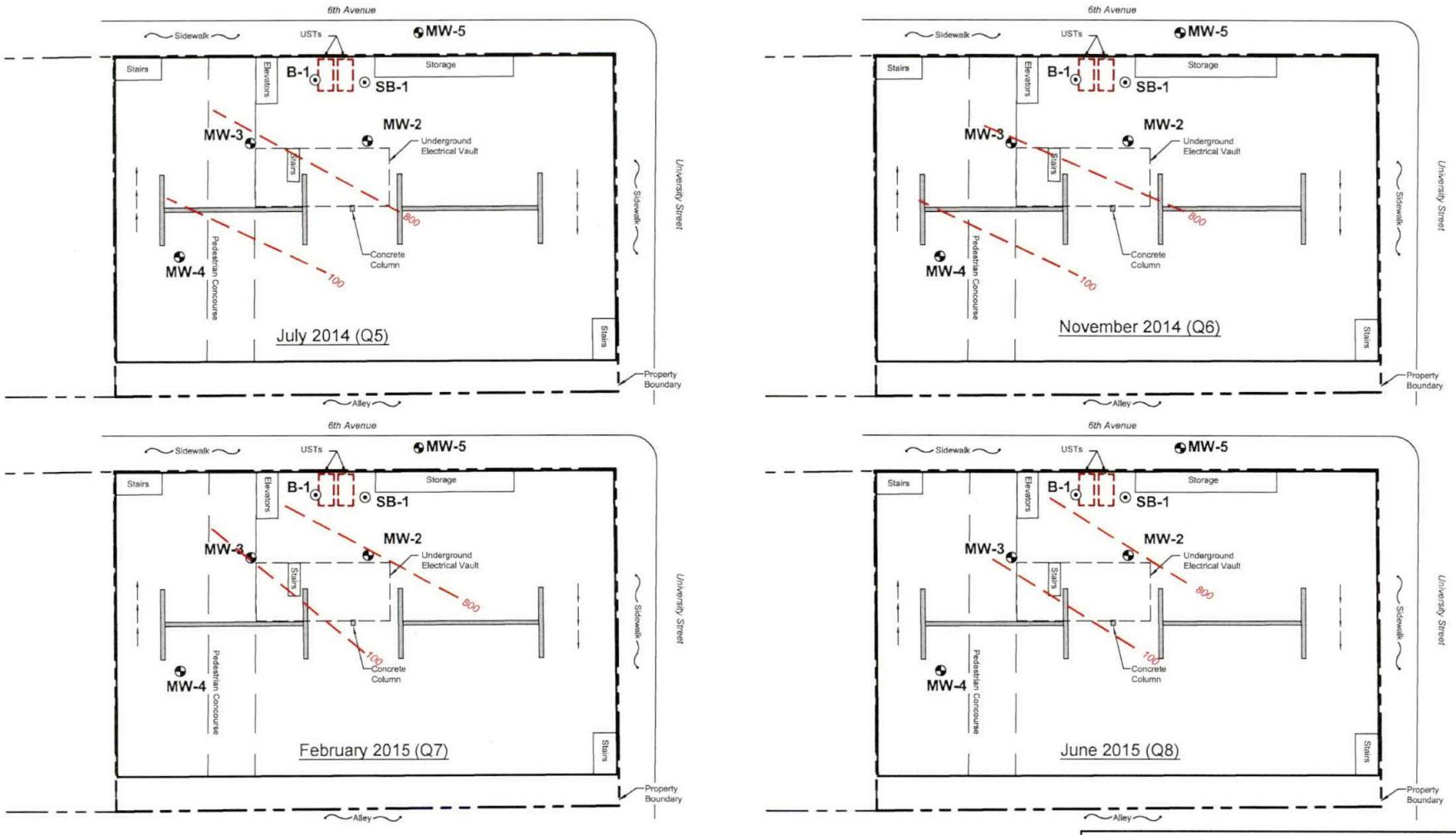
FIG. 2

FIG. 2

Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O-Q8.dwg Layout: Gasoline Date: 06-19-2015 Login: bac



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

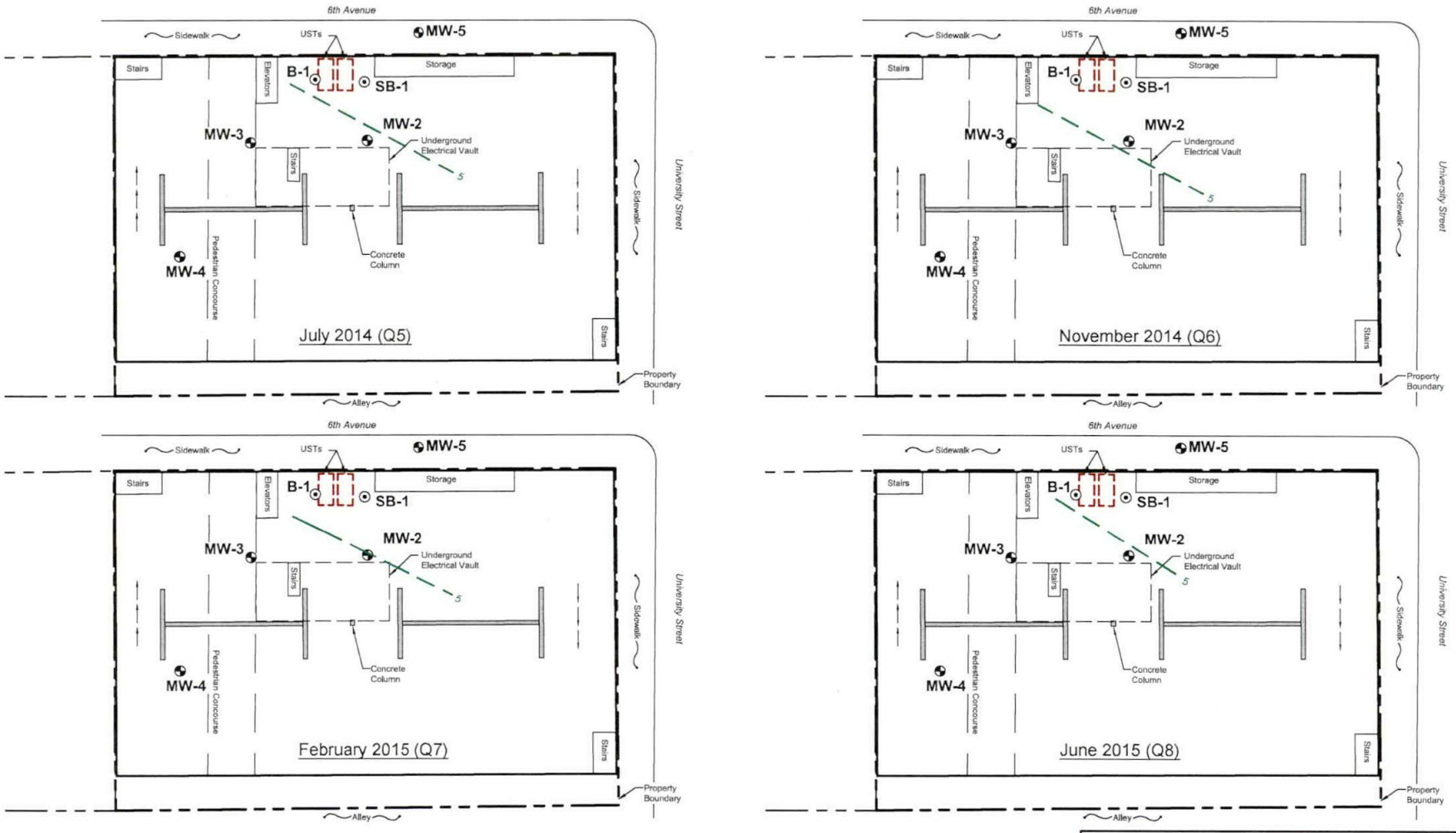
June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

FIG. 3

Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O-Q8.dwg Layout: Benzene Date: 06-19-2015 Login: bac



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.

0 60 120

Scale in Feet

Hilton Seattle Hotel
Seattle, Washington

ESTIMATED EXTENT OF BENZENE CONTAMINATION

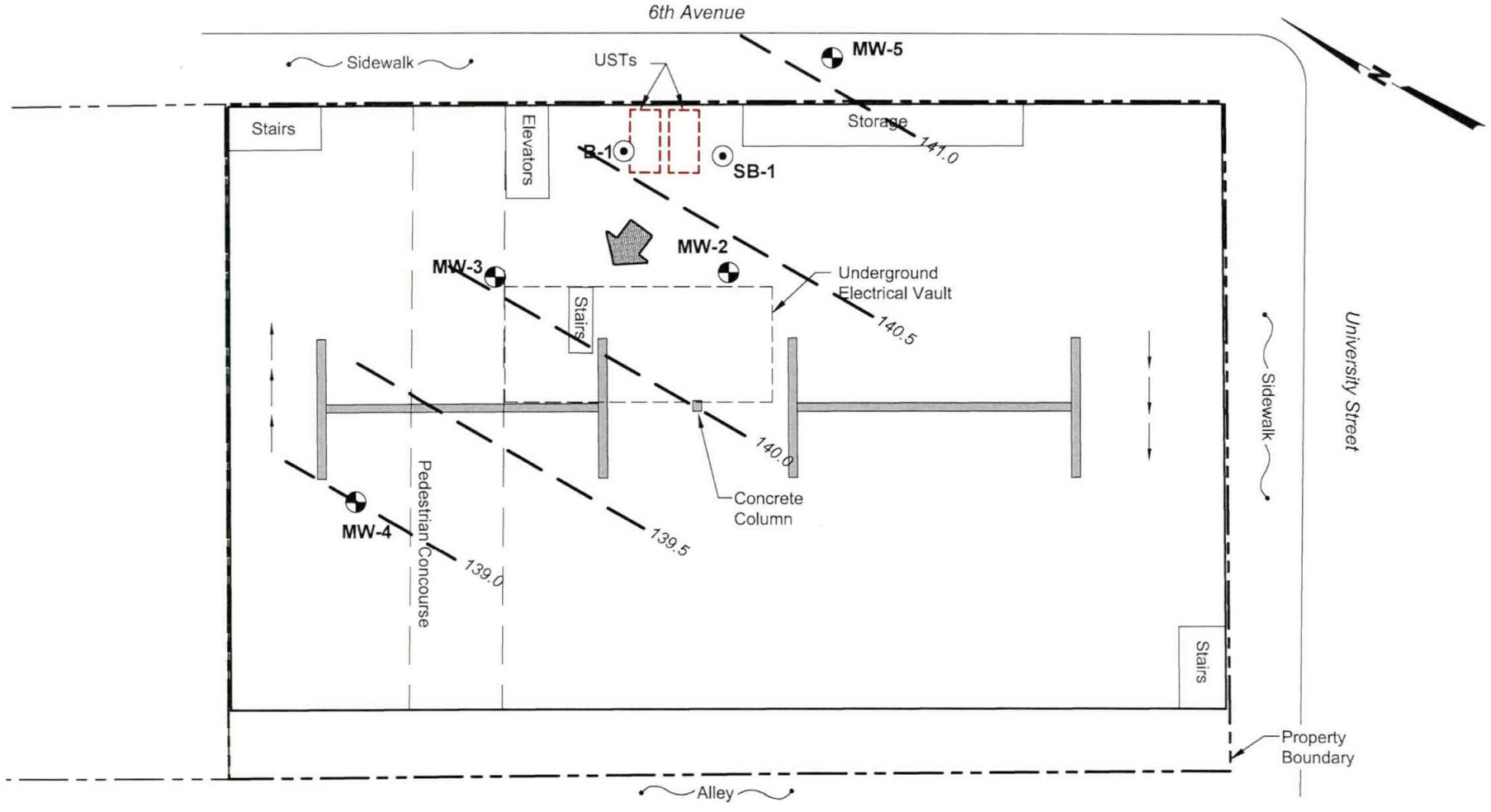
June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 4

FIG. 4

Filename: J:\211\12341-004\21-1-12341-004 SP_Contams_H2O-Q8.dwg Layout: H2O Date: 06-19-2015 Login: bac



LEGEND

- Monitoring Well Designation and Approximate Location
- Historical Boring Designation and Approximate Location
- Approximate Groundwater Elevation Contour 11/25/14
- 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

June 2015 21-1-12341-004

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FIG. 5

FIG. 5

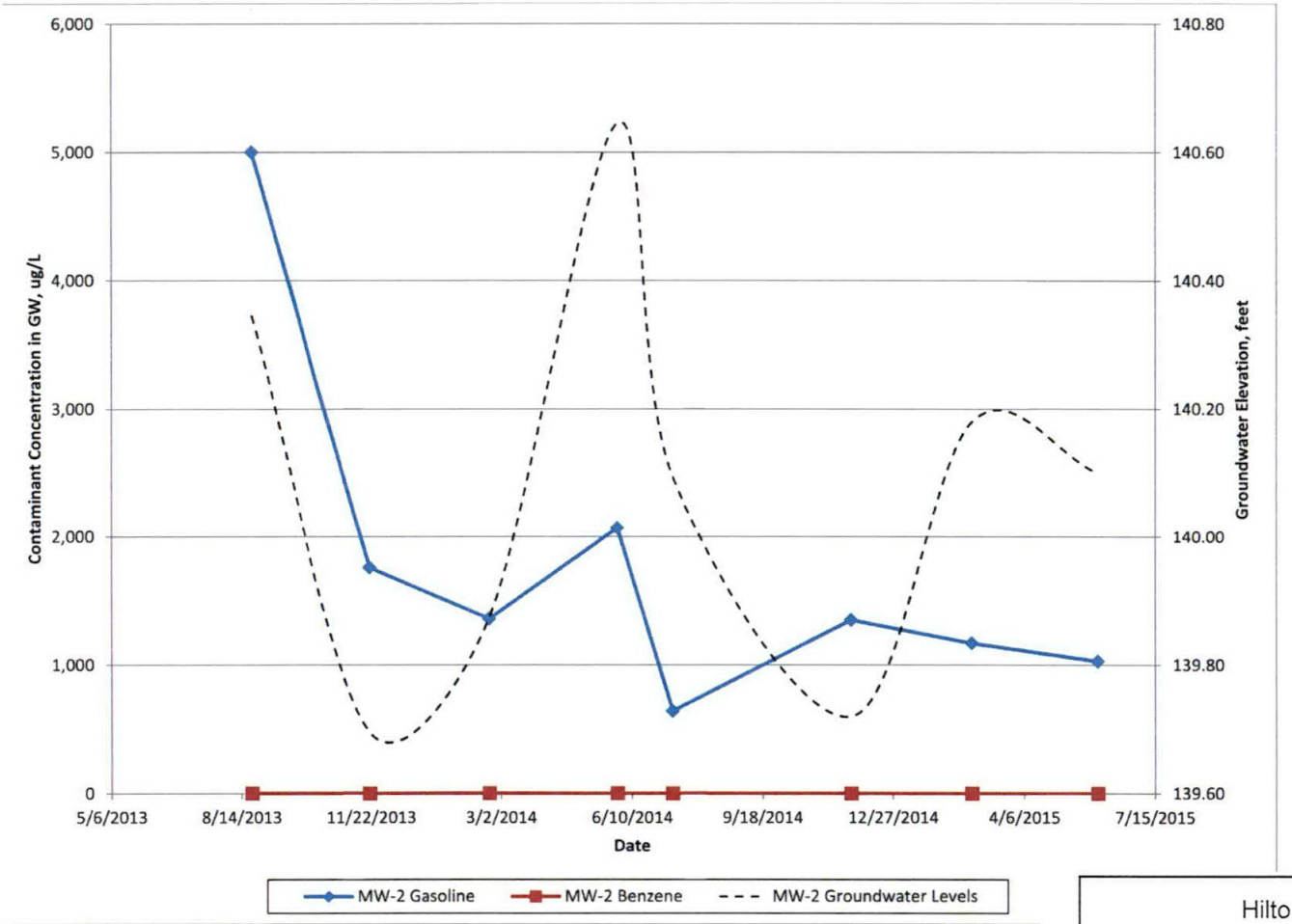

FIG. 6

Hilton Seattle Hotel
Seattle, Washington

MW-2
CONTAMINANT CONCENTRATIONS AND GROUNDWATER LEVELS

June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 6

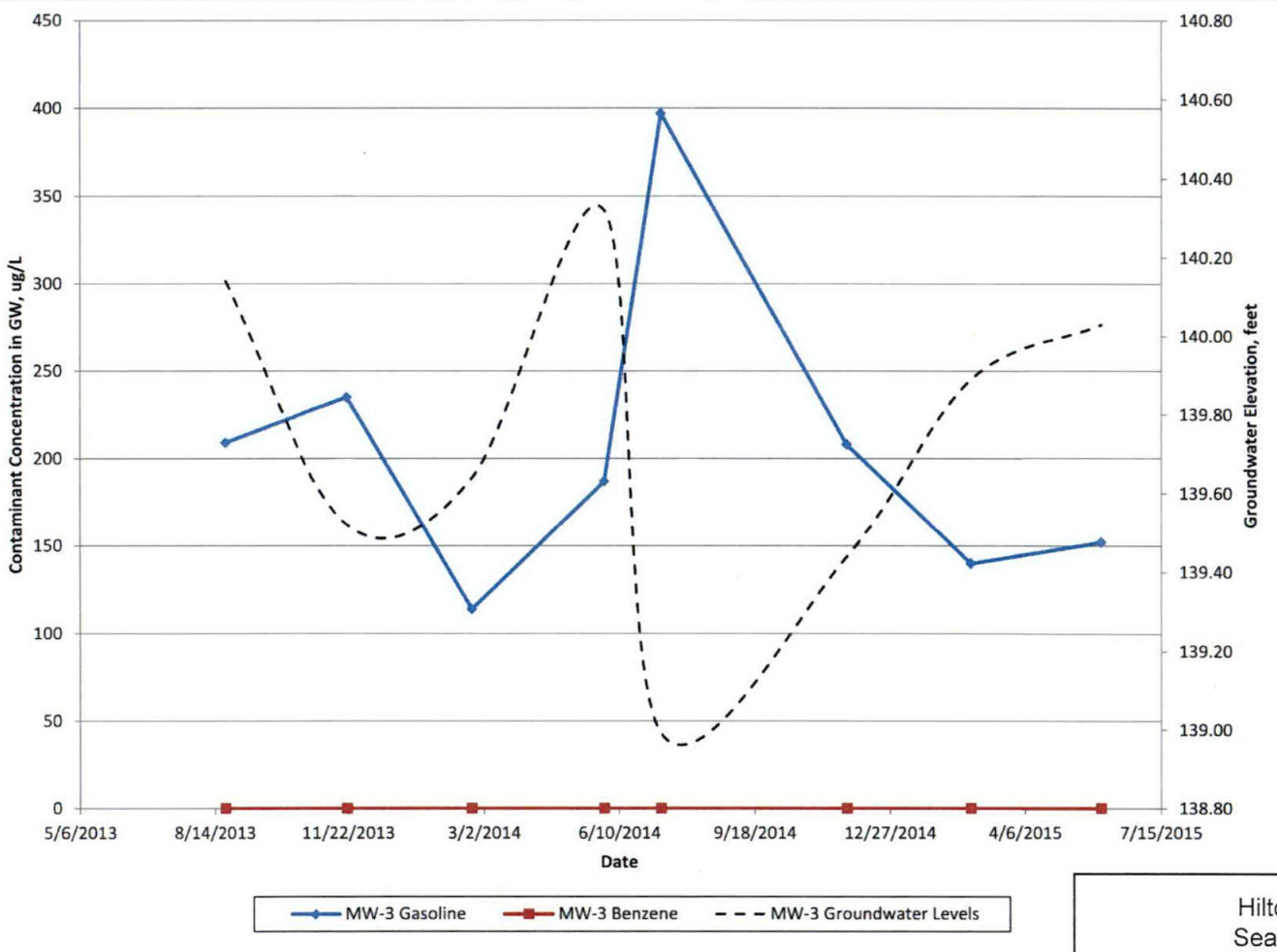

FIG. 7

Hilton Seattle Hotel
Seattle, Washington

MW-3
CONTAMINANT CONCENTRATIONS AND GROUNDWATER LEVELS

June 2015 21-1-12341-004

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Geotechnical and Environmental Consultants

FIG. 7

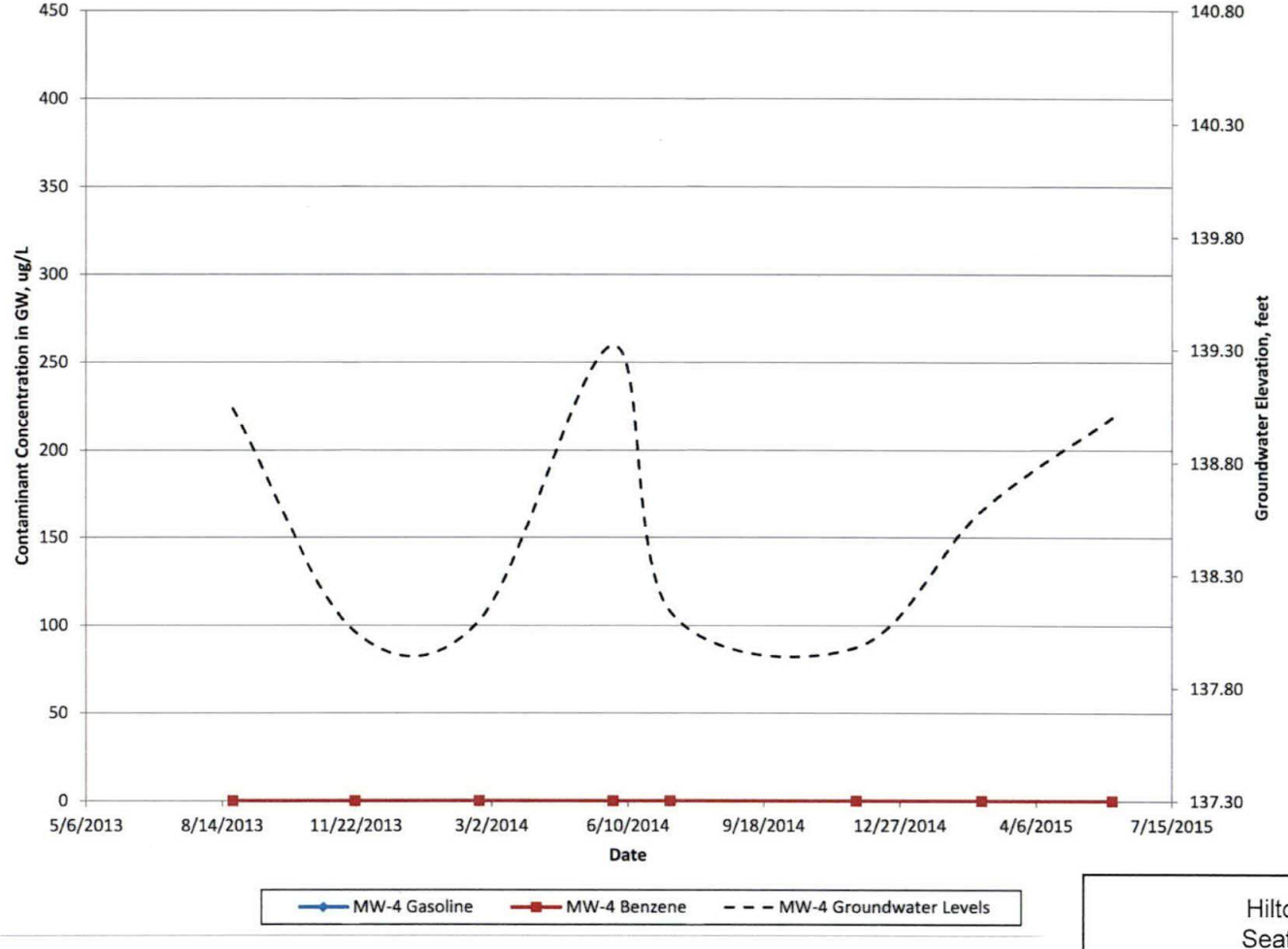


FIG. 8

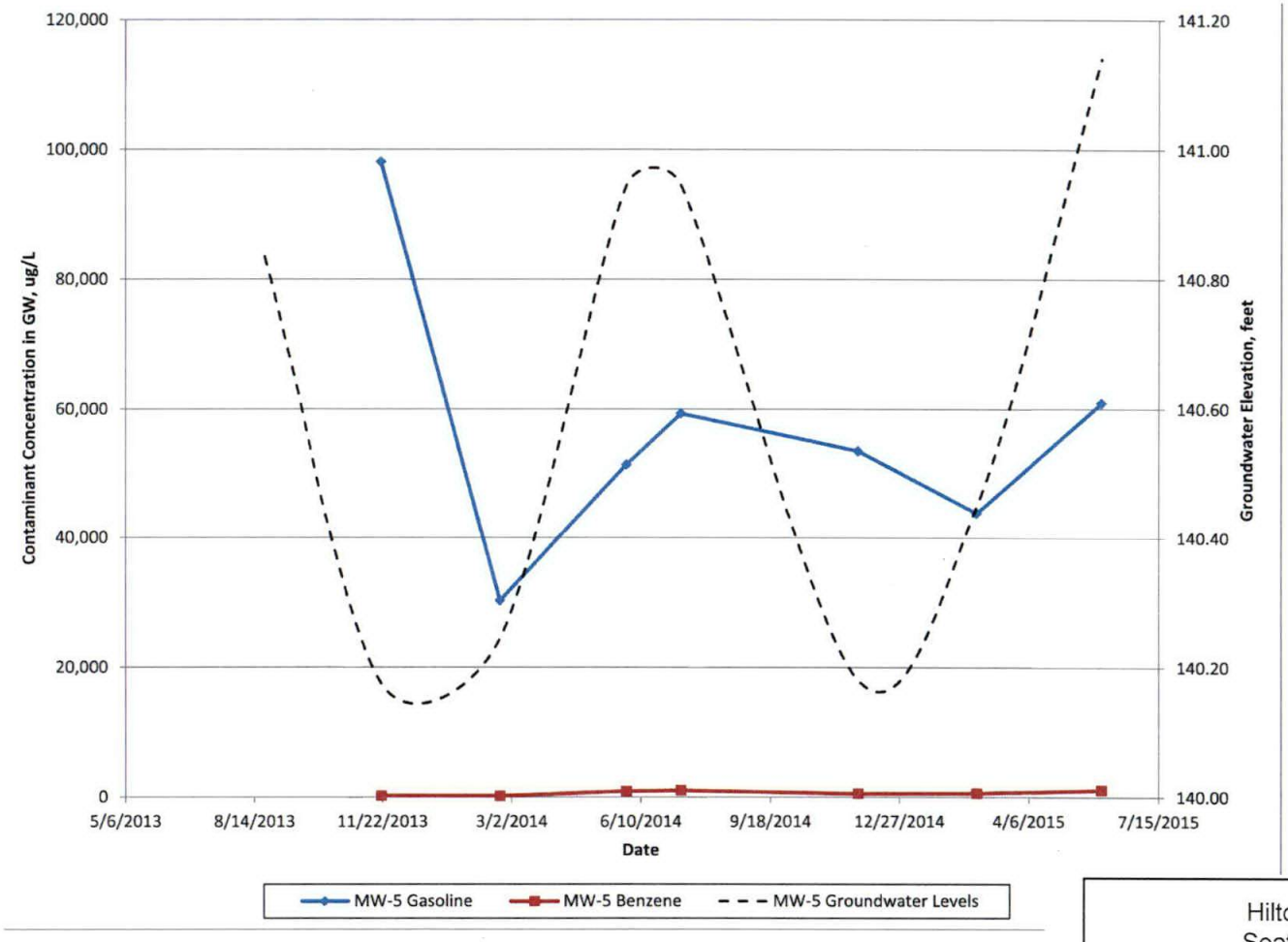
Hilton Seattle Hotel
Seattle, Washington

MW-4
CONTAMINANT CONCENTRATIONS AND GROUNDWATER LEVELS

June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 8



Hilton Seattle Hotel
Seattle, Washington

MW-5
CONTAMINANT CONCENTRATIONS AND GROUNDWATER LEVELS

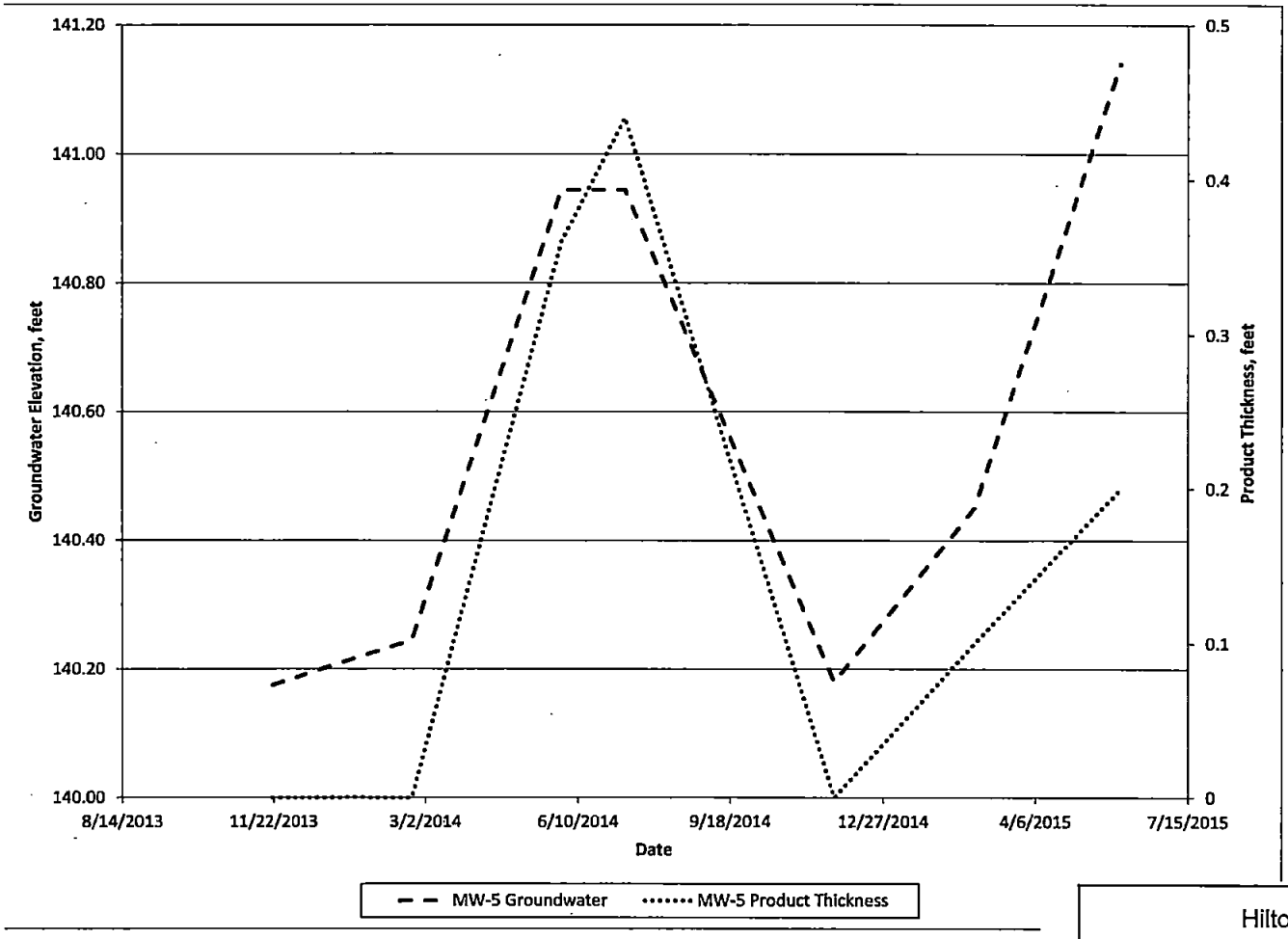
June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 9

FIG. 9

Filename: I:\WIP\Projects\21-1 Seattle\21-1-12341-004 Seattle Hilton Hotel\Graphics\Cad\Figures MW5-Q8.dwg Date: 06-18-2015 Login: ath



Hilton Seattle Hotel
Seattle, Washington

MW-5
PRODUCT THICKNESS
AND GROUNDWATER LEVELS

June 2015 21-1-12341-004

SHANNON & WILSON, INC.
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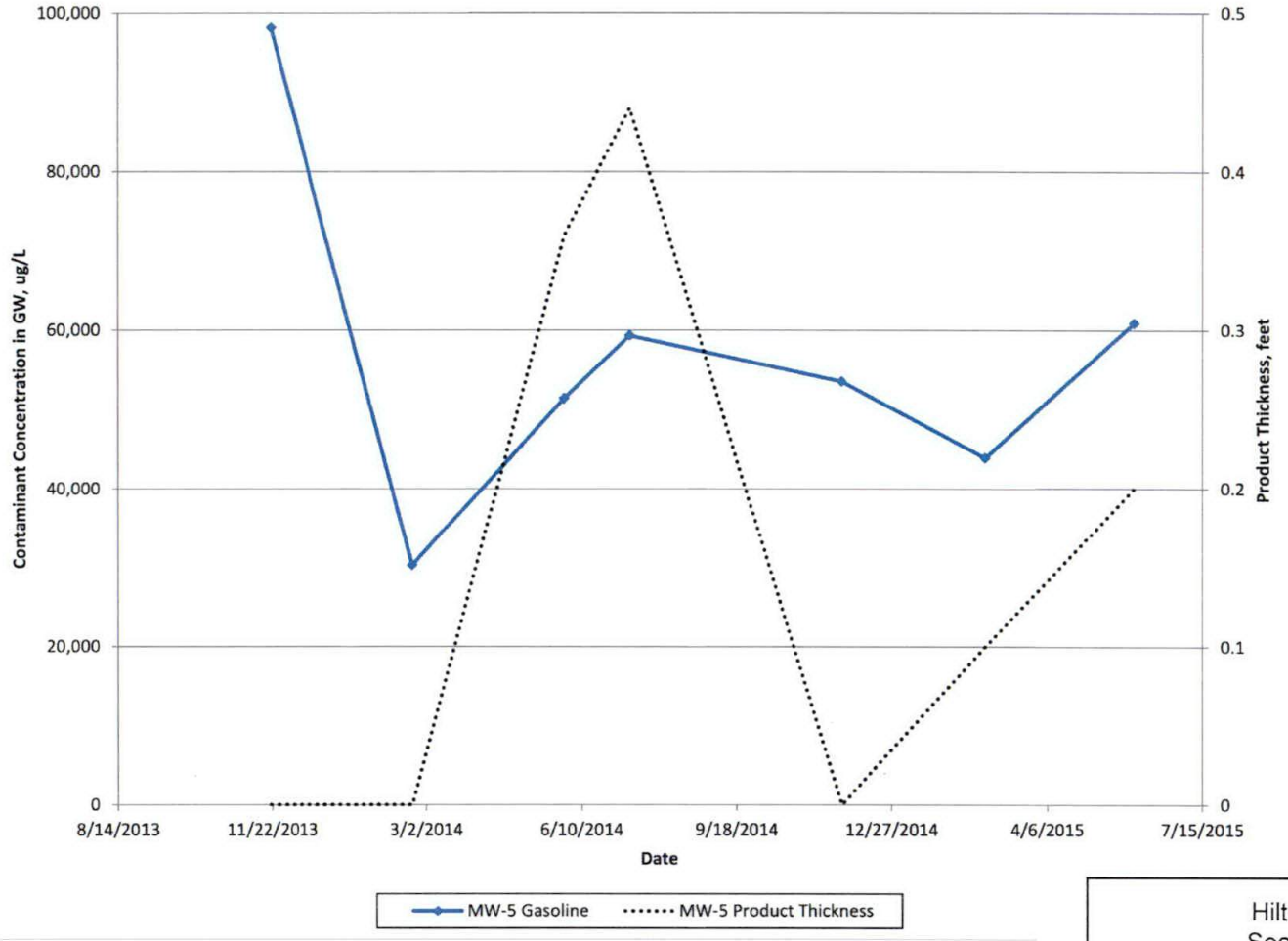
FIG. 10

FIG. 10



Hilton Seattle Hotel
Seattle, Washington

MW-5
PRODUCT THICKNESS
AND GASOLINE CONCENTRATIONS

June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 11

FIG. 11

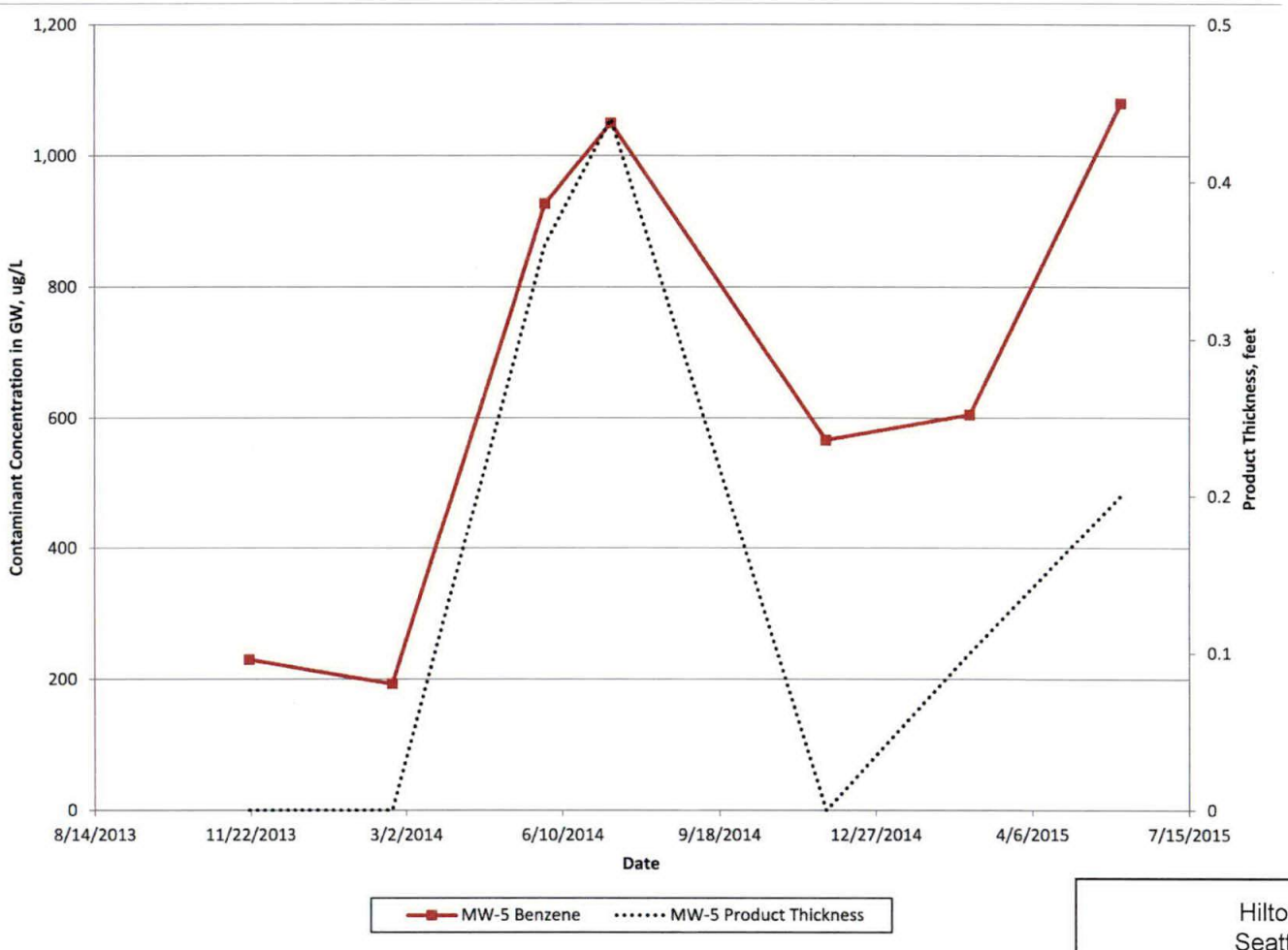


FIG. 12

Hilton Seattle Hotel
Seattle, Washington

MW-5
PRODUCT THICKNESS
AND BENZENE CONCENTRATIONS

June 2015 21-1-12341-004

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 12

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: 1506014

June 09, 2015

Attention Michael Reynolds:

Fremont Analytical, Inc. received 5 sample(s) on 6/1/2015 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,

Mike Ridgeway
President

Fremont Analytical

Date: *06/09/2015*

CLIENT: Shannon & Wilson
Project: Seattle Hilton
Lab Order: 1506014

Work Order Sample Summary

Lab Sample ID	Client Sample ID	Date/Time Collected	Date/Time Received
1506014-001	MW-5	06/01/2015 12:50 PM	06/01/2015 1:43 PM
1506014-002	MW-4	06/01/2015 10:30 AM	06/01/2015 1:43 PM
1506014-003	MW-3	06/01/2015 11:35 AM	06/01/2015 1:43 PM
1506014-004	MW-2	06/01/2015 12:25 PM	06/01/2015 1:43 PM
1506014-005	Trip Blank	05/28/2015 11:45 AM	06/01/2015 1:43 PM

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

Case Narrative

WO#: **1506014**
Date: **6/9/2015**

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.

Qualifiers:

* - Flagged value is not within established control limits
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
I - Analyte with an internal standard that does not meet established acceptance criteria
J - Analyte detected below LOQ
N - Tentatively Identified Compound (TIC)
Q - Analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20%RSD, <20% Drift or minimum RRF)
S - Spike recovery outside accepted recovery limits
ND - Not detected at the Reporting Limit

Acronyms:

%Rec - Percent Recovery
CCB - Continued Calibration Blank
CCV - Continued Calibration Verification
DF - Dilution Factor
HEM - Hexane Extractable Material
ICV - Initial Calibration Verification
LCS/LCSD - Laboratory Control Sample / Laboratory Control Sample Duplicate
MB or MBLANK - Method Blank
MDL - Method Detection Limit
MS/MSD - Matrix Spike / Matrix Spike Duplicate
PDS - Post Digestion Spike
Ref Val - Reference Value
RL - Reporting Limit
RPD - Relative Percent Difference
SD - Serial Dilution
SGT - Silica Gel Treatment
SPK - Spike
Surr - Surrogate

Fremont Analytical

Analytical Report

WO#: **1506014**
Date Reported: **6/9/2015**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1506014-001
Client Sample ID: **MW-5**

Collection Date: 6/1/2015 12:50:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R22758		Analyst: BC
Gasoline	60,900	5,000	D	µg/L	100	6/5/2015 3:09:00 AM
Surr: 4-Bromofluorobenzene	92.0	65-135	D	%REC	100	6/5/2015 3:09:00 AM
Surr: Toluene-d8	99.4	65-135	D	%REC	100	6/5/2015 3:09:00 AM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R22757		Analyst: BC
Benzene	1,080	100	D	µg/L	100	6/5/2015 3:09:00 AM
Toluene	570	100	D	µg/L	100	6/8/2015 5:11:00 PM
Ethylbenzene	1,990	100	D	µg/L	100	6/5/2015 3:09:00 AM
m,p-Xylene	7,690	100	D	µg/L	100	6/5/2015 3:09:00 AM
o-Xylene	2,700	100	D	µg/L	100	6/5/2015 3:09:00 AM
Surr: Dibromofluoromethane	99.1	77.4-147		%REC	1	6/3/2015 9:30:00 PM
Surr: Toluene-d8	135	40.1-139		%REC	1	6/3/2015 9:30:00 PM
Surr: 1-Bromo-4-fluorobenzene	121	64.2-128		%REC	1	6/3/2015 9:30:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R22728		Analyst: KT
Nitrate	0.0965	0.500	JD	mg/L	5	6/2/2015 1:50:00 PM
Sulfate	ND	1.50	D	mg/L	5	6/2/2015 1:50:00 PM
NOTES: Diluted due to matrix and high levels of non-target analytes.						
Total Metals by EPA Method 200.8				Batch ID: 10923		Analyst: TN
Lead	22.8	1.00		µg/L	1	6/3/2015 5:03:12 PM
Ferrous Iron by SM3500-Fe B				Batch ID: R22703		Analyst: KT
Ferrous Iron	4.20	0.300	D	mg/L	10	6/1/2015 6:00:00 PM

Fremont Analytical

Analytical Report

WO#: **1506014**
Date Reported: **6/9/2015**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1506014-002
Client Sample ID: **MW-4**

Collection Date: 6/1/2015 10:30:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R22758		Analyst: BC
Gasoline	ND	50.0		µg/L	1	6/3/2015 6:41:00 PM
Surr: 4-Bromofluorobenzene	132	65-135		%REC	1	6/3/2015 6:41:00 PM
Surr: Toluene-d8	135	65-135		%REC	1	6/3/2015 6:41:00 PM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R22757		Analyst: BC
Benzene	ND	1.00		µg/L	1	6/3/2015 6:41:00 PM
Toluene	ND	1.00		µg/L	1	6/3/2015 6:41:00 PM
Ethylbenzene	ND	1.00		µg/L	1	6/3/2015 6:41:00 PM
m,p-Xylene	ND	1.00		µg/L	1	6/5/2015 12:43:00 AM
o-Xylene	ND	1.00		µg/L	1	6/3/2015 6:41:00 PM
Surr: Dibromofluoromethane	98.8	77.4-147		%REC	1	6/3/2015 6:41:00 PM
Surr: Toluene-d8	101	40.1-139		%REC	1	6/3/2015 6:41:00 PM
Surr: 1-Bromo-4-fluorobenzene	101	64.2-128		%REC	1	6/3/2015 6:41:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R22728		Analyst: KT
Nitrate	0.201	0.500	JD	mg/L	5	6/2/2015 2:00:00 PM
Sulfate	33.3	1.50	D	mg/L	5	6/2/2015 2:00:00 PM
NOTES: Diluted due to matrix and high levels of non-target analytes.						
Total Metals by EPA Method 200.8				Batch ID: 10923		Analyst: TN
Lead	ND	1.00		µg/L	1	6/3/2015 5:06:43 PM
Ferrous Iron by SM3500-Fe B				Batch ID: R22703		Analyst: KT
Ferrous Iron	ND	0.0300		mg/L	1	6/1/2015 5:54:00 PM

Fremont Analytical

Analytical Report

WO#: **1506014**
Date Reported: **6/9/2015**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1506014-003
Client Sample ID: **MW-3**

Collection Date: 6/1/2015 11:35:00 AM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R22758		Analyst: BC
Gasoline	152	50.0		µg/L	1	6/3/2015 8:05:00 PM
Surr: 4-Bromofluorobenzene	135	65-135		%REC	1	6/3/2015 8:05:00 PM
Surr: Toluene-d8	139	65-135	S	%REC	1	6/3/2015 8:05:00 PM
NOTES: S - Outlying surrogate recovery observed, a duplicate analysis was performed and recovered within range.						
Volatile Organic Compounds by EPA Method 8260				Batch ID: R22757		Analyst: BC
Benzene	ND	1.00		µg/L	1	6/3/2015 8:05:00 PM
Toluene	ND	1.00		µg/L	1	6/3/2015 8:05:00 PM
Ethylbenzene	ND	1.00		µg/L	1	6/3/2015 8:05:00 PM
m,p-Xylene	1.21	1.00		µg/L	1	6/5/2015 1:12:00 AM
o-Xylene	ND	1.00		µg/L	1	6/3/2015 8:05:00 PM
Surr: Dibromofluoromethane	97.5	77.4-147		%REC	1	6/3/2015 8:05:00 PM
Surr: Toluene-d8	101	40.1-139		%REC	1	6/3/2015 8:05:00 PM
Surr: 1-Bromo-4-fluorobenzene	103	64.2-128		%REC	1	6/3/2015 8:05:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R22728		Analyst: KT
Nitrate	0.118	0.500	JD	mg/L	5	6/2/2015 2:35:00 PM
Sulfate	ND	1.50	D	mg/L	5	6/2/2015 2:35:00 PM
NOTES: Diluted due to matrix and high levels of non-target analytes.						
Total Metals by EPA Method 200.8				Batch ID: 10923		Analyst: TN
Lead	ND	1.00		µg/L	1	6/3/2015 5:10:15 PM
Ferrous Iron by SM3500-Fe B				Batch ID: R22703		Analyst: KT
Ferrous Iron	1.75	0.0300		mg/L	1	6/1/2015 5:56:00 PM

Fremont Analytical

Analytical Report

WO#: **1506014**
Date Reported: **6/9/2015**

Client: Shannon & Wilson
Project: Seattle Hilton
Lab ID: 1506014-004
Client Sample ID: **MW-2**

Collection Date: 6/1/2015 12:25:00 PM
Matrix: Water

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
Gasoline by NWTPH-Gx				Batch ID: R22758		Analyst: BC
Gasoline	1,030	50.0		µg/L	1	6/3/2015 9:02:00 PM
Surr: 4-Bromofluorobenzene	131	65-135		%REC	1	6/3/2015 9:02:00 PM
Surr: Toluene-d8	133	65-135		%REC	1	6/3/2015 9:02:00 PM
Volatile Organic Compounds by EPA Method 8260				Batch ID: R22757		Analyst: BC
Benzene	ND	1.00		µg/L	1	6/3/2015 9:02:00 PM
Toluene	1.52	1.00		µg/L	1	6/3/2015 9:02:00 PM
Ethylbenzene	1.96	1.00		µg/L	1	6/3/2015 9:02:00 PM
m,p-Xylene	2.62	1.00		µg/L	1	6/5/2015 1:42:00 AM
o-Xylene	1.86	1.00		µg/L	1	6/3/2015 9:02:00 PM
Surr: Dibromofluoromethane	95.3	77.4-147		%REC	1	6/3/2015 9:02:00 PM
Surr: Toluene-d8	100	40.1-139		%REC	1	6/3/2015 9:02:00 PM
Surr: 1-Bromo-4-fluorobenzene	100	64.2-128		%REC	1	6/3/2015 9:02:00 PM
Ion Chromatography by EPA Method 300.0				Batch ID: R22728		Analyst: KT
Nitrate	0.178	0.500	JD	mg/L	5	6/2/2015 2:45:00 PM
Sulfate	ND	1.50	D	mg/L	5	6/2/2015 2:45:00 PM
NOTES: Diluted due to matrix and high levels of non-target analytes.						
Total Metals by EPA Method 200.8				Batch ID: 10923		Analyst: TN
Lead	ND	1.00		µg/L	1	6/3/2015 5:13:46 PM
Ferrous Iron by SM3500-Fe B				Batch ID: R22703		Analyst: KT
Ferrous Iron	0.600	0.0300		mg/L	1	6/1/2015 5:58:00 PM

Fremont Analytical

Date: 6/9/2015

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **CCV-B-R22757** SampType: **CCV** Units: **µg/L** Prep Date: **6/4/2015** RunNo: **22757**
Client ID: **CCV** Batch ID: **R22757** Analysis Date: **6/4/2015** SeqNo: **431816**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Surr: Dibromofluoromethane	28.8		25.00		115	72.1	122				
Surr: Toluene-d8	33.3		25.00		133	62.1	129				S
Surr: 1-Bromo-4-fluorobenzene	25.4		25.00		101	63.3	132				

Sample ID: **CCV-C-R22757** SampType: **CCV** Units: **µg/L** Prep Date: **6/8/2015** RunNo: **22757**
Client ID: **CCV** Batch ID: **R22757** Analysis Date: **6/8/2015** SeqNo: **432740**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Toluene	17.9	1.00	20.00	0	89.7	80	120				
Surr: Dibromofluoromethane	23.7		25.00		94.6	72.1	122				
Surr: Toluene-d8	22.1		25.00		88.5	62.1	129				
Surr: 1-Bromo-4-fluorobenzene	16.6		25.00		66.6	63.3	132				

Fremont Analytical

Date: 6/9/2015

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **1506014-002AMS**	SampType: **MS**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22757**			
Client ID: **MW-4**	Batch ID: **R22757**					Analysis Date: **6/3/2015**		SeqNo: **431371**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ethylbenzene	20.2	1.00	20.00	0	101	64.5	136				
m,p-Xylene	21.1	1.00	40.00	0	52.8	63.3	135				S
o-Xylene	20.1	1.00	20.00	0	101	65.4	134				
Surr: Dibromofluoromethane	25.8		25.00		103	77.4	147				
Surr: Toluene-d8	25.6		25.00		102	40.1	139				
Surr: 1-Bromo-4-fluorobenzene	24.6		25.00		98.3	64.2	128				

NOTES:
S - Outlying QC recoveries were associated with this sample. The method is in control as indicated by the LCS.

Sample ID: **1506014-003ADUP**	SampType: **DUP**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22757**			
Client ID: **MW-3**	Batch ID: **R22757**					Analysis Date: **6/3/2015**		SeqNo: **431373**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	ND	1.00						0		30	
Toluene	ND	1.00						0		30	
Ethylbenzene	ND	1.00						0		30	
m,p-Xylene	ND	1.00						0		30	
o-Xylene	ND	1.00						0		30	*
Surr: Dibromofluoromethane	26.5		25.00		106	77.4	147		0		
Surr: Toluene-d8	25.3		25.00		101	40.1	139		0		
Surr: 1-Bromo-4-fluorobenzene	25.5		25.00		102	64.2	128		0		

NOTES:
* - Flagged value is not within established control limits.

Sample ID: **CCV-B-R22757**	SampType: **CCV**			Units: **µg/L**		Prep Date: **6/4/2015**		RunNo: **22757**			
Client ID: **CCV**	Batch ID: **R22757**					Analysis Date: **6/4/2015**		SeqNo: **431816**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	21.3	1.00	20.00	0	106	80	120				
Ethylbenzene	19.2	1.00	20.00	0	96.0	80	120				
m,p-Xylene	38.1	1.00	40.00	0	95.3	80	120				
o-Xylene	18.9	1.00	20.00	0	94.4	80	120				

Fremont Analytical

Date: *6/9/2015*

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Volatile Organic Compounds by EPA Method 8260

Sample ID: **LCS-R22757**	SampType: **LCS**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22757**			
Client ID: **LCSW**	Batch ID: **R22757**					Analysis Date: **6/3/2015**		SeqNo: **431032**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	19.4	1.00	20.00	0	96.8	69.3	132				
Toluene	19.7	1.00	20.00	0	98.4	61.3	145				
Ethylbenzene	19.5	1.00	20.00	0	97.5	72	130				
m,p-Xylene	20.7	1.00	40.00	0	51.7	70.3	134				S
o-Xylene	21.4	1.00	20.00	0	107	72.1	131				
Surr: Dibromofluoromethane	24.0		25.00		95.8	77.4	147				
Surr: Toluene-d8	25.3		25.00		101	40.1	139				
Surr: 1-Bromo-4-fluorobenzene	24.2		25.00		97.0	64.2	128				

NOTES:
S - Outlying spike recovery observed for m,p-Xylene (low bias). Samples will be qualified with an *.

Sample ID: **MB-R22757**	SampType: **MBLK**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22757**			
Client ID: **MBLKW**	Batch ID: **R22757**					Analysis Date: **6/3/2015**		SeqNo: **431033**			
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									
Ethylbenzene	ND	1.00									
m,p-Xylene	ND	1.00									*
o-Xylene	ND	1.00									
Surr: Dibromofluoromethane	24.7		25.00		98.6	77.4	147				
Surr: Toluene-d8	24.2		25.00		96.8	40.1	139				
Surr: 1-Bromo-4-fluorobenzene	24.6		25.00		98.2	64.2	128				

NOTES:
* - Flagged value is not within established control limits.

Sample ID: **1506014-002AMS**	SampType: **MS**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22757**			
Client ID: **MW-4**	Batch ID: **R22757**					Analysis Date: **6/3/2015**		SeqNo: **431371**			
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Benzene	22.1	1.00	20.00	0	110	65.4	138				
Toluene	21.6	1.00	20.00	0	108	64	139				

Fremont Analytical

Date: *6/9/2015*

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Gasoline by NWTPH-Gx

Sample ID: **LCS-R22758**	SampType: **LCS**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22758**		
Client ID: **LCSW**	Batch ID: **R22758**					Analysis Date: **6/3/2015**		SeqNo: **431041**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	447	50.0	500.0	0	89.3	65	135				
Surr: Toluene-d8	32.4		25.00		130	65	135				
Surr: 4-Bromofluorobenzene	30.5		25.00		122	65	135				

Sample ID: **MB-R22758**	SampType: **MBLK**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22758**		
Client ID: **MBLKW**	Batch ID: **R22758**					Analysis Date: **6/3/2015**		SeqNo: **431042**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	ND	50.0									
Surr: Toluene-d8	31.8		25.00		127	65	135				
Surr: 4-Bromofluorobenzene	32.0		25.00		128	65	135				

Sample ID: **1506014-003ADUP**	SampType: **DUP**			Units: **µg/L**		Prep Date: **6/3/2015**		RunNo: **22758**		
Client ID: **MW-3**	Batch ID: **R22758**					Analysis Date: **6/3/2015**		SeqNo: **431365**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	112	50.0						151.6	29.7	30	
Surr: Toluene-d8	33.4		25.00		134	65	135		0	0	
Surr: 4-Bromofluorobenzene	33.2		25.00		133	65	135		0	0	

Sample ID: **CCV-C-R22758**	SampType: **CCV**			Units: **µg/L**		Prep Date: **6/5/2015**		RunNo: **22758**		
Client ID: **CCV**	Batch ID: **R22758**					Analysis Date: **6/5/2015**		SeqNo: **431809**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Gasoline	439	50.0	500.0	0	87.7	80	120				
Surr: Toluene-d8	24.8		25.00		99.3	65	135				
Surr: 4-Bromofluorobenzene	22.7		25.00		90.6	65	135				

Fremont Analytical

Date: 6/9/2015

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Total Metals by EPA Method 200.8

Sample ID: **MB-10923**	SampType: **MBLK**			Units: **µg/L**		Prep Date: **6/3/2015**			RunNo: **22759**		
Client ID: **MBLKW**	Batch ID: **10923**					Analysis Date: **6/3/2015**			SeqNo: **431062**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	ND	1.00									

Sample ID: **LCS-10923**	SampType: **LCS**			Units: **µg/L**		Prep Date: **6/3/2015**			RunNo: **22759**		
Client ID: **LCSW**	Batch ID: **10923**					Analysis Date: **6/3/2015**			SeqNo: **431063**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	44.6	1.00	50.00	0	89.3	85	115				

Sample ID: **1506005-001ADUP**	SampType: **DUP**			Units: **µg/L**		Prep Date: **6/3/2015**			RunNo: **22759**		
Client ID: **BATCH**	Batch ID: **10923**					Analysis Date: **6/3/2015**			SeqNo: **431065**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	29.3	1.00						28.77	1.95	30	

Sample ID: **1506005-001AMS**	SampType: **MS**			Units: **µg/L**		Prep Date: **6/3/2015**			RunNo: **22759**		
Client ID: **BATCH**	Batch ID: **10923**					Analysis Date: **6/3/2015**			SeqNo: **431066**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	244	1.00	250.0	28.77	86.0	70	130				

Sample ID: **1506005-001AMSD**	SampType: **MSD**			Units: **µg/L**		Prep Date: **6/3/2015**			RunNo: **22759**		
Client ID: **BATCH**	Batch ID: **10923**					Analysis Date: **6/3/2015**			SeqNo: **431067**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Lead	245	1.00	250.0	28.77	86.3	70	130	243.7	0.359	30	

Fremont Analytical

Date: *6/9/2015*

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **MB-R22728** SampType: **MBLK** Units: **mg/L** Prep Date: **6/2/2015** RunNo: **22728**
Client ID: **MBLKW** Batch ID: **R22728** Analysis Date: **6/2/2015** SeqNo: **430391**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Sulfate	ND	0.300									

Fremont Analytical

Date: *6/9/2015*

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Ion Chromatography by EPA Method 300.0

Sample ID: **1506035-001ADUP** SampType: **DUP** Units: **mg/L** Prep Date: **6/2/2015** RunNo: **22728**
Client ID: **BATCH** Batch ID: **R22728** Analysis Date: **6/2/2015** SeqNo: **430386**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	ND	0.100						0		20	
Sulfate	1.85	0.300						1.832	1.24	20	

Sample ID: **1506035-001AMS** SampType: **MS** Units: **mg/L** Prep Date: **6/2/2015** RunNo: **22728**
Client ID: **BATCH** Batch ID: **R22728** Analysis Date: **6/2/2015** SeqNo: **430387**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	2.88	0.100	3.000	0	95.9	80	120				
Sulfate	15.2	0.300	15.00	1.832	89.3	80	120				

Sample ID: **1506035-001AMSD** SampType: **MSD** Units: **mg/L** Prep Date: **6/2/2015** RunNo: **22728**
Client ID: **BATCH** Batch ID: **R22728** Analysis Date: **6/2/2015** SeqNo: **430388**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	2.91	0.100	3.000	0	96.9	80	120	2.878	1.02	20	
Sulfate	15.3	0.300	15.00	1.832	90.0	80	120	15.23	0.638	20	

Sample ID: **LCS-R22728** SampType: **LCS** Units: **mg/L** Prep Date: **6/2/2015** RunNo: **22728**
Client ID: **LCSW** Batch ID: **R22728** Analysis Date: **6/2/2015** SeqNo: **430390**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	2.30	0.100	2.250	0	102	90	110				
Sulfate	14.0	0.300	15.00	0	93.4	90	110				

Sample ID: **MB-R22728** SampType: **MBLK** Units: **mg/L** Prep Date: **6/2/2015** RunNo: **22728**
Client ID: **MBLKW** Batch ID: **R22728** Analysis Date: **6/2/2015** SeqNo: **430391**

Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Nitrate	ND	0.100									

Fremont Analytical

Date: *6/9/2015*

Work Order: 1506014
CLIENT: Shannon & Wilson
Project: Seattle Hilton

QC SUMMARY REPORT

Ferrous Iron by SM3500-Fe B

Sample ID: **MB-R22703**	SampType: **MBLK**			Units: **mg/L**		Prep Date: **6/1/2015**			RunNo: **22703**		
Client ID: **MBLKW**	Batch ID: **R22703**					Analysis Date: **6/1/2015**			SeqNo: **429883**		
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-R22703**	SampType: **LCS**			Units: **mg/L**		Prep Date: **6/1/2015**			RunNo: **22703**		
Client ID: **LCSW**	Batch ID: **R22703**					Analysis Date: **6/1/2015**			SeqNo: **429884**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	0.960	0.0300	1.000	0	96.0	90	110				

Sample ID: **1506014-003CDUP**	SampType: **DUP**			Units: **mg/L**		Prep Date: **6/1/2015**			RunNo: **22703**		
Client ID: **MW-3**	Batch ID: **R22703**					Analysis Date: **6/1/2015**			SeqNo: **429889**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	1.46	0.0300						1.750	18.1	20	

Sample ID: **1506014-004CMS**	SampType: **MS**			Units: **mg/L**		Prep Date: **6/1/2015**			RunNo: **22703**		
Client ID: **MW-2**	Batch ID: **R22703**					Analysis Date: **6/1/2015**			SeqNo: **429890**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	1.51	0.0300	1.000	0.6000	91.0	85	115				

Sample ID: **1506014-004CMSD**	SampType: **MSD**			Units: **mg/L**		Prep Date: **6/1/2015**			RunNo: **22703**		
Client ID: **MW-2**	Batch ID: **R22703**					Analysis Date: **6/1/2015**			SeqNo: **429891**		
Analyte	Result	RL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Ferrous Iron	1.50	0.0300	1.000	0.6000	90.0	85	115	1.510	0.664	20	

Fremont Analytical

Sample Log-In Check List

Client Name:	**SW**	Work Order Number:	**1506014**
Logged by:	**Erica Silva**	Date Received:	**6/1/2015 1:43:00 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 present on shipping container/cooler? (Refer to comments for Custody Seals not intact)	Yes ☐	No ☐	Not Required ☑
6.	Was an attempt made to cool the samples?	Yes ☐	No ☑	NA ☐
	Samples received straight from field			
7.	Were all items 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 there 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
Cooler	14.2
Sample	17.5
Temp Blank	4.9

* Note: DoD/ELAP and TNI require items to be received at 4°C +/- 2°C

Fremont Analytical

Chain of Custody Record

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

Laboratory Project No (internal): 1506014

Date: 6/1/15

Page: 1 of: 1

Client: Shannon & Wilson Inc.
Address: 400 N 34th St. Suite 100
City, State, Zip: Seattle, WA
Tel: 206-632-8020 Fax: 206-695-6777

Project Name: Seattle Hilton
Project No: 21-1-12341-004 Collected by: EVP
Location: Seattle Hilton
Reports To (PM): Michael Reynolds
Email: mrs@shanwil.com

*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, SW = Storm 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 VOC (EPA 8270)	PAH (EPA 8270 - SIM)	PCBs (EPA 8082)	Metals** (6020 / 200.8)	Total (T) / Dissolved (D)	Anions (IC)***	EDB (8011)	Cadmium 6020		Comments/Depth
1	MW-5	6/1/15	1250	GW	X									T		X	X			
2	MW-4		1030		X									T		X	X			
3	MW-3		1135		X									T		X	X			
4	MW-2		1225		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

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

Turn-around times for samples received after 4:00pm will begin on the following business day.

Special Remarks

Relinquished	Date/Time	Received	Date/Time
x	6/1/15 1:43PM	x	06/01/15 1:43PM
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

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	83.3	6.89	
#5	2/21/2014	1360	2.9	1.62	20.8	7.44	
#6	5/30/2014	2070	1.82	2	36.5	8.47	
#7	7/11/2014	642	1.22	0.5	4.8	3.07	
#8	11/25/2014	1350	1.01	1.63	6.53	8.19	
#9	2/25/2015	1170	0.5	1.33	3.36	4.52	
#10	6/1/2015	1030	0.5	1.52	1.96	4.48	
#11							
#12							
#13							
#14							
#15							
#16							

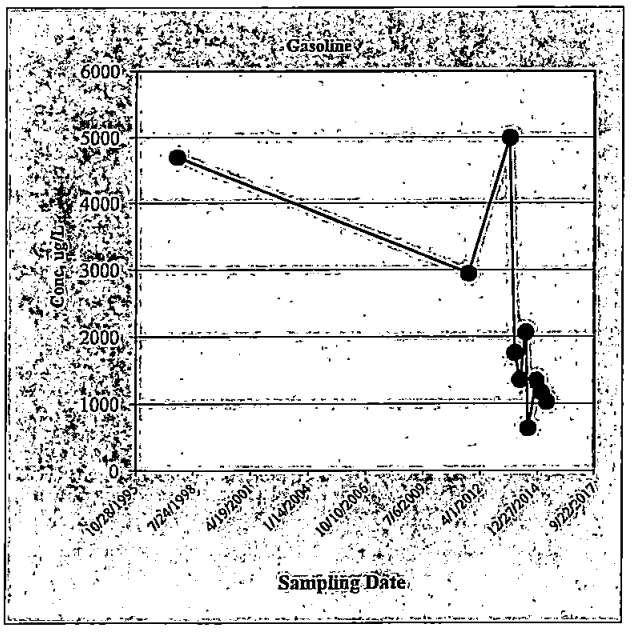
2. Mann-Kendall Non-parametric Statistical Test Results

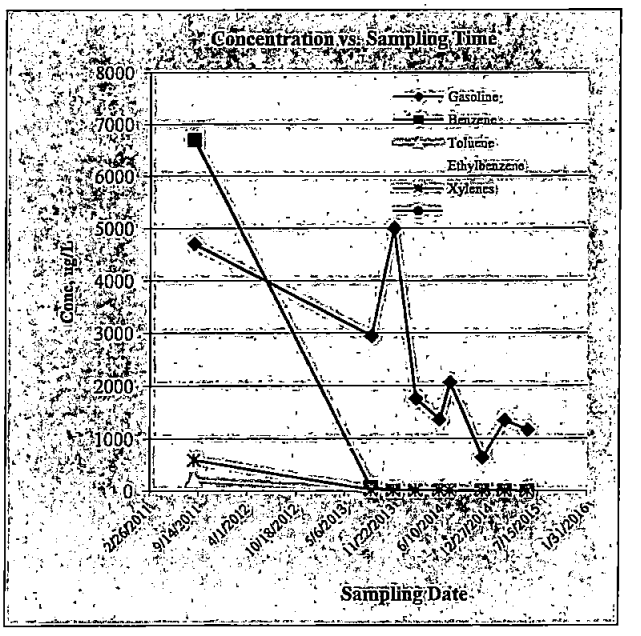
Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	99.80%	100.00%	99.20%	100.00%	99.50%	NA
Plume Stability?	Shrinking	Shrinking	Shrinking	Shrinking	Shrinking	NA
Coefficient of Variation?						n<4
Mann-Kendall Statistic "S" value?	-31	-40	-27	-39	-29	0
Number of Sampling Rounds?	10	10	10	10	10	0
Average Concentration?	2203.20	678.85	22.44	209.83	66.59	NA
Standard Deviation?	1532.90	2115.75	65.90	321.22	183.99	NA
Coefficient of Variation?	0.70	3.12	2.94	1.53	2.76	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	5/30/2014	187	0.5	0.5	0.5	3.59	
#7	7/11/2014	397	0.5	0.5	0.5	1.31	
#8	11/25/2014	208	0.5	0.5	1.34	5.04	
#9	2/25/2015	140	0.5	0.5	0.5	1.16	
#10	6/1/2015	152	0.5	0.5	0.5	1.21	
#11							
#12							
#13							
#14							
#15							
#16							

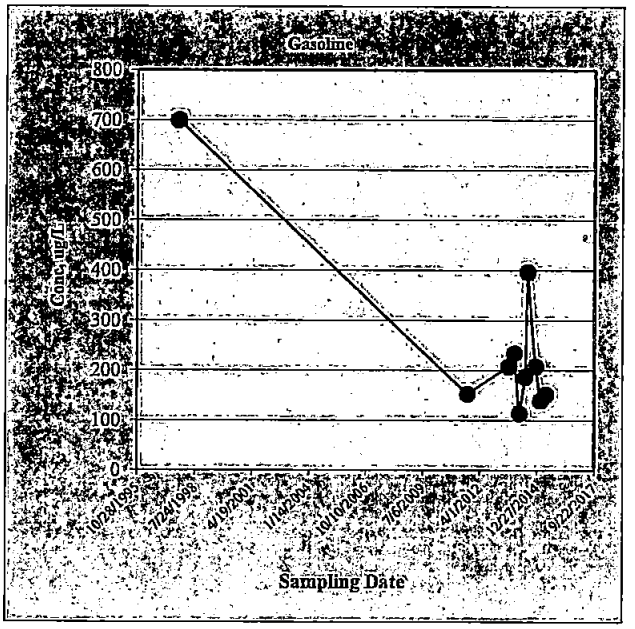
2. Mann-Kendall Non-parametric Statistical Test Results

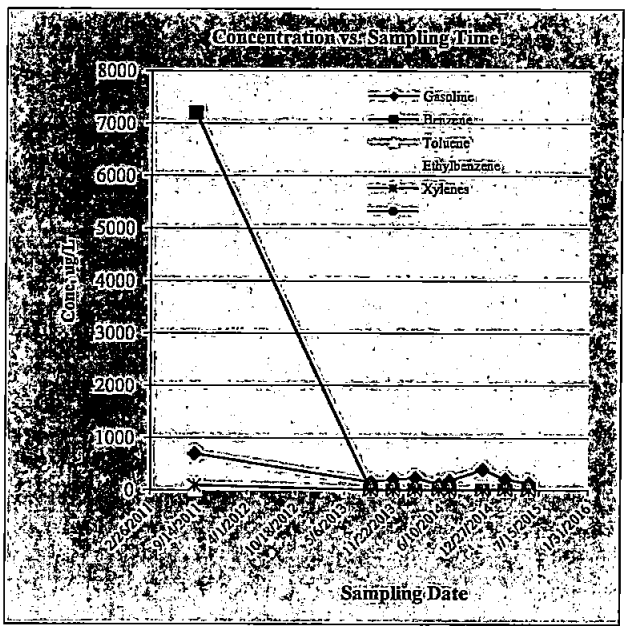
Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	85.40%	75.80%	75.80%	63.60%	50.00%	NA
Plume Stability?	Shrinking	Undetermined	Undetermined	Undetermined	Undetermined	NA
Coefficient of Variation?		CV > 1	CV > 1	CV > 1	CV > 1	n<4
Mann-Kendall Statistic "S" value?	-13	-9	-9	-5	-2	0
Number of Sampling Rounds?	10	10	10	10	10	0
Average Concentration?	249.50	720.45	1.45	7.93	11.37	NA
Standard Deviation?	176.81	2276.68	3.00	23.21	30.12	NA
Coefficient of Variation?	0.71	3.16	2.07	2.93	2.65	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-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	5/30/2014	25	0.5	0.5	0.5	1.5	
#7	7/11/2014	25	0.5	0.5	0.5	1.5	
#8	11/25/2014	25	0.5	0.5	0.5	1.5	
#9	2/25/2015	25	0.5	0.5	0.5	1.5	
#10	6/1/2015	25	0.5	0.5	0.5	1.5	
#11							
#12							
#13							
#14							
#15							
#16							

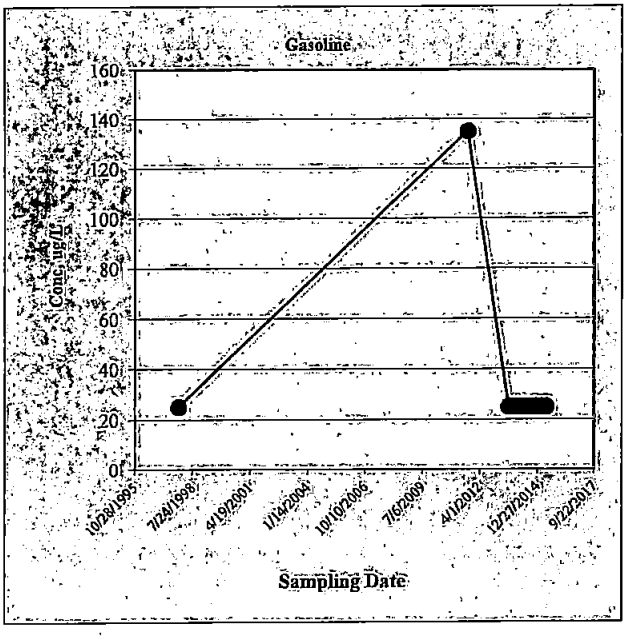
2. Mann-Kendall Non-parametric Statistical Test Results

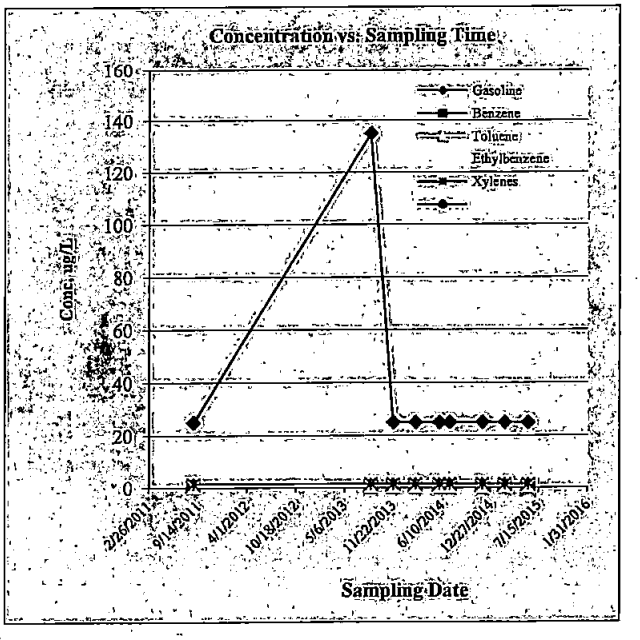
Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	70.00%	-900.00%	-900.00%	-900.00%	-900.00%	NA
Plume Stability?	Stable	Stable	Stable	Stable	Stable	NA
Coefficient of Variation?	CV <= 1	CV <= 1	CV <= 1	CV <= 1	CV <= 1	n<4
Mann-Kendall Statistic "S" value?	-7	0	0	0	0	0
Number of Sampling Rounds?	10	10	10	10	10	0
Average Concentration?	36.00	0.50	0.50	0.50	1.50	NA
Standard Deviation?	34.79	0.00	0.00	0.00	0.00	NA
Coefficient of Variation?	0.97	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? **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-5**
Level of Confidence (Decision Criteria)?	**85%**

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

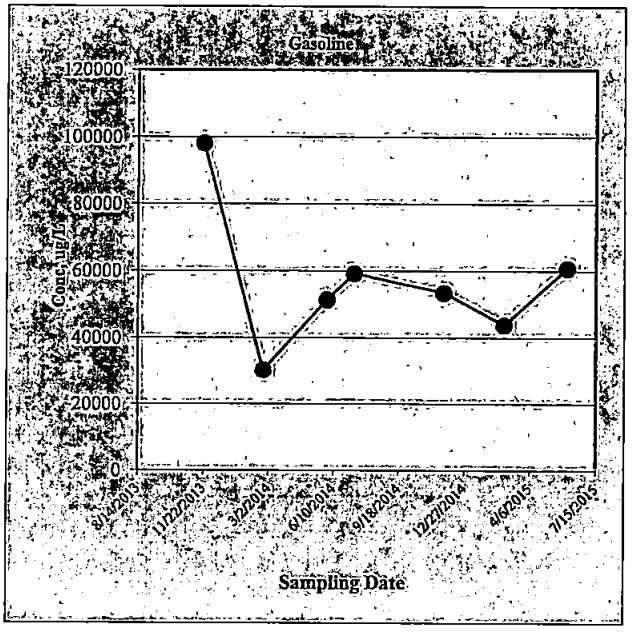
		Hazardous Substances (unit is ug/L)					
Sampling Event	Date Sampled	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
#1	11/21/2013	98100	230	179	1070	6100	
#2	2/21/2014	30300	193	122	796	3670	
#3	5/30/2014	51400	927	552	1820	7610	
#4	7/11/2014	59300	1050	837	1940	9960	
#5	11/25/2014	53500	566	204	1480	7610	
#6	2/25/2015	43900	605	262	1320	6680	
#7	6/1/2015	60900	1080	570	1990	10390	
#8							
#9							
#10							
#11							
#12							
#13							
#14							
#15							
#16							

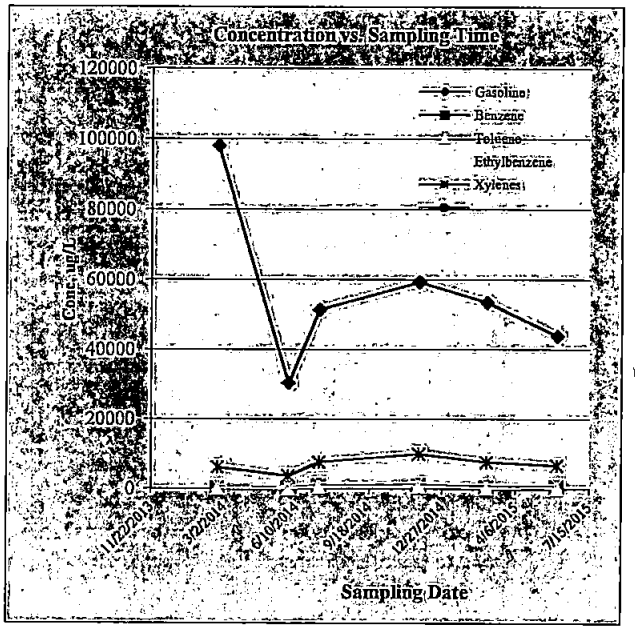
2. Mann-Kendall Non-parametric Statistical Test Results

Hazardous Substance?	Gasoline	Benzene	Toluene	Ethylbenzene	Xylenes	
Confidence Level Calculated?	50.00%	93.20%	88.10%	88.10%	88.10%	NA
Plume Stability?	Stable	***Expanding***	***Expanding***	***Expanding***	***Expanding***	NA
Coefficient of Variation?	CV <= 1					n<4
Mann-Kendall Statistic "S" value?	1	11	9	9	10	0
Number of Sampling Rounds?	7	7	7	7	7	0
Average Concentration?	56771.43	664.43	389.43	1488.00	7431.43	NA
Standard Deviation?	20966.06	368.44	266.39	456.14	2298.42	NA
Coefficient of Variation?	0.37	0.55	0.68	0.31	0.31	NA
Blank if No Errors found						n<4

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

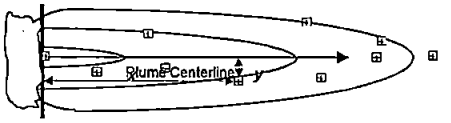
Hazardous substance?	**Gasoline**
Plume Stability?	**Stable**





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	5/30/14	6091	51400	2070	187	25												
#7	7/11/14	6133	59300	642	397	25												
#8	11/25/14	6270	53500	1350	208	25												
#9	2/25/15	6362	43900	1170	140	25												
#10	6/1/15	6458	60900	1030	152	25												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			56771.4	2203.2	249.5	36.0	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	642	114	25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

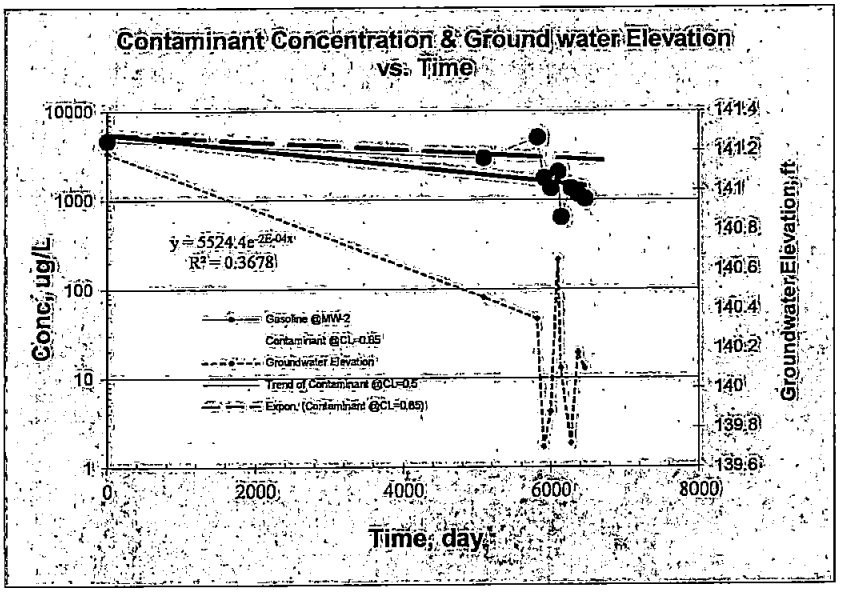
Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
#6	5/30/14	6091	140.95	140.65	140.32	139.32												
#7	7/11/14	6133	140.95	140.1	138.99	138.14												
#8	11/25/14	6270	140.18	139.72	139.44	137.98												
#9	2/25/15	6362	140.45	140.18	139.89	138.59												
#10	6/1/15	6458	141.14	140.1	140.03	139												
#11																		
#12																		
#13																		
#14																		
#15	—																	
#16																		
#17																		
#18																		
#19																		
#20																		

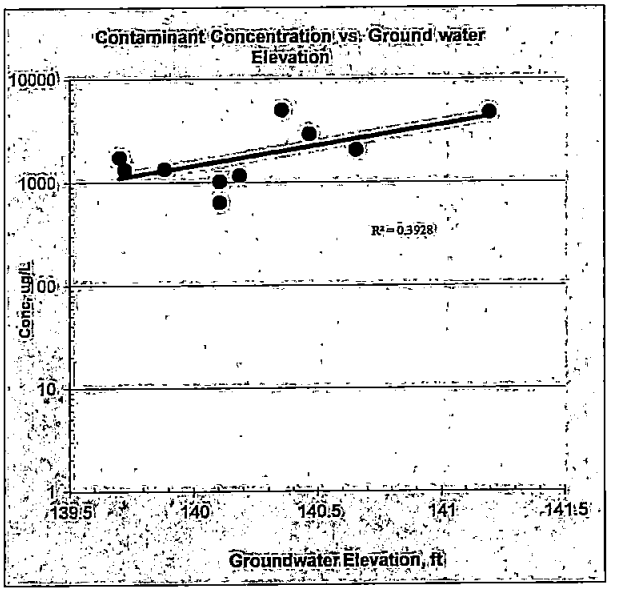
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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

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

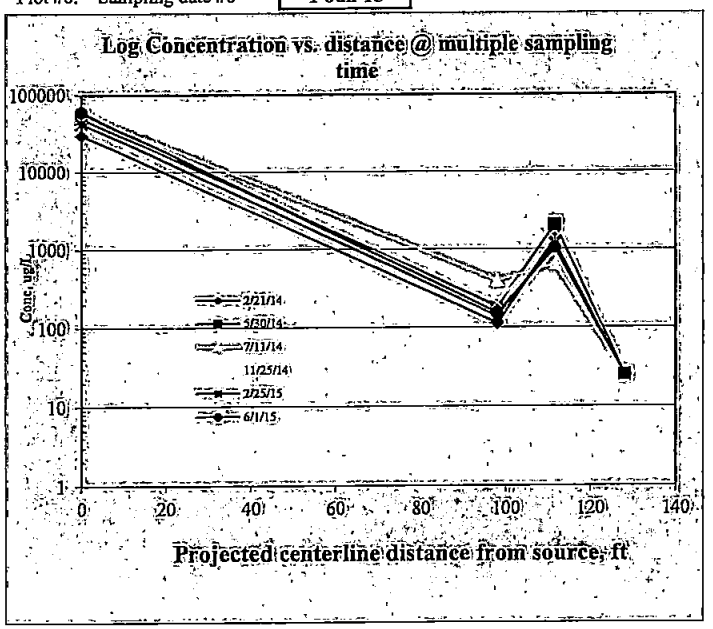
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*93.696%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.076* @50% C.L.;	*0.037* @85% C.L.	
Half Life for k_{point}, yr	*9.166* @50% C.L.;	*18.695* @85% C.L.	

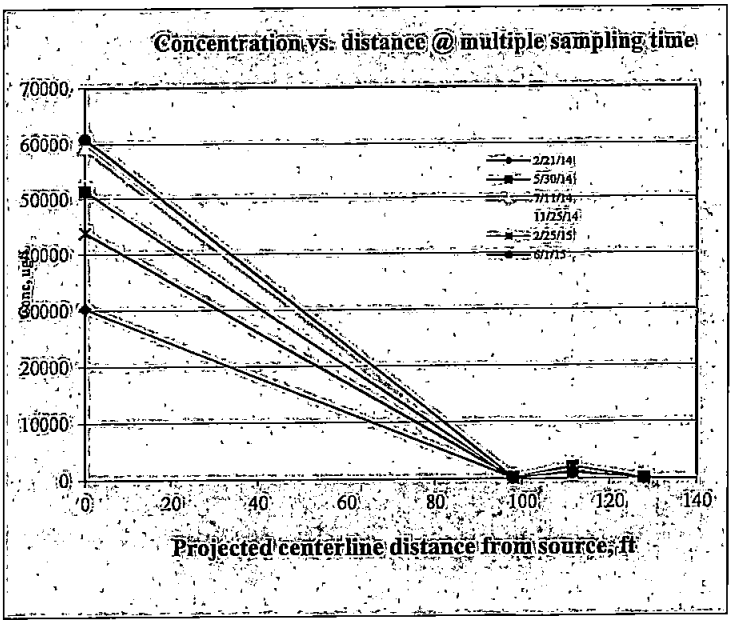




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



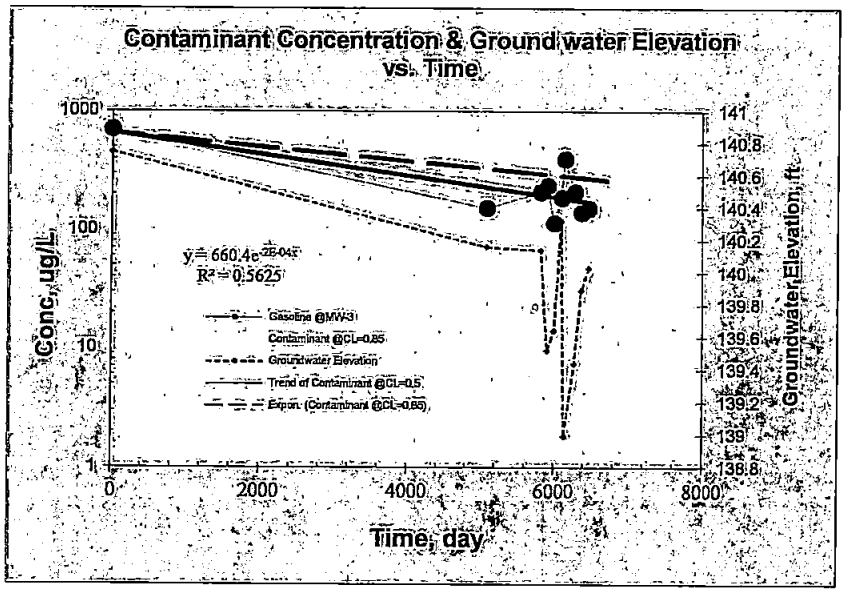


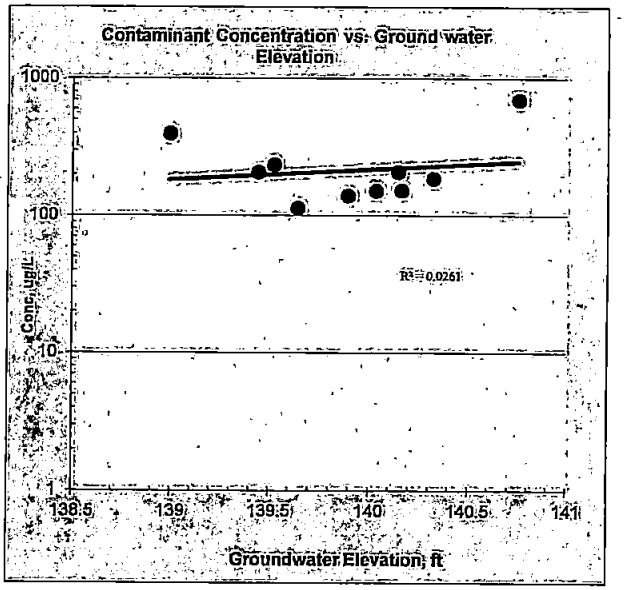
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

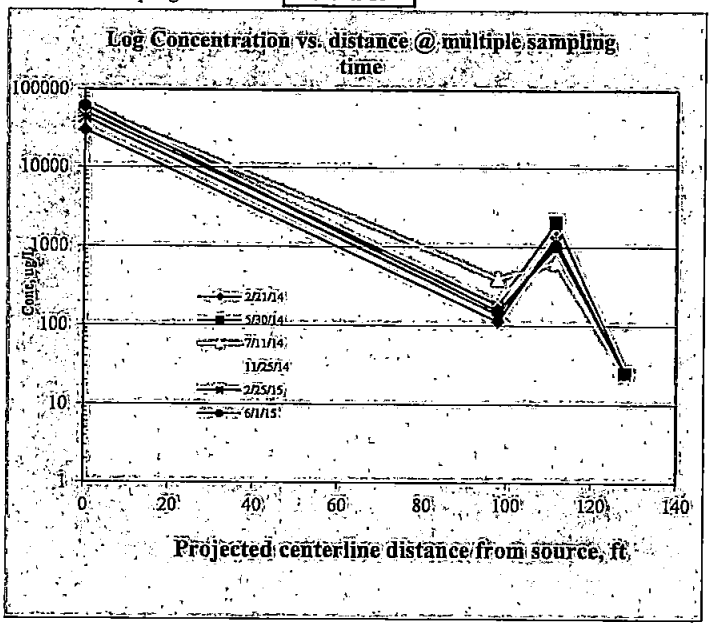
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*98.752%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.076* @50% C.L.;	*0.050* @85% C.L.	
Half Life for k_{point}, yr	*9.099* @50% C.L.;	*13.847* @85% C.L.	

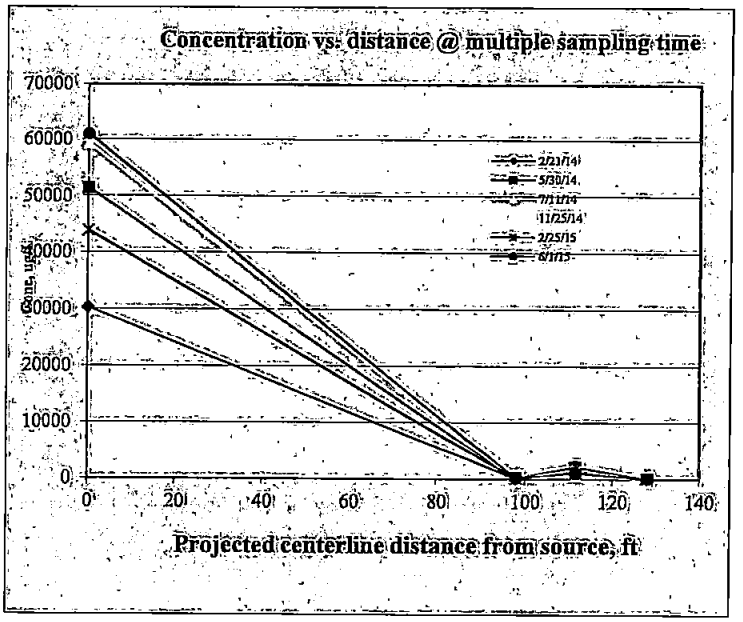




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



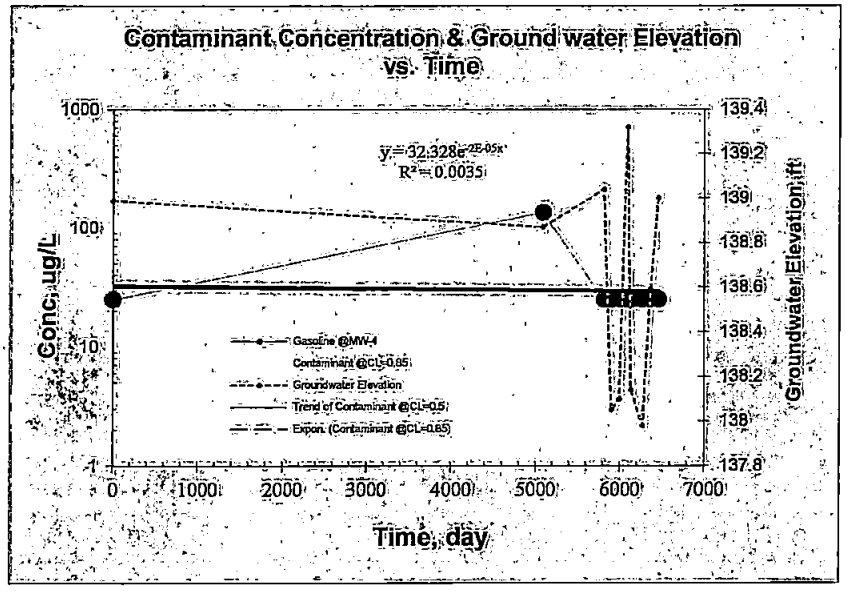


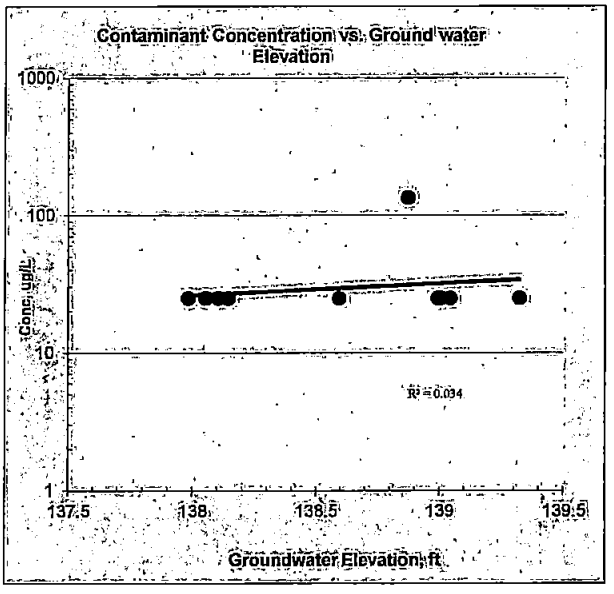
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

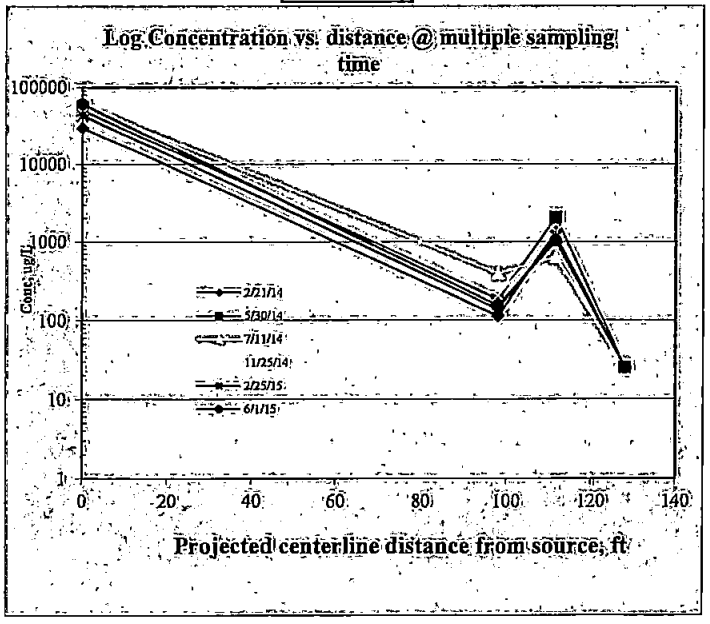
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*12.954%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.006* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*116.205* @50% C.L.;	*NA* @85% C.L.	

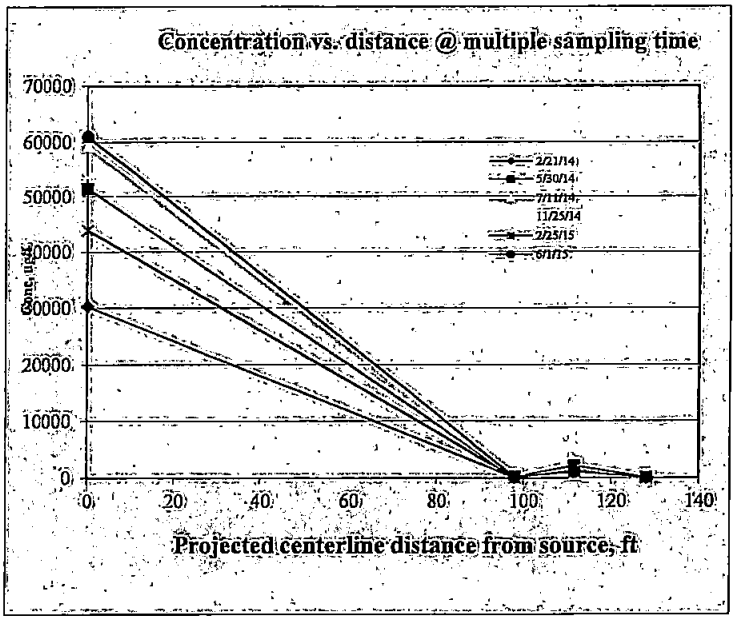




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



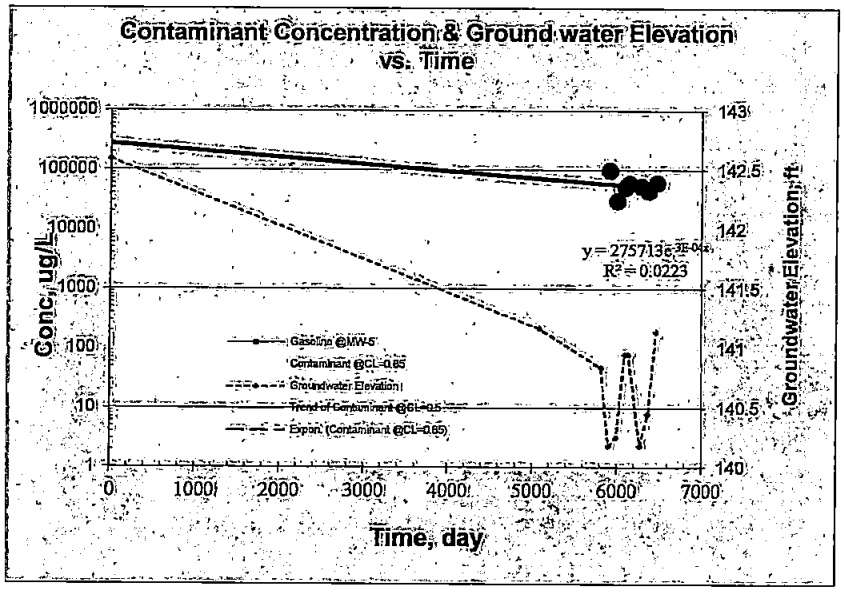


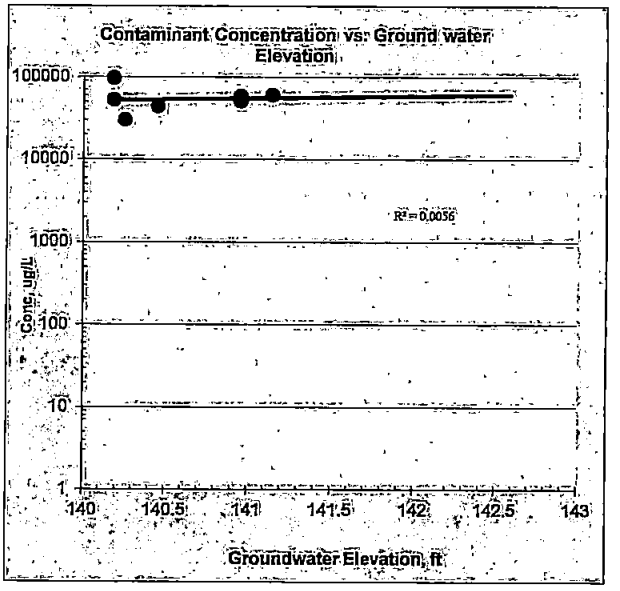
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

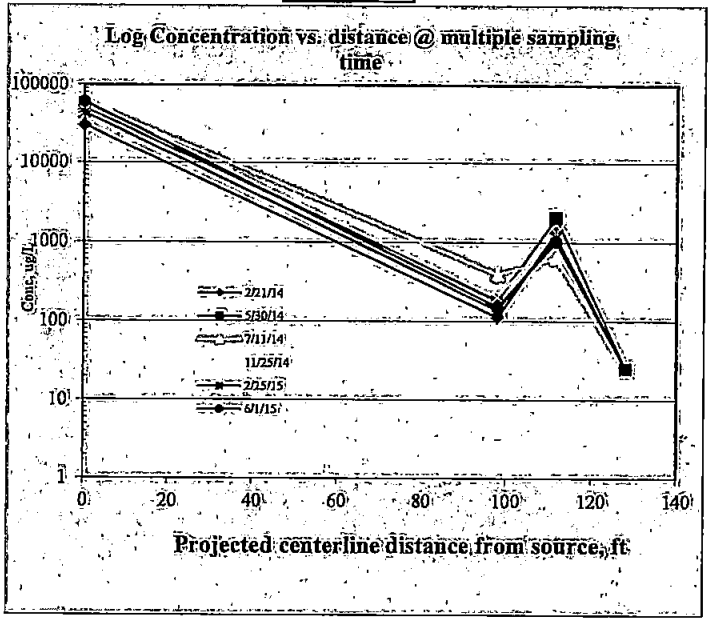
Name of Sampling Well?	MW-5	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*25.065%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.097* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*7.169* @50% C.L.;	*NA* @85% C.L.	

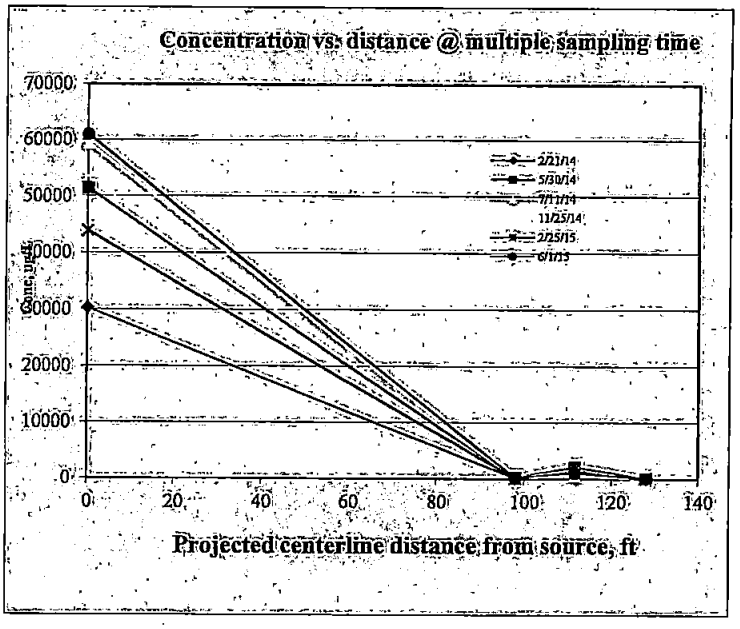




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15





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	25.55	-2.52	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	4/8/23	3/21/95	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	52.12	-3.83	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	10/24/49	11/26/93	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/15	9/30/15	9/30/15	9/30/15												
B.1 Average conc predicted (@50% CL)	ug/L	NA	1413.48	167.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	NA	2831.71	267.90	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	0.022	0.368	0.563	0.004	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	-0.149	-0.606	-0.750	-0.059	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	7	10	10	10	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, %		25.065%	93.696%	98.752%	12.954%	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?		NO!	YES!	YES!	NO!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		0.369	NA	NA	0.966	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		Stable	Shrinking	Shrinking	Stable	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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

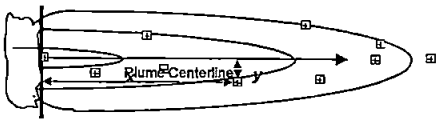
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	0.097	0.076	0.076	0.006	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	0.037	0.050	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	7.169	9.166	9.099	116.205	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	18.695	13.847	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	*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	5/30/14	6091	927	1.82	0.5	0.5												
#7	7/11/14	6133	1050	1.22	0.5	0.5												
#8	11/25/14	6270	566	1.01	0.5	0.5												
#9	2/25/15	6362	605	0.5	0.5	0.5												
#10	6/1/15	6458	1080	0.5	0.5	0.5												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			664.4	678.9	720.5	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			1080	6700	7200	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			193	0.5	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	5/30/14	6091	140.95	140.65	140.32	139.32												
#7	7/11/14	6133	140.95	140.1	138.99	138.14												
#8	11/25/14	6270	140.18	139.72	139.44	137.98												
#9	2/25/15	6362	140.45	140.18	139.89	138.59												
#10	6/1/15	6458	141.14	140.1	140.03	139												
#11																		
#12																		
#13																		
#14																		
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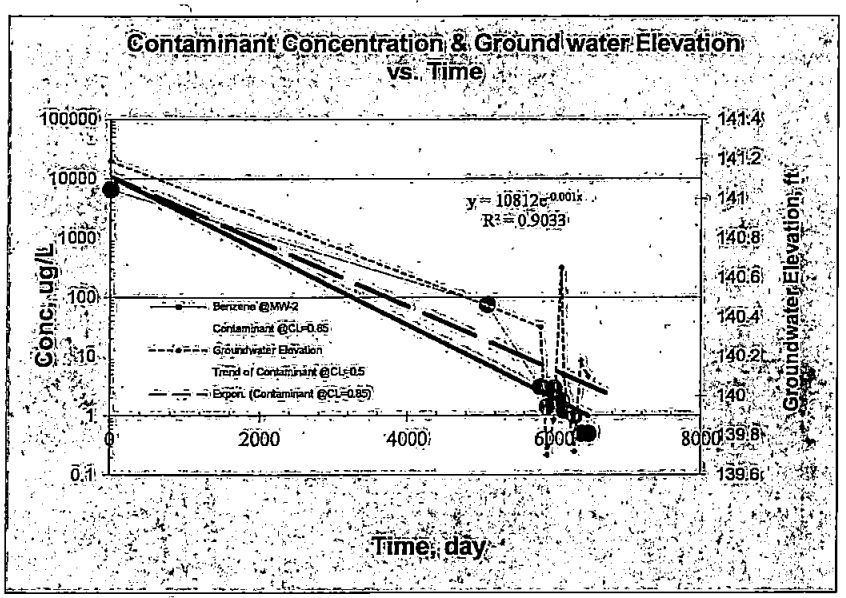
#16																		
#17																		
#18																		
#19																		
#20																		

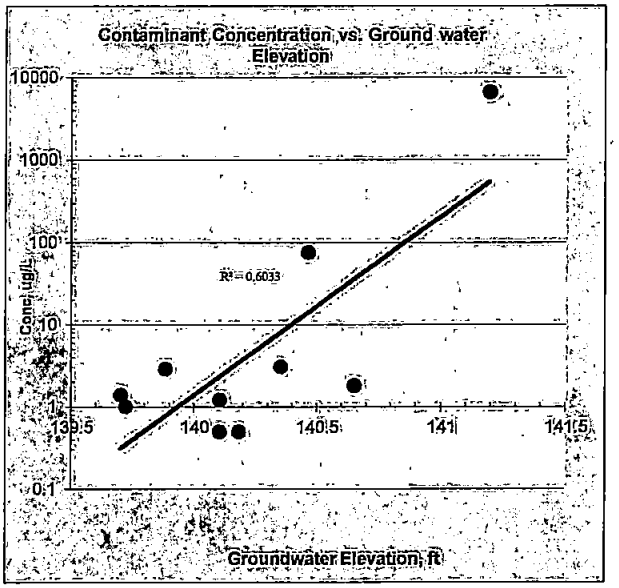
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

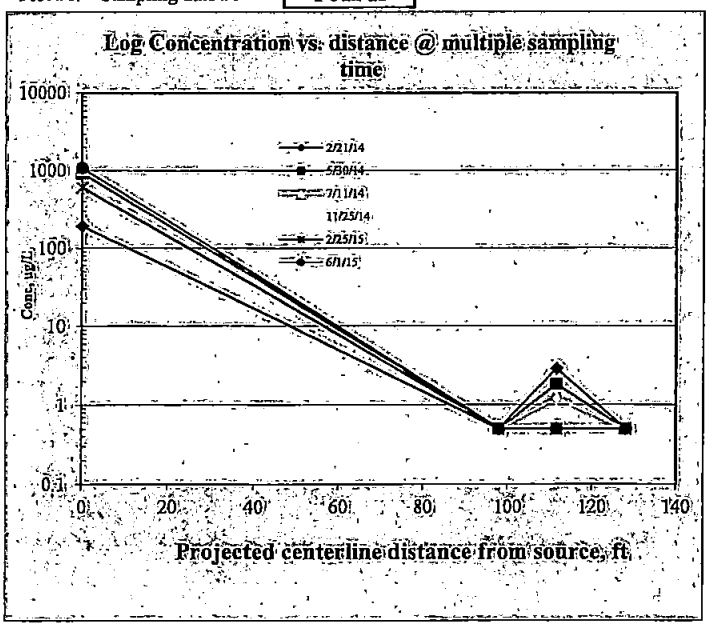
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.998%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.525* @50% C.L.;	*0.458* @85% C.L.	
Half Life for k_{point}, yr	*1.321* @50% C.L.;	*1.513* @85% C.L.	

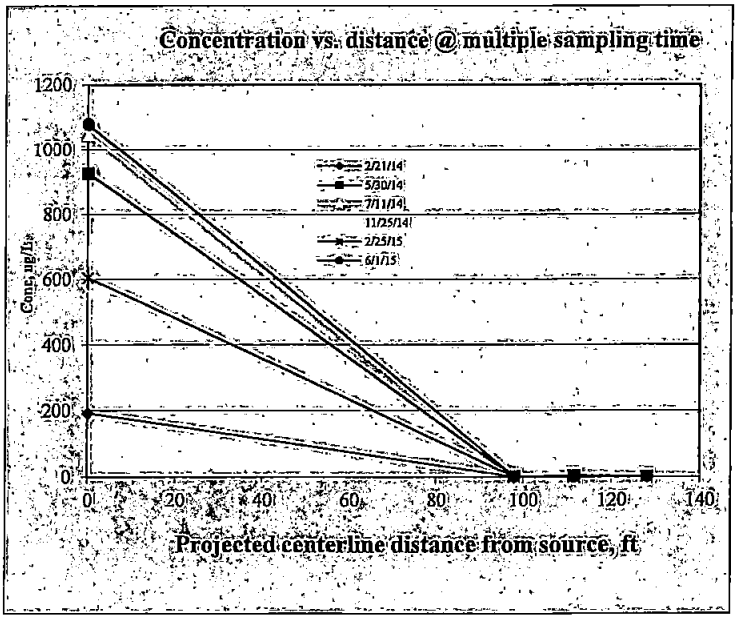




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



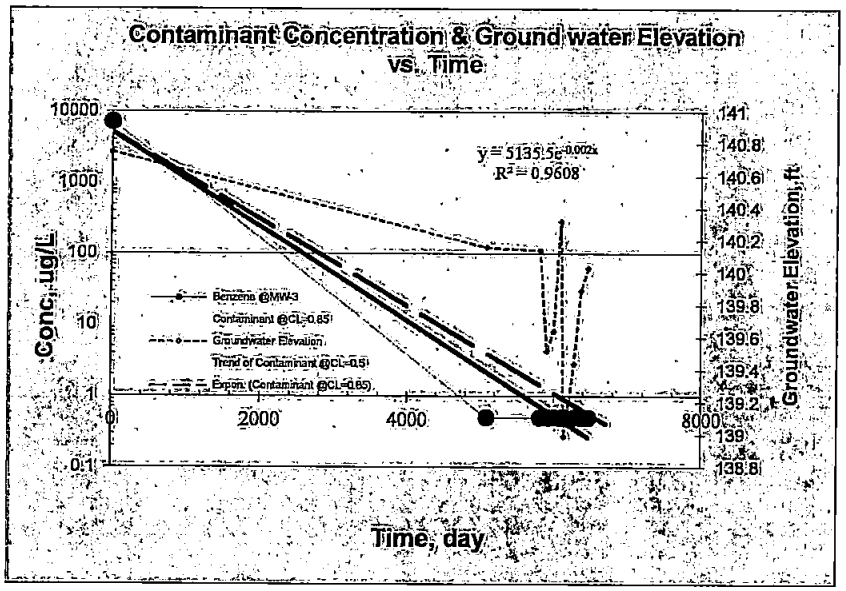


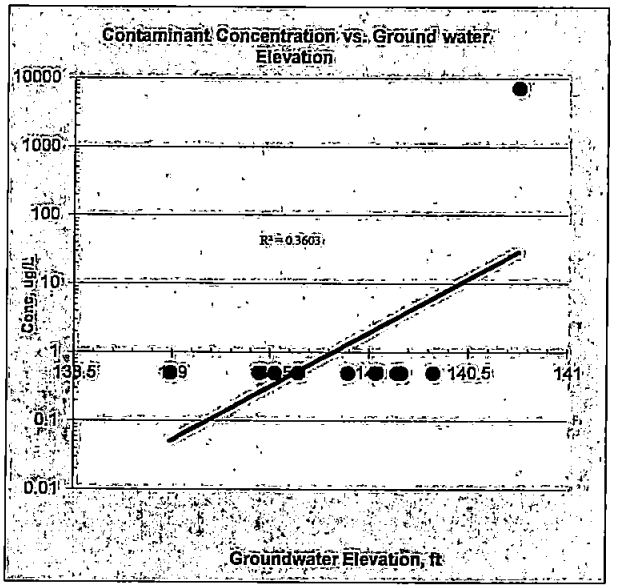
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

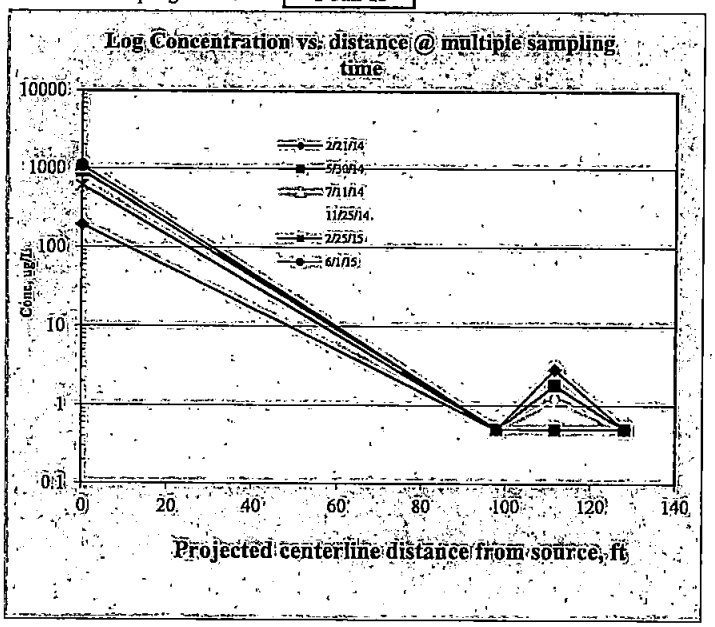
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*100.000%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.559* @50% C.L.;	*0.515* @85% C.L.	
Half Life for k_{point}, yr	*1.241* @50% C.L.;	*1.347* @85% C.L.	

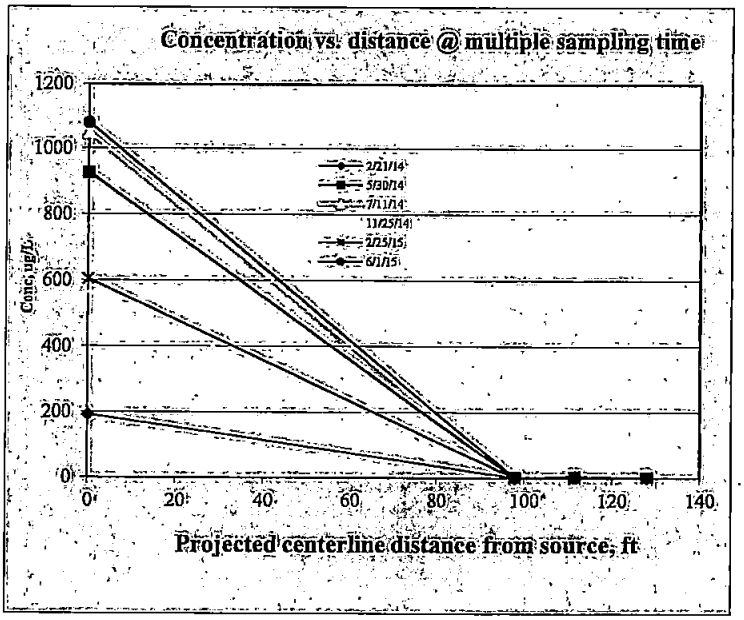




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



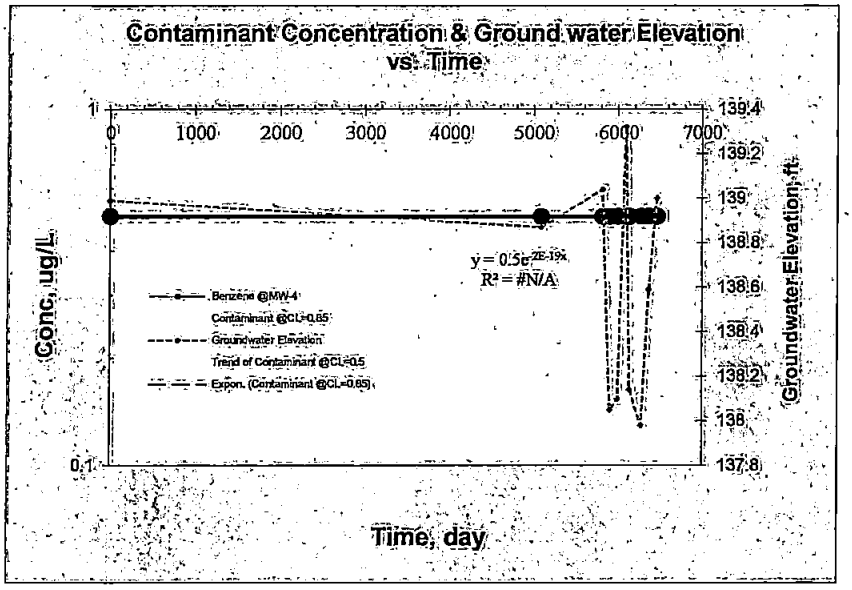


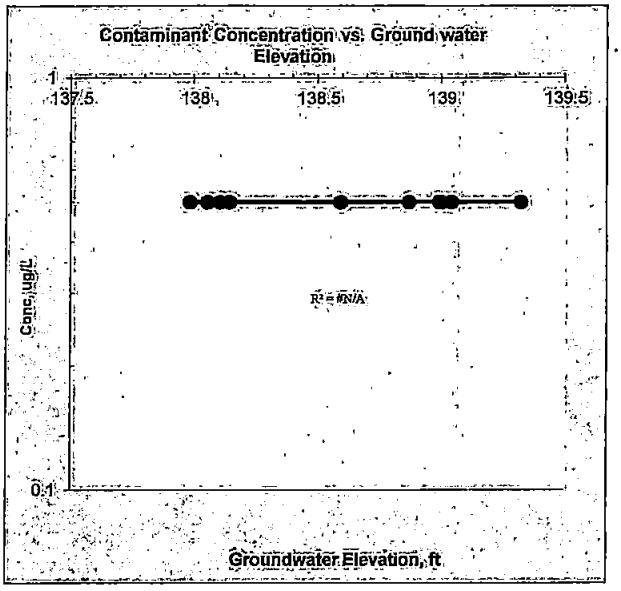
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

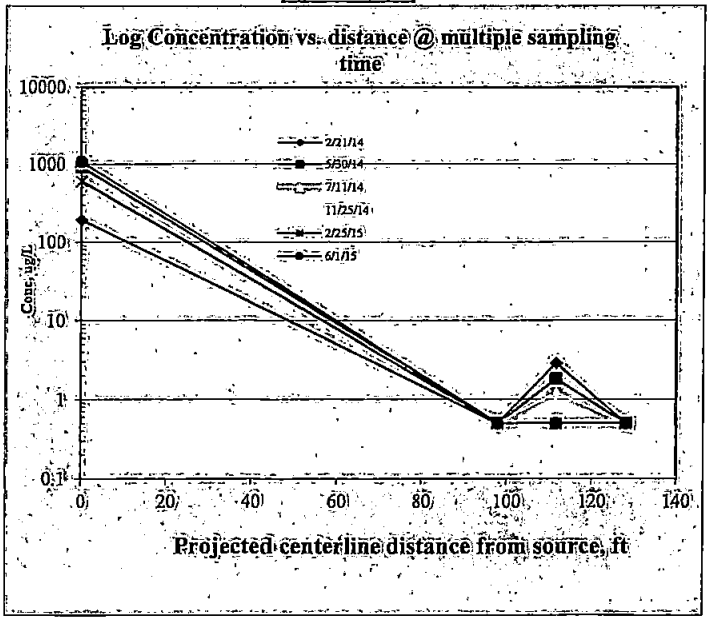
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*NA*		
Plume Stability?	NA	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*NA* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr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

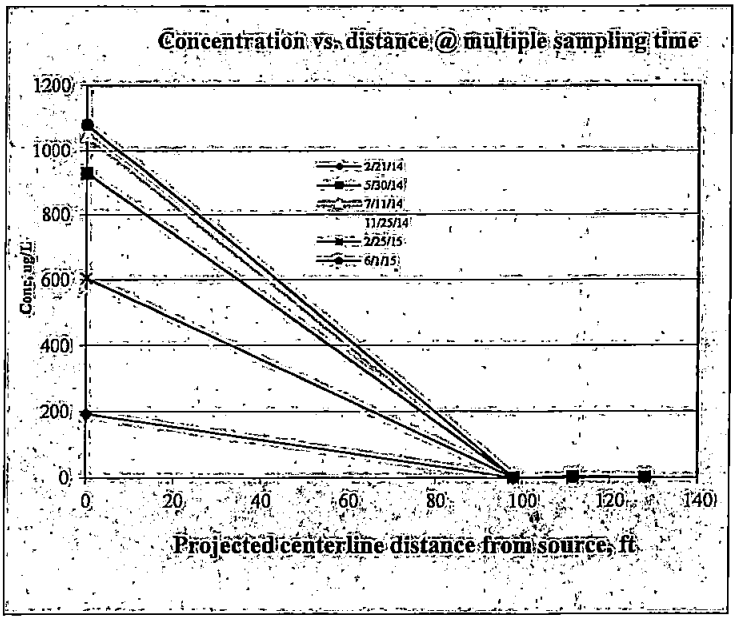




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



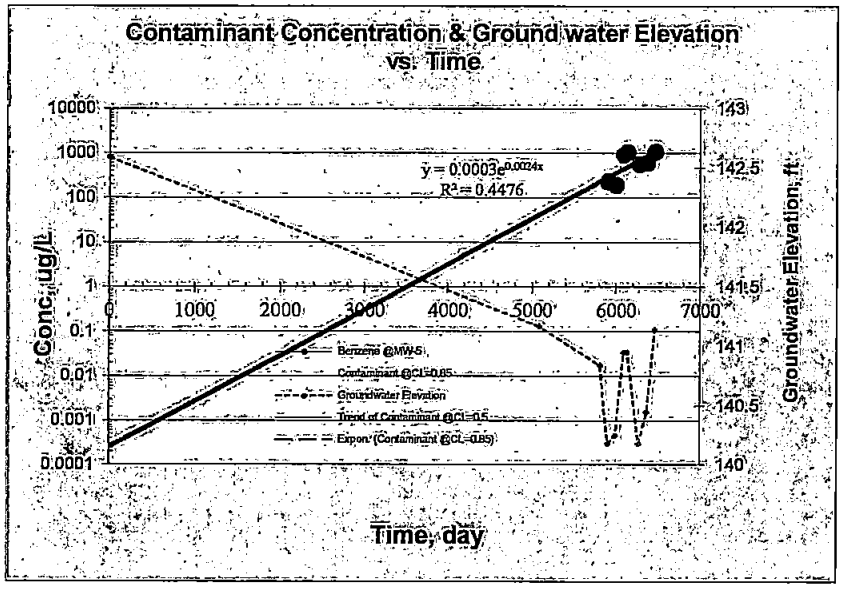


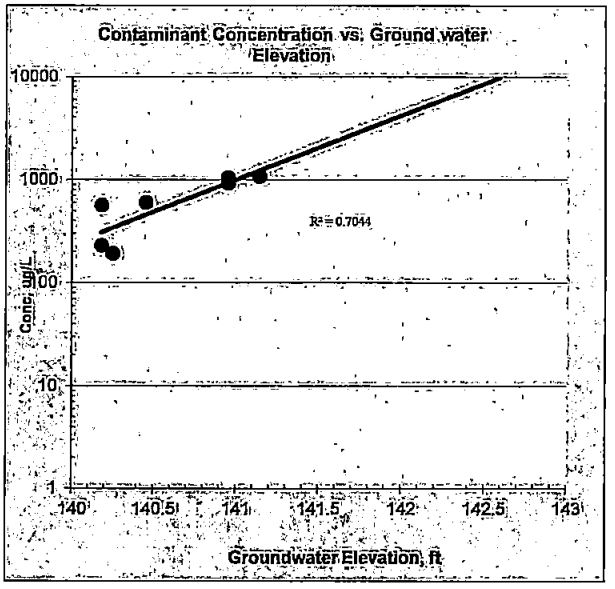
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

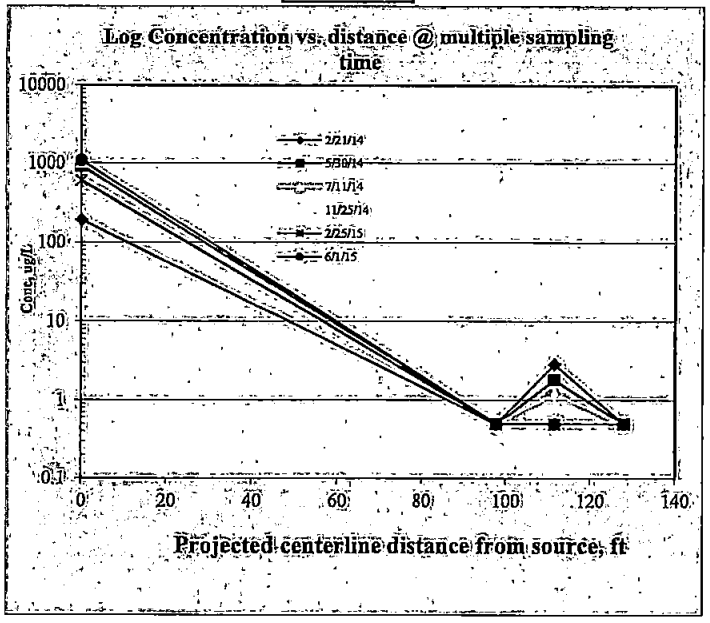
Name of Sampling Well?	MW-5	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*89.970%*		
Plume Stability?	Expanding	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*NA* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*NA* @50% C.L.;	*NA* @85% C.L.	

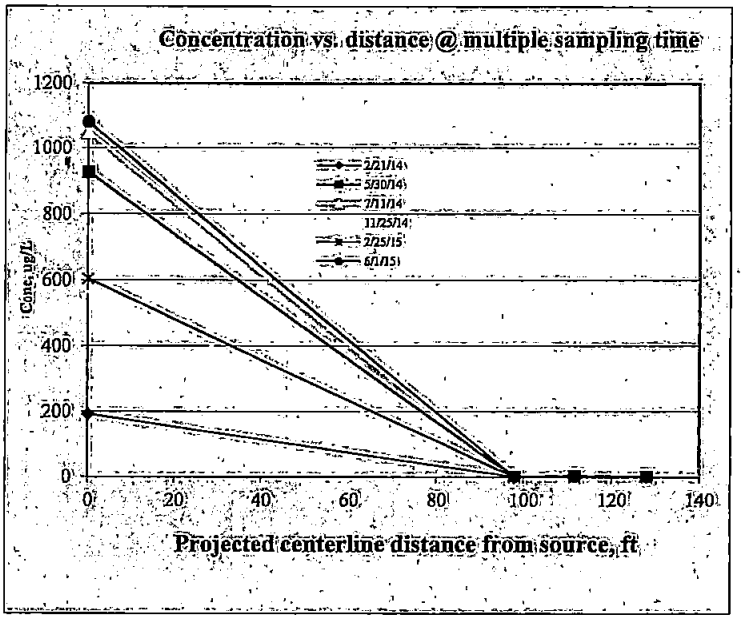




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15





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	14.63	12.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	5/8/12	2/20/10	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	16.76	13.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	6/26/14	3/13/11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/15	9/30/15	9/30/15	9/30/15												
B.1 Average conc predicted (@50% CL)	ug/L	NA	0.84	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	NA	2.80	0.48	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	0.448	0.903	0.961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	0.669	-0.950	-0.980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	7	10	10	10	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, %		89.970%	99.998%	100.000%	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?		YES!	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?		Expanding	Shrinking	Shrinking	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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

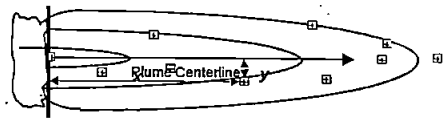
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	NA	0.525	0.559	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	0.458	0.515	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	NA	1.321	1.241	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	1.513	1.347	NA	NA	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	5/30/14	6091	552	2	0.5	0.5												
#7	7/11/14	6133	837	0.5	0.5	0.5												
#8	11/25/14	6270	204	1.63	0.5	0.5												
#9	2/25/15	6362	262	1.33	0.5	0.5												
#10	6/1/15	6458	570	1.52	0.5	0.5												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			389.4	22.4	1.5	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			837	210	10	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			122	0.5	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

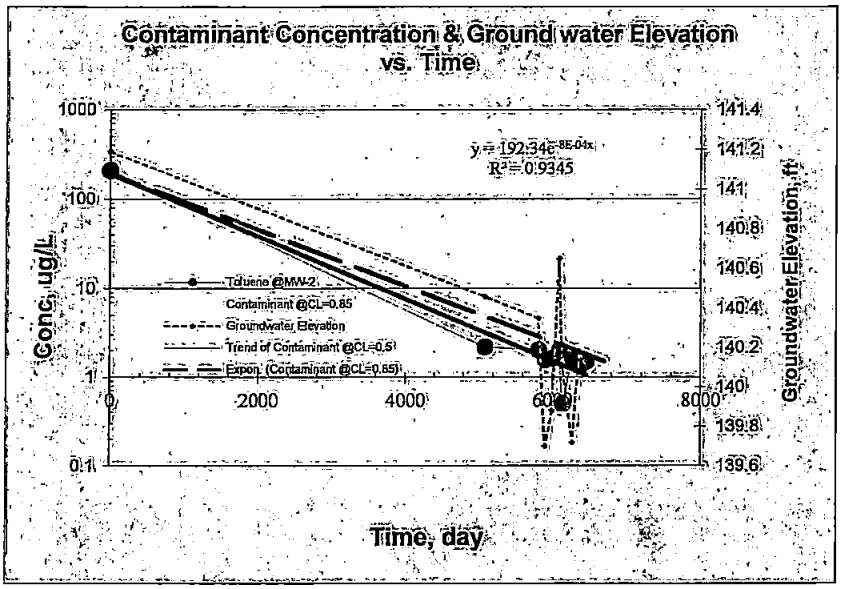
Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
#6	5/30/14	6091	140.95	140.65	140.32	139.32												
#7	7/11/14	6133	140.95	140.1	138.99	138.14												
#8	11/25/14	6270	140.18	139.72	139.44	137.98												
#9	2/25/15	6362	140.45	140.18	139.89	138.59												
#10	6/1/15	6458	141.14	140.1	140.03	139												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		

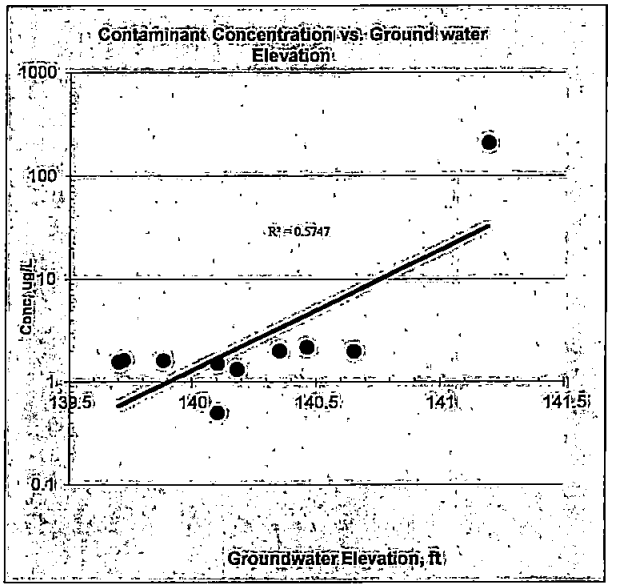
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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

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

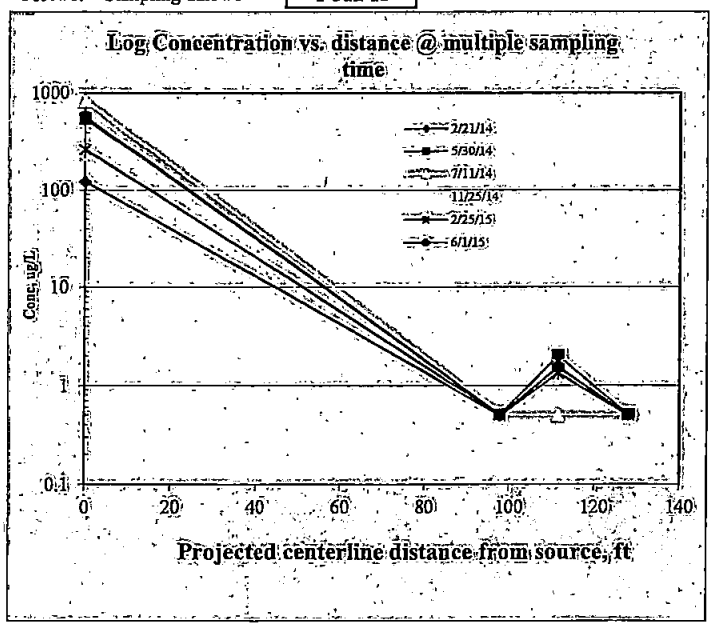
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.999%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.294* @50% C.L.;	*0.264*	@85% C.L.
Half Life for k_{point}, yr	*2.354* @50% C.L.;	*2.625*	@85% C.L.

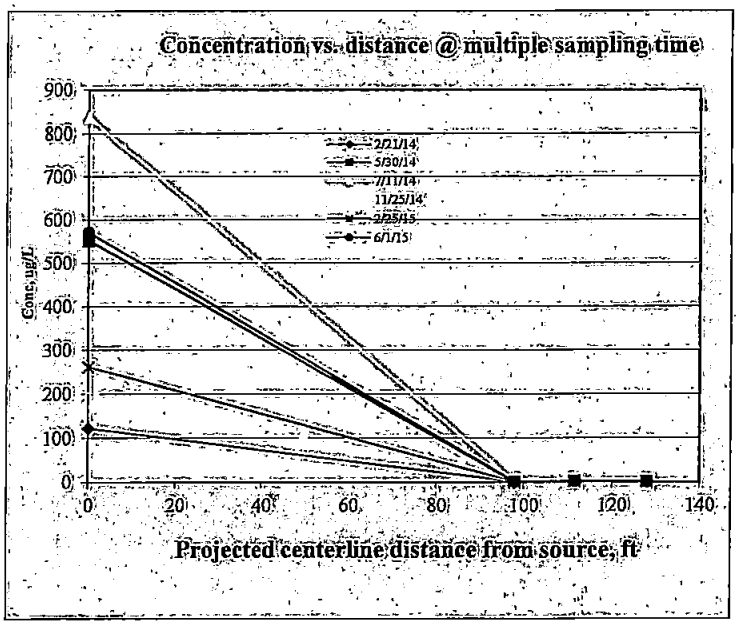




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



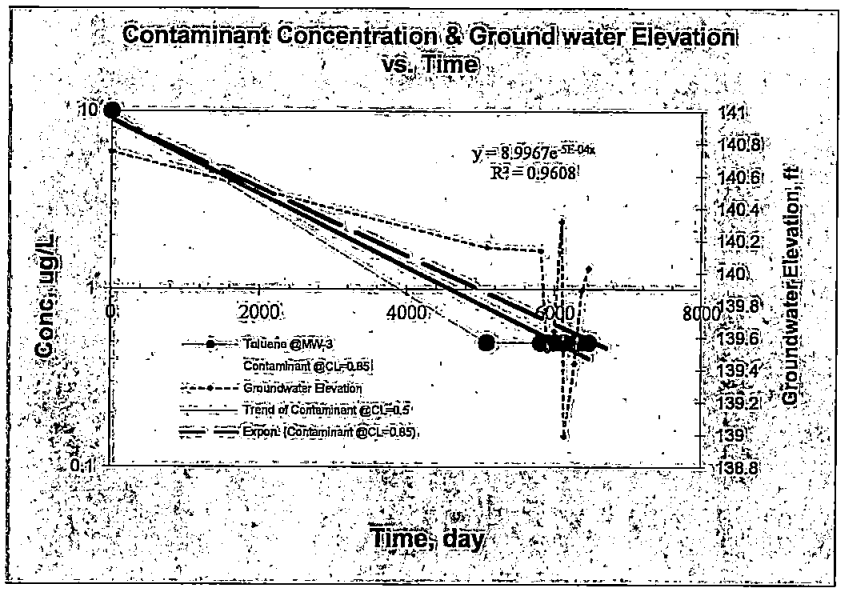


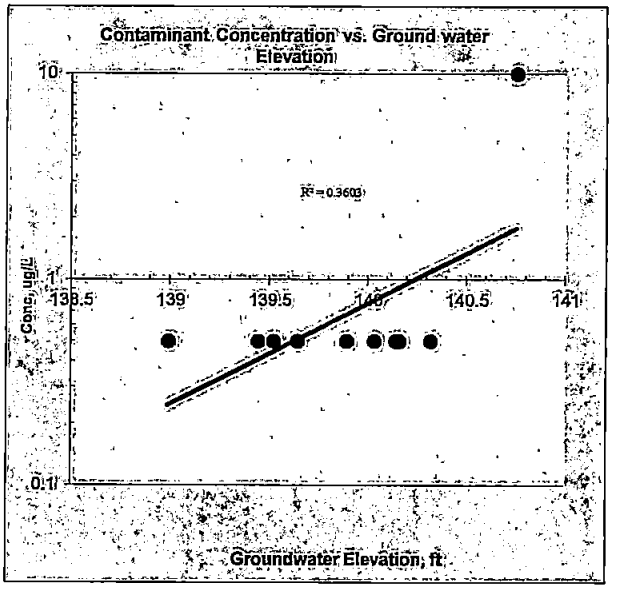
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

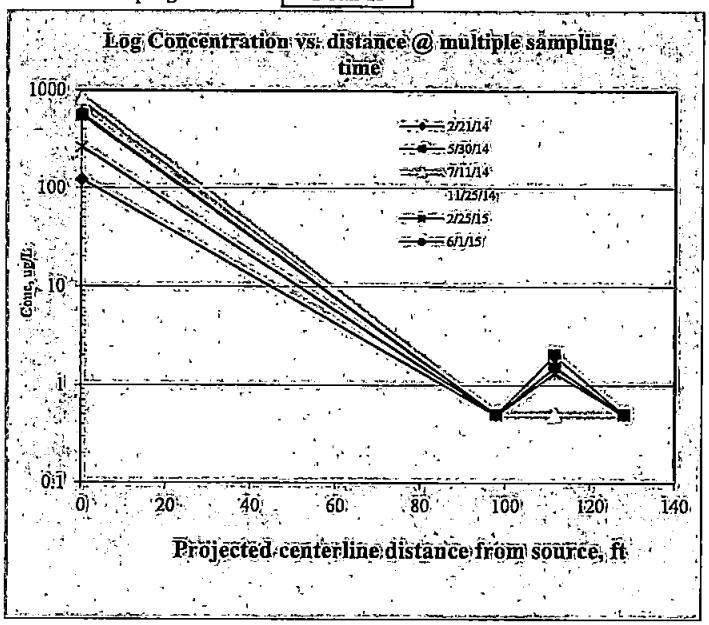
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*100.000%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.175* @50% C.L.;	*0.161*	@85% C.L.
Half Life for k_{point}, yr	*3.966* @50% C.L.;	*4.304*	@85% C.L.

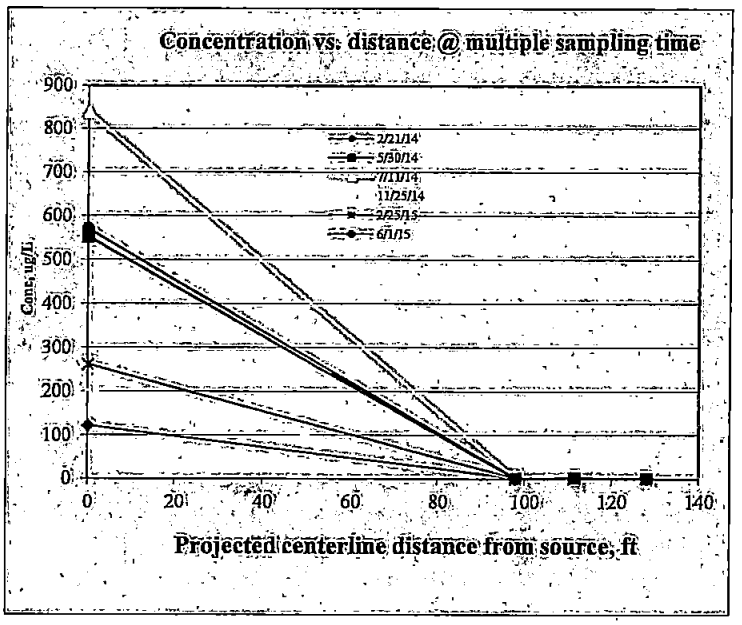




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



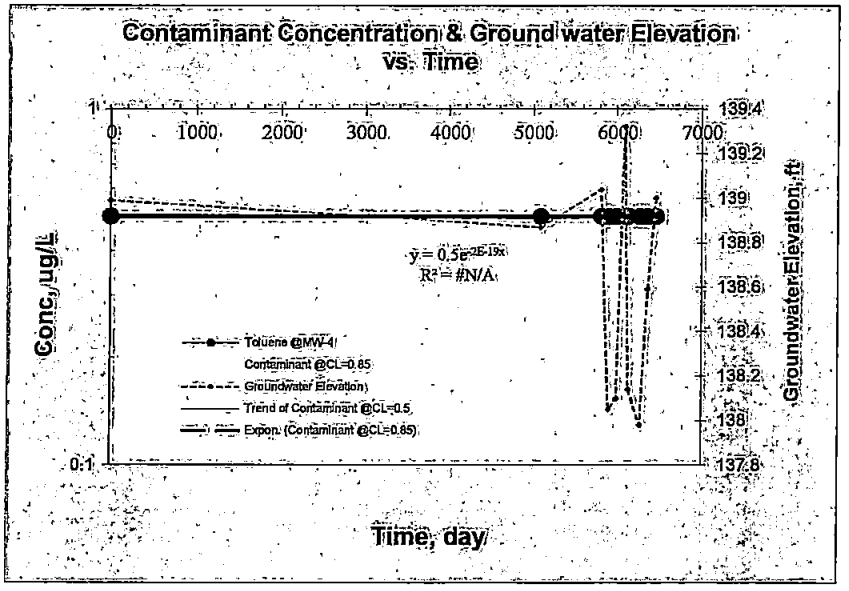


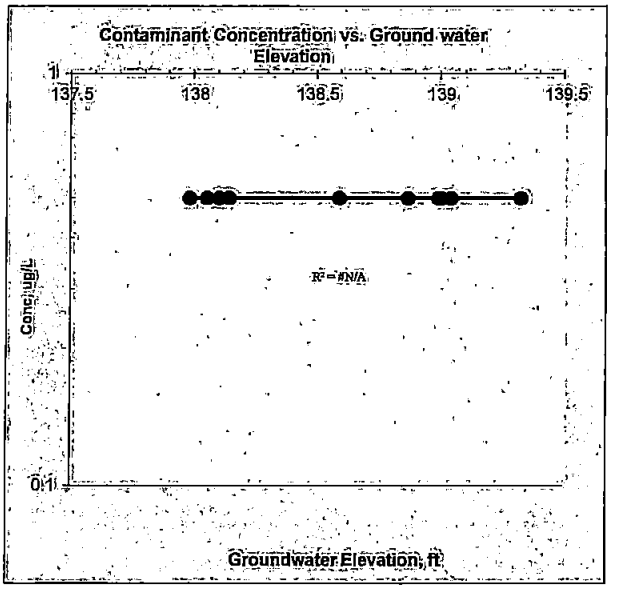
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
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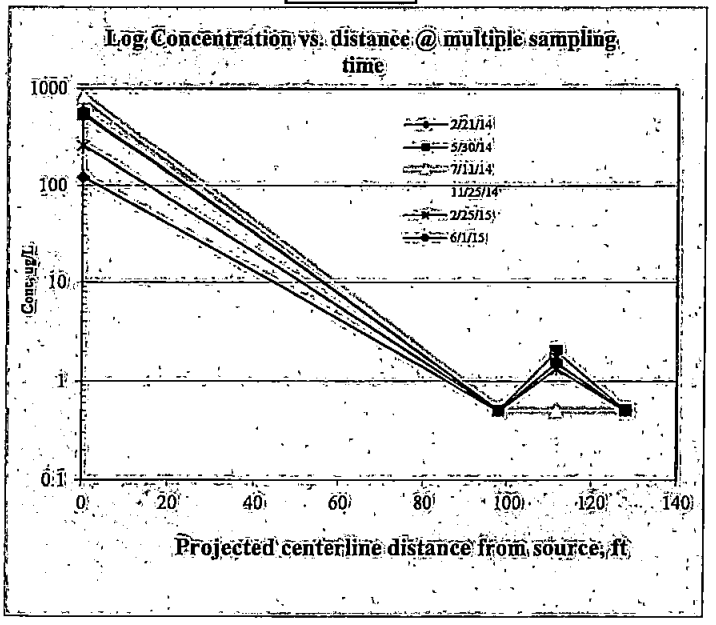
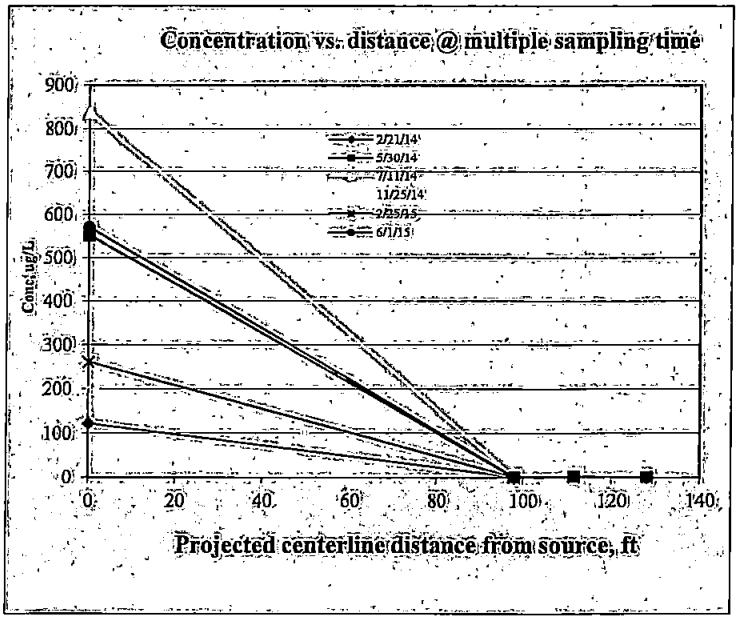
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



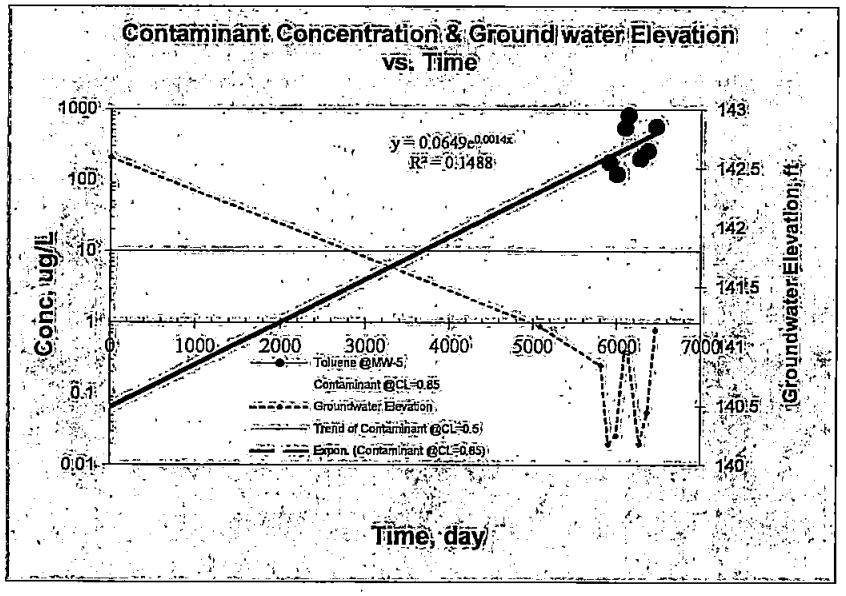


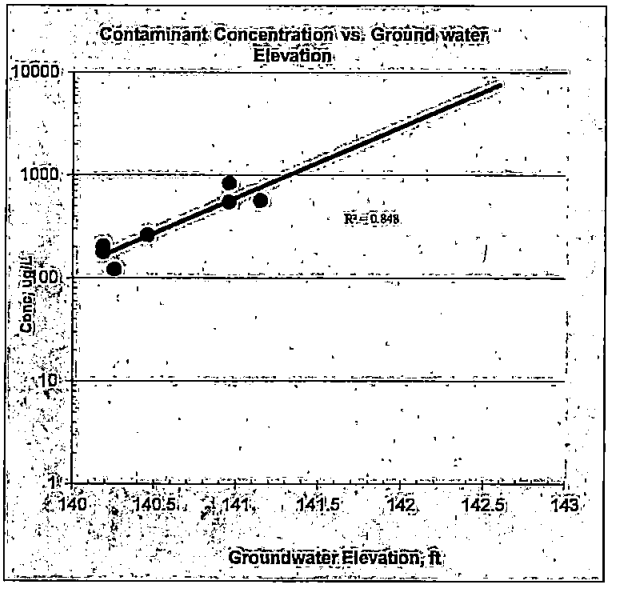
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

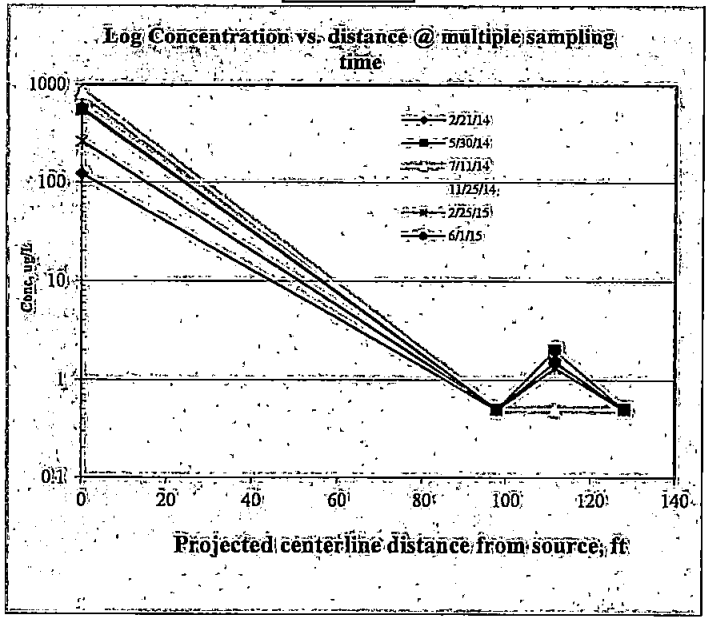
Name of Sampling Well?	MW-5	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*60.718%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.502* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr	*1.381* @50% C.L.;	*NA* @85% C.L.	

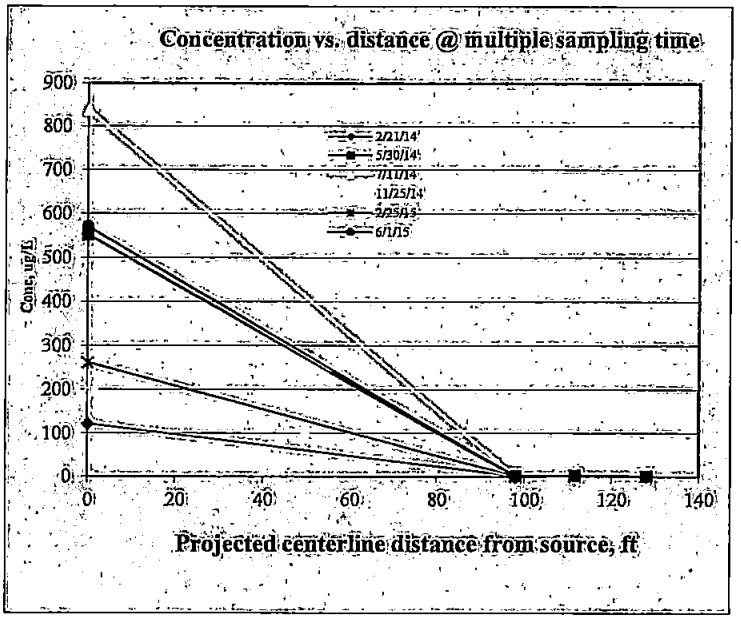




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15





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	-5.60	-26.95	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	2/20/92	10/18/70	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	-6.24	-29.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	6/30/91	7/1/68	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/15	9/30/15	9/30/15	9/30/15												
B.1 Average conc predicted (@50% CL)	ug/L	NA	0.95	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	NA	1.65	0.49	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	0.149	0.934	0.961	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	0.386	-0.967	-0.980	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	7	10	10	10	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, %		60.718%	99.999%	100.000%	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?		NO!	YES!	YES!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		0.684	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		Stable	Shrinking	Shrinking	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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

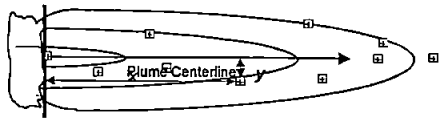
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	0.502	0.294	0.175	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	NA	0.264	0.161	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	1.381	2.354	3.966	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	NA	2.625	4.304	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	5/30/14	6091	1820	36.5	0.5	0.5												
#7	7/11/14	6133	1940	4.8	0.5	0.5												
#8	11/25/14	6270	1480	6.53	1.34	0.5												
#9	2/25/15	6362	1320	3.36	0.5	0.5												
#10	6/1/15	6458	1990	1.96	0.5	0.5												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			1488.0	209.8	7.9	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			1990	863	74	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			796	1.96	0.5	0.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

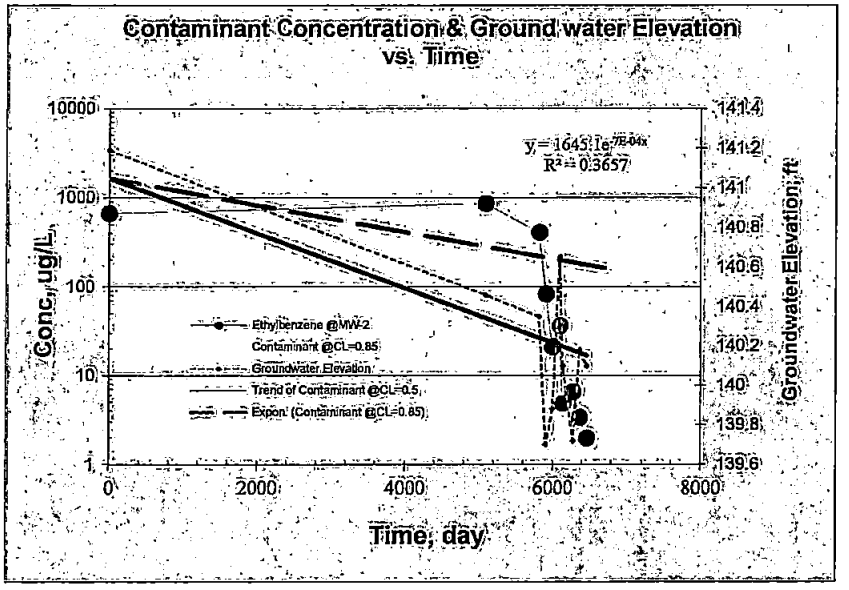
Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
#6	5/30/14	6091	140.95	140.65	140.32	139.32												
#7	7/11/14	6133	140.95	140.1	138.99	138.14												
#8	11/25/14	6270	140.18	139.72	139.44	137.98												
#9	2/25/15	6362	140.45	140.18	139.89	138.59												
#10	6/1/15	6458	141.14	140.1	140.03	139												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		

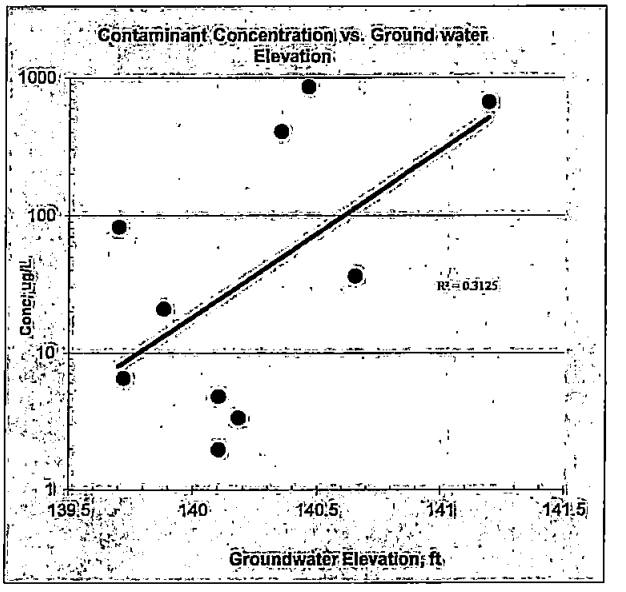
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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

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

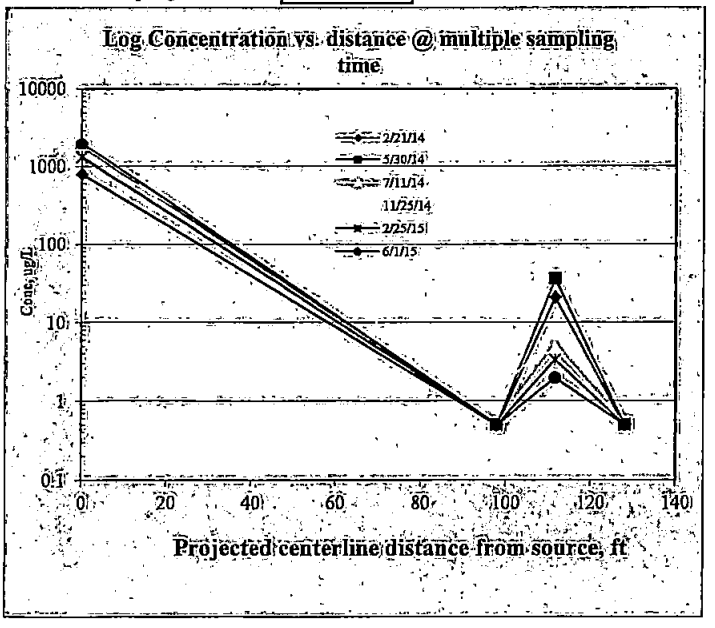
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*93.601%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.259* @50% C.L.;	*0.126* @85% C.L.	
Half Life for k_{point}, yr	*2.676* @50% C.L.;	*5.485* @85% C.L.	

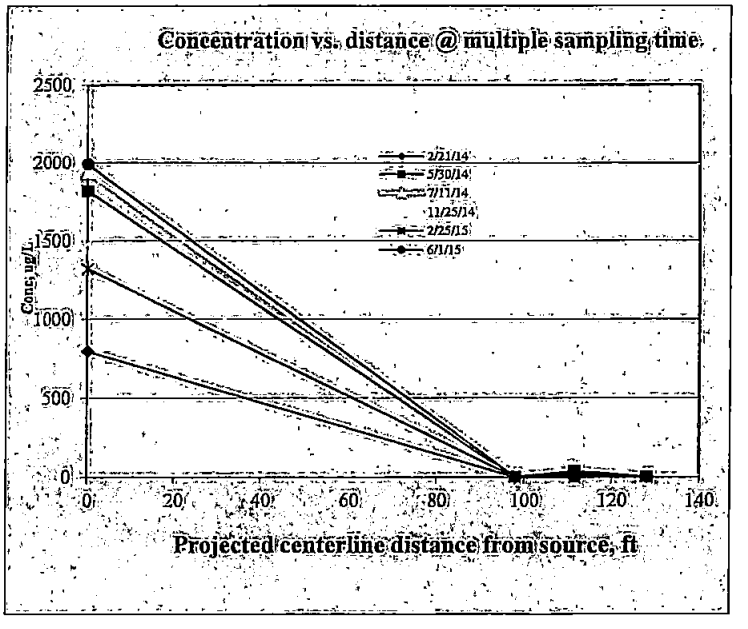




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



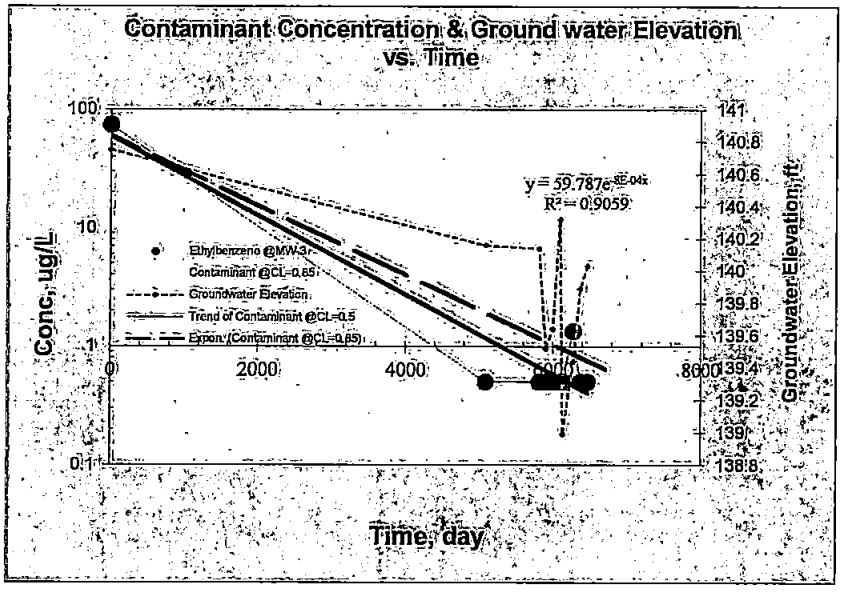


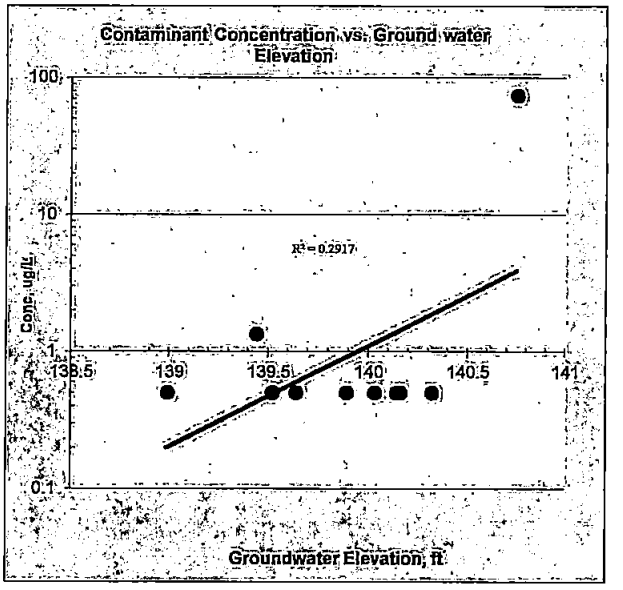
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

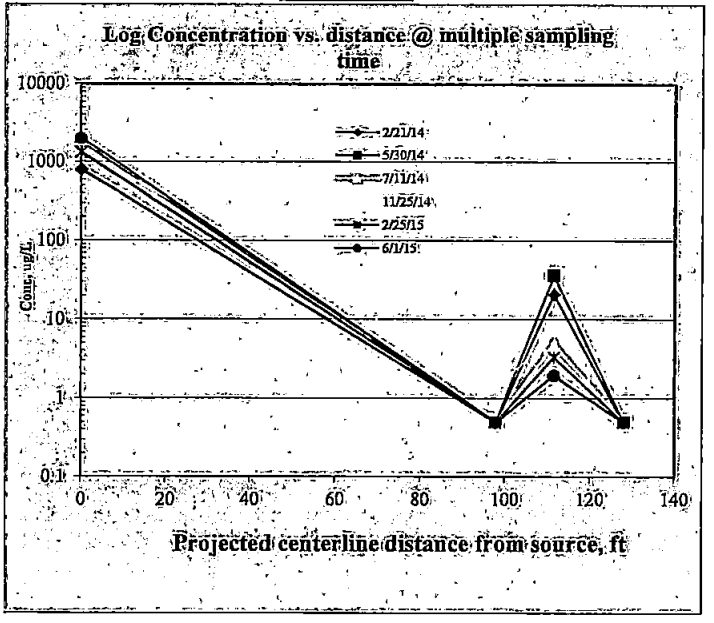
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.998%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.282* @50% C.L.;	*0.247*	@85% C.L.
Half Life for k_{point}, yr	*2.455* @50% C.L.;	*2.806*	@85% C.L.

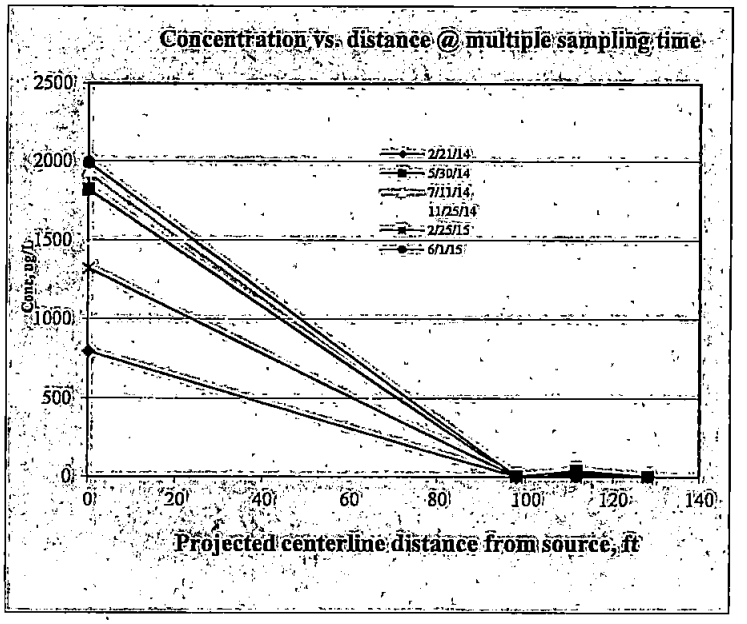




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



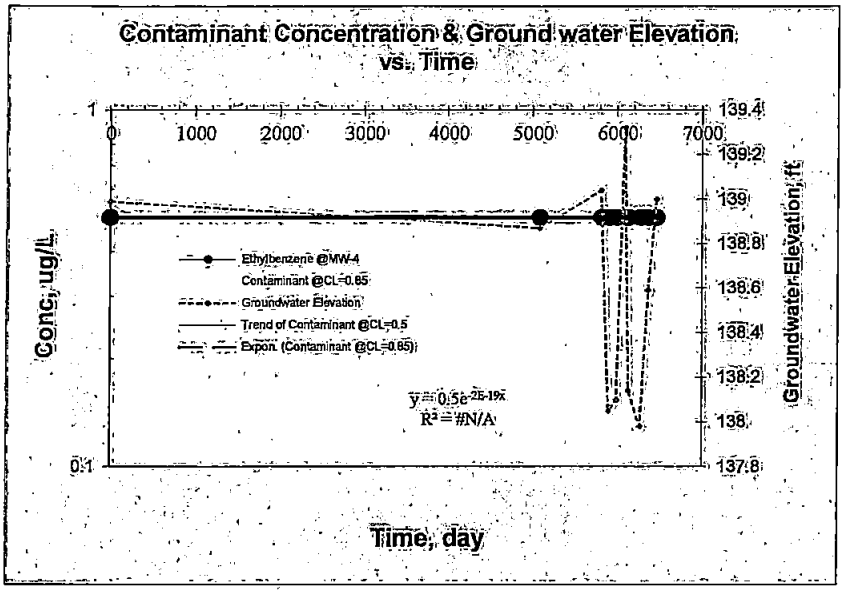


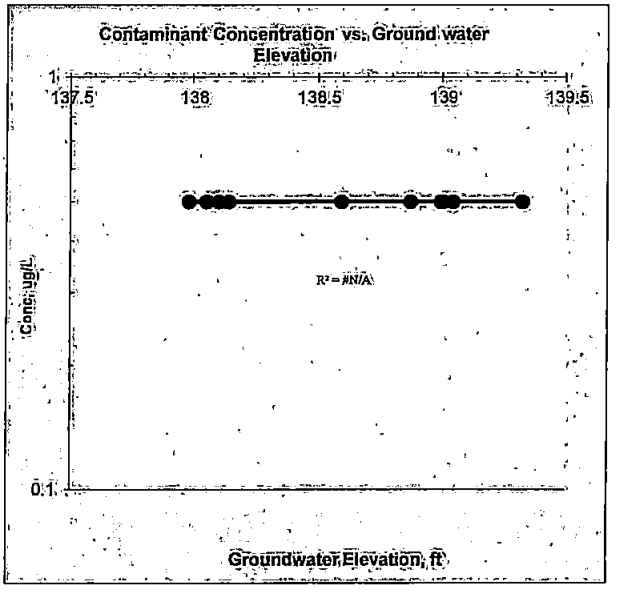
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

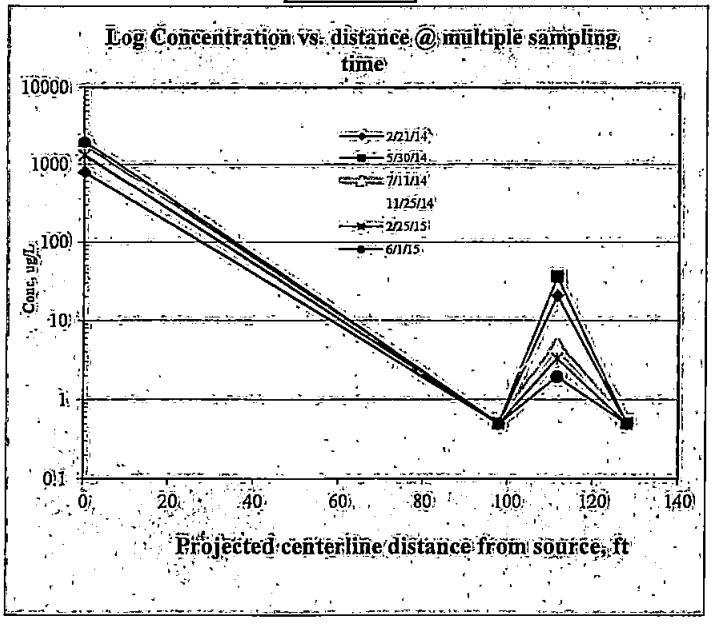
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*NA*		
Plume Stability?	NA	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*NA* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point}, yr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

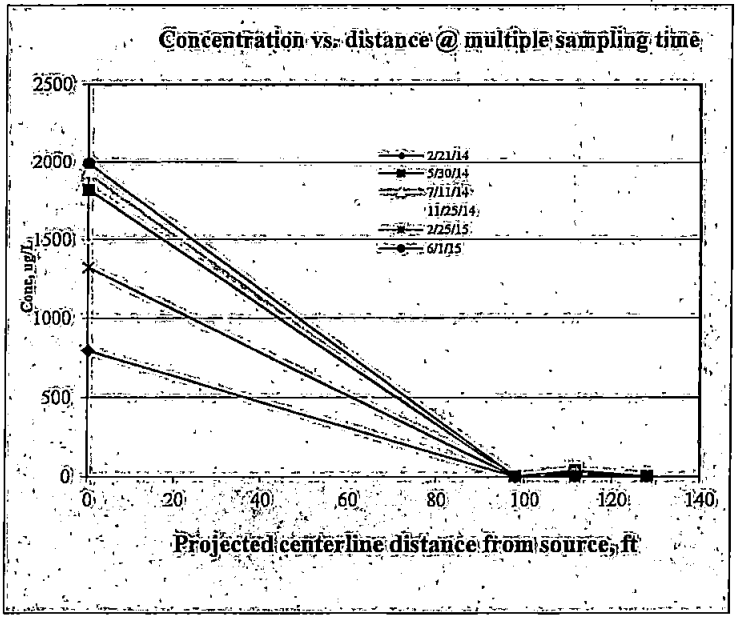




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



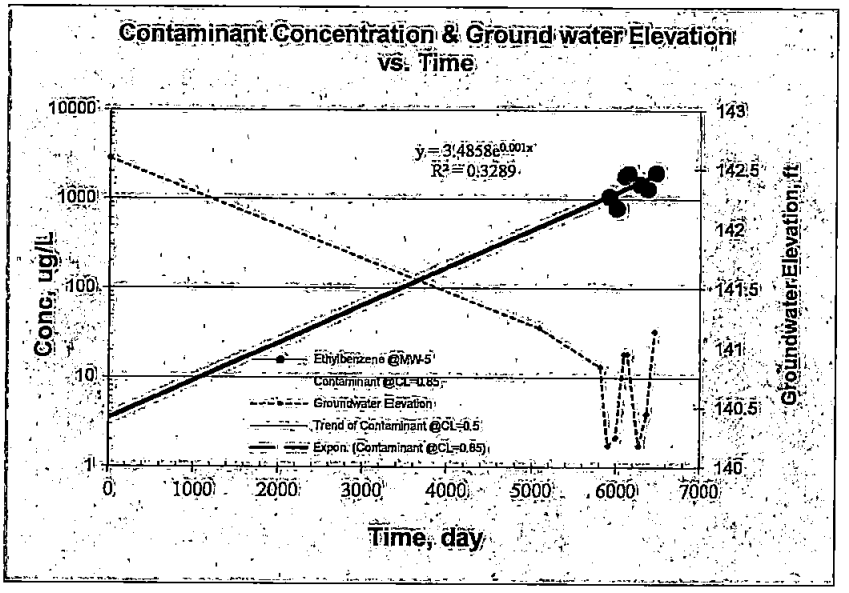


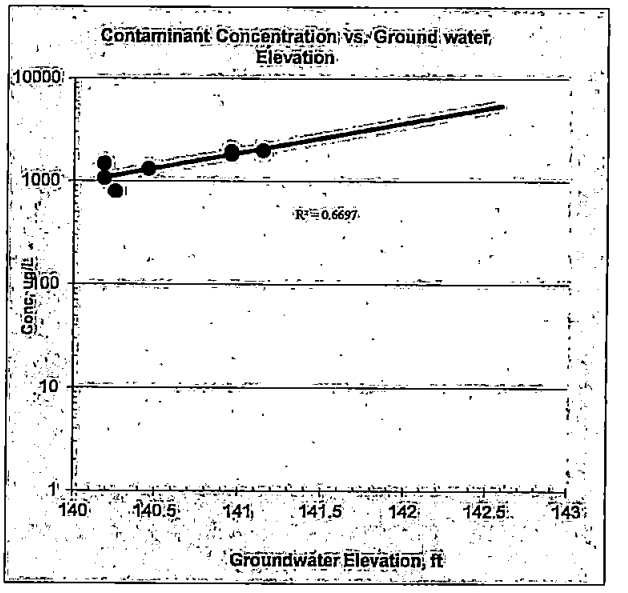
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

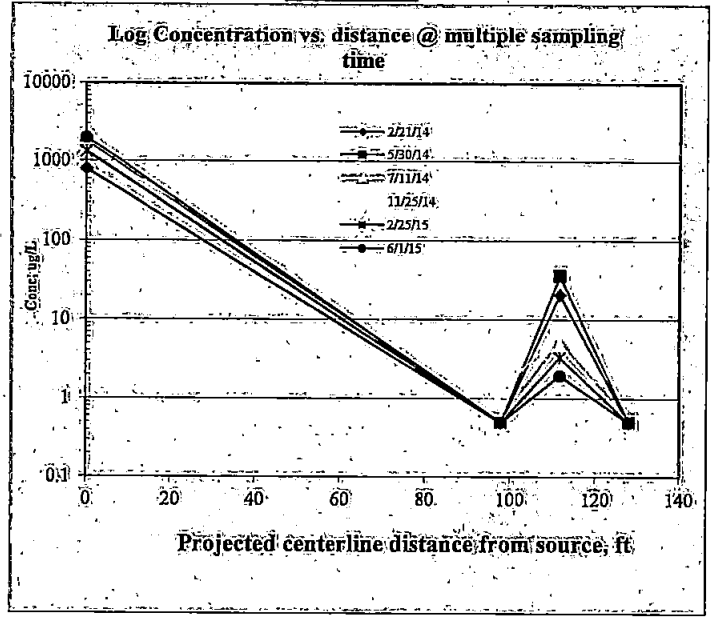
Name of Sampling Well?	MW-5	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*82.170%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.355* @50% C.L.;	*0.098* @85% C.L.	
Half Life for k_{point}, yr	*1.950* @50% C.L.;	*7.081* @85% C.L.	

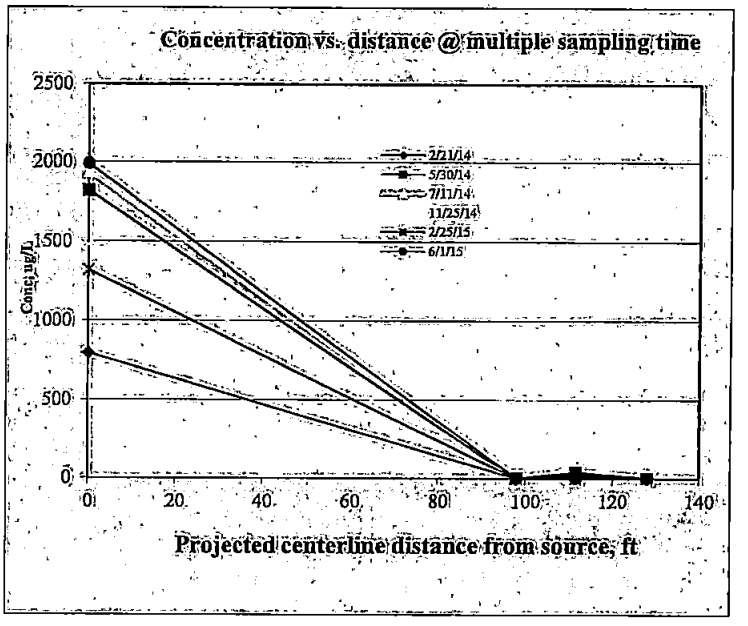




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15





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	3.30	-8.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	1/11/01	1/10/89	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	6.76	-9.96	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	6/27/04	10/12/87	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/15	9/30/15	9/30/15	9/30/15												
B.1 Average conc predicted (@50% CL)	ug/L	NA	15.45	0.37	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	NA	168.61	0.70	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	0.329	0.366	0.906	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	0.573	-0.605	-0.952	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	7	10	10	10	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, %		82.170%	93.601%	99.998%	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?		NO!	YES!	YES!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		0.307	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		Stable	Shrinking	Shrinking	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

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

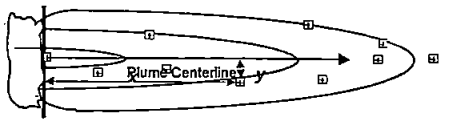
Slope: Point decay rate constant (k_{point})	@50% CL	yr^{-1}	0.355	0.259	0.282	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	0.098	0.126	0.247	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	1.950	2.676	2.455	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	7.081	5.485	2.806	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	5/30/14	6091	7610	8.47	3.59	1.5												
#7	7/11/14	6133	9960	3.07	1.31	1.5												
#8	11/25/14	6270	7610	8.19	5.04	1.5												
#9	2/25/15	6362	6680	4.52	1.16	1.5												
#10	6/1/15	6458	10390	4.48	1.21	1.5												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		
Average Concentration			7431.4	66.6	11.4	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			10390	590	97	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Minimum Concentration			3670	3.07	1	1.5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

2. Groundwater Elevation:

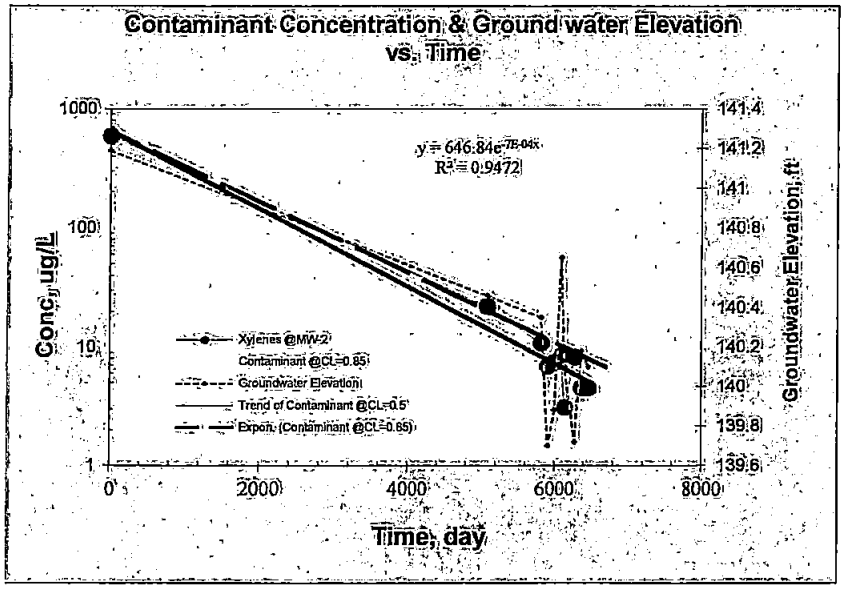
Well Location:																		
Sampling Event	Date sampled	Day																
#1	9/25/97	0	142.59	141.19	140.75	138.99												
#2	8/25/11	5082	141.17	140.46	140.16	138.87												
#3	8/22/13	5810	140.84	140.35	140.14	139.04												
#4	11/21/13	5901	140.18	139.7	139.52	138.05												
#5	2/21/14	5993	140.25	139.88	139.64	138.1												
#6	5/30/14	6091	140.95	140.65	140.32	139.32												
#7	7/11/14	6133	140.95	140.1	138.99	138.14												
#8	11/25/14	6270	140.18	139.72	139.44	137.98												
#9	2/25/15	6362	140.45	140.18	139.89	138.59												
#10	6/1/15	6458	141.14	140.1	140.03	139												
#11																		
#12																		
#13																		
#14																		
#15																		
#16																		
#17																		
#18																		
#19																		
#20																		

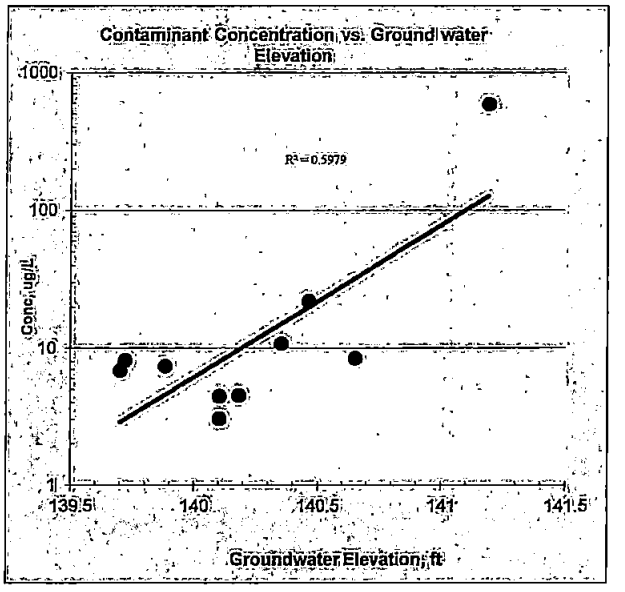
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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

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

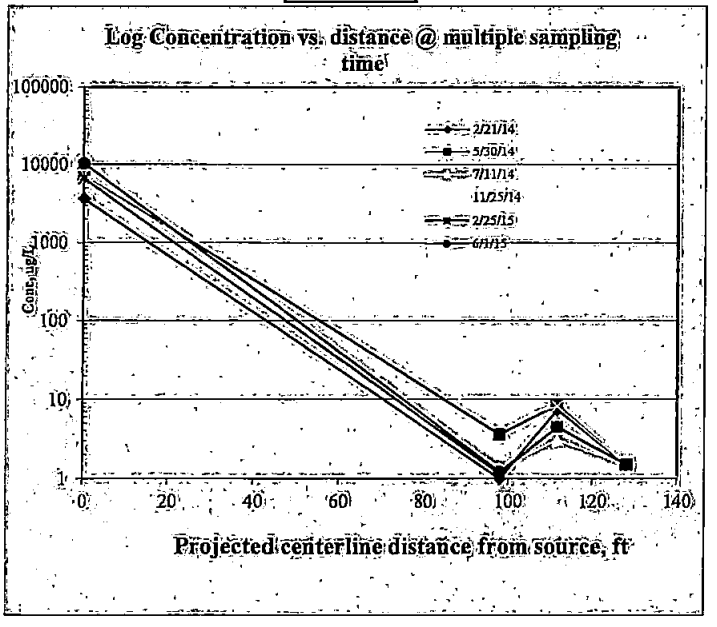
Name of Sampling Well?	MW-2	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*100.000%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.274* @50% C.L.;	*0.249* @85% C.L.	
Half Life for k_{point}, yr	@50% C.L.;	*2.788* @85% C.L.	

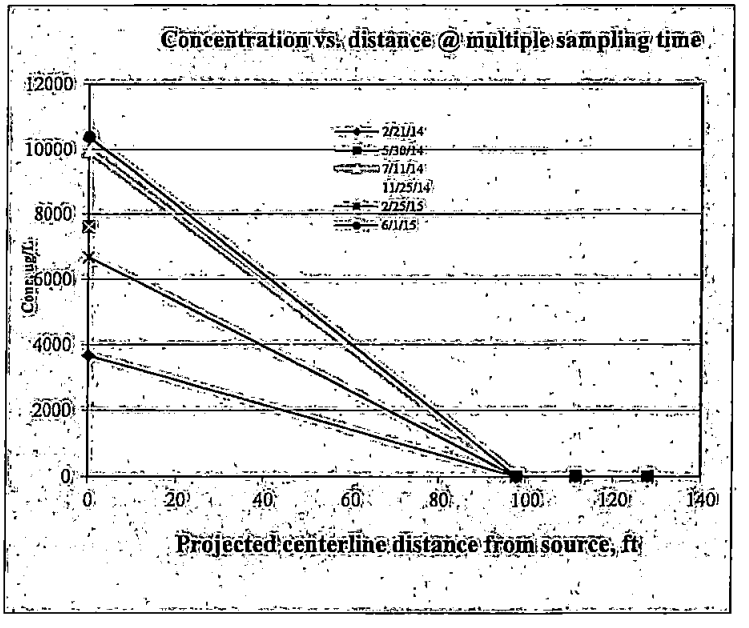




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



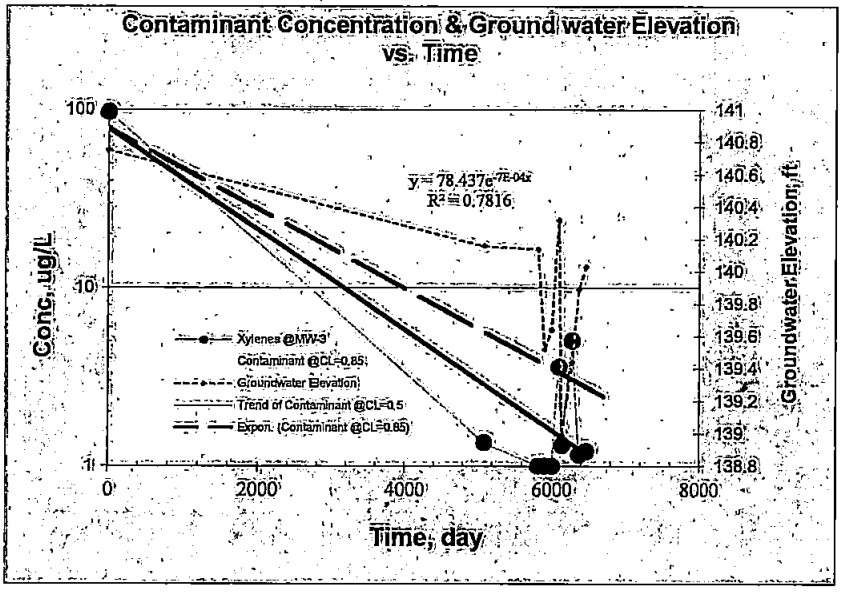


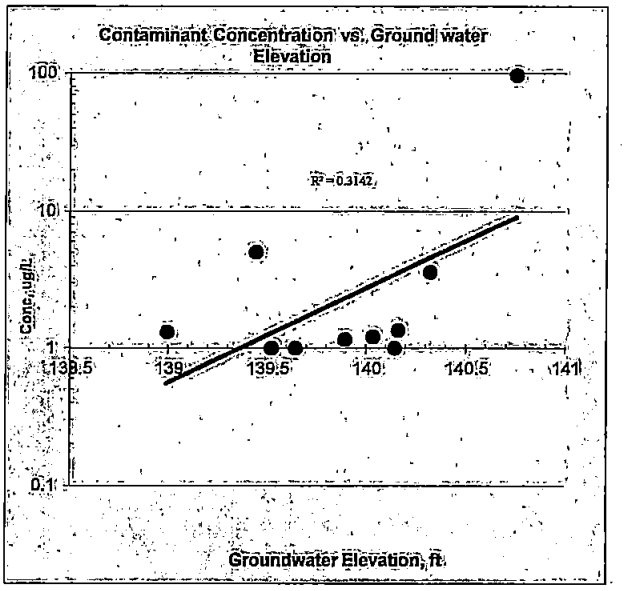
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

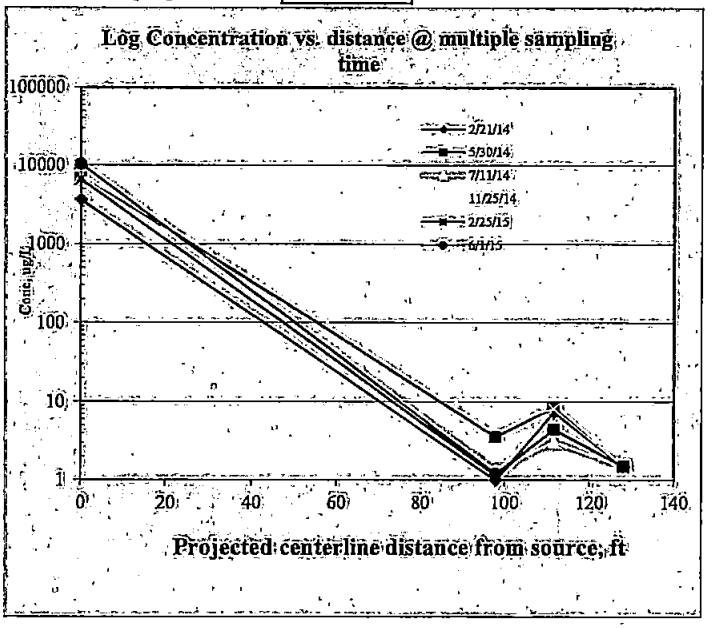
Name of Sampling Well?	MW-3	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*99.932%*		
Plume Stability?	Shrinking	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.238* @50% C.L.;	*0.189* @85% C.L.	
Half Life for k_{point}, yr	@50% C.L.;	*3.669* @85% C.L.	

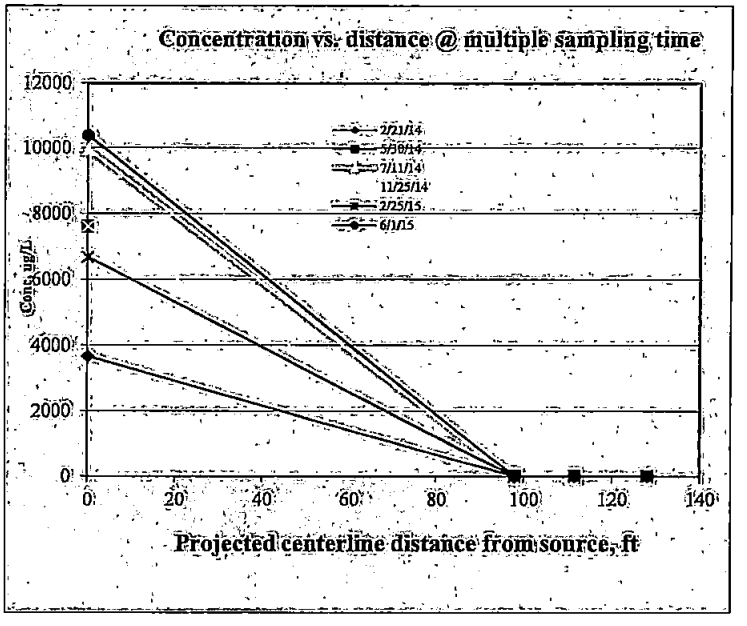




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



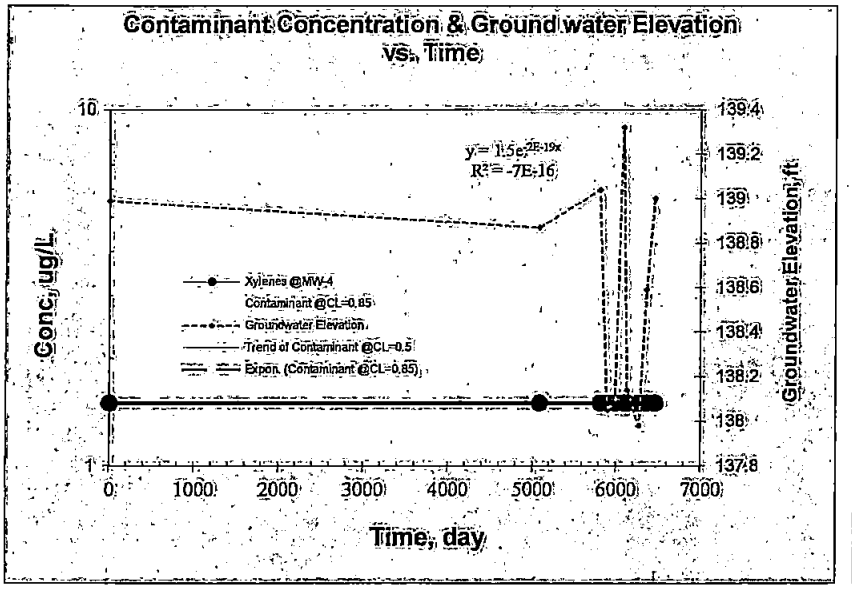


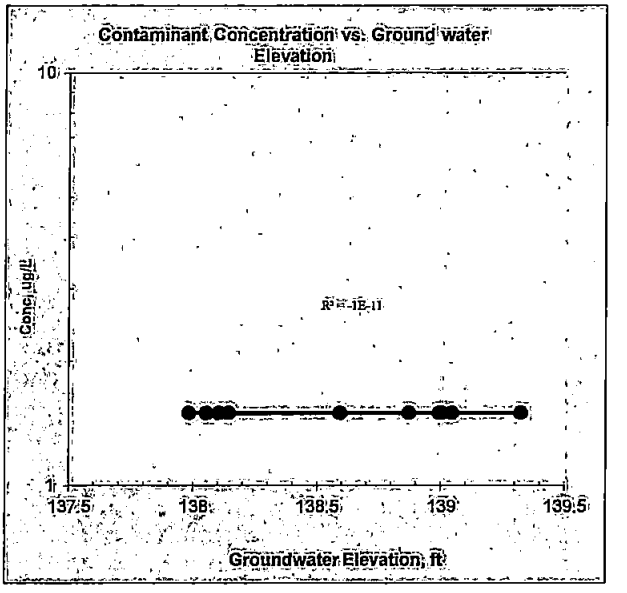
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

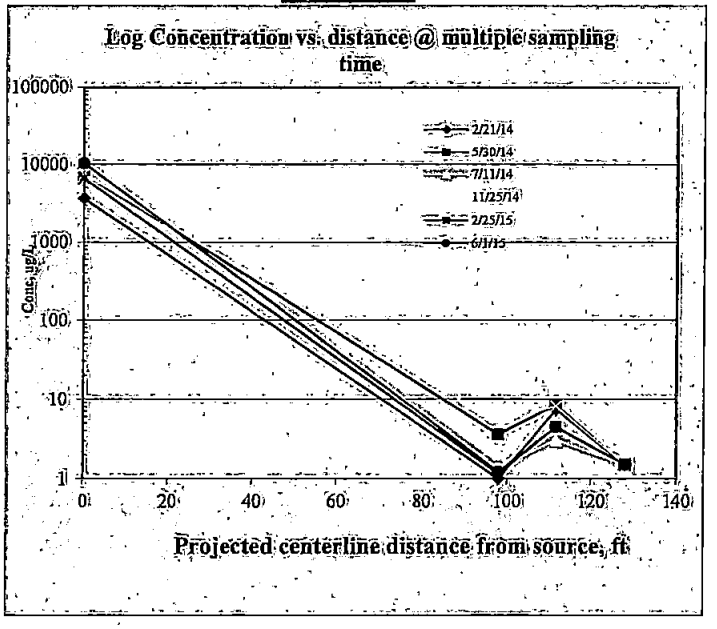
Name of Sampling Well?	MW-4	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*0.000%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.000* @50% C.L.;	*NA* @85% C.L.	
Half Life for k_{point},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

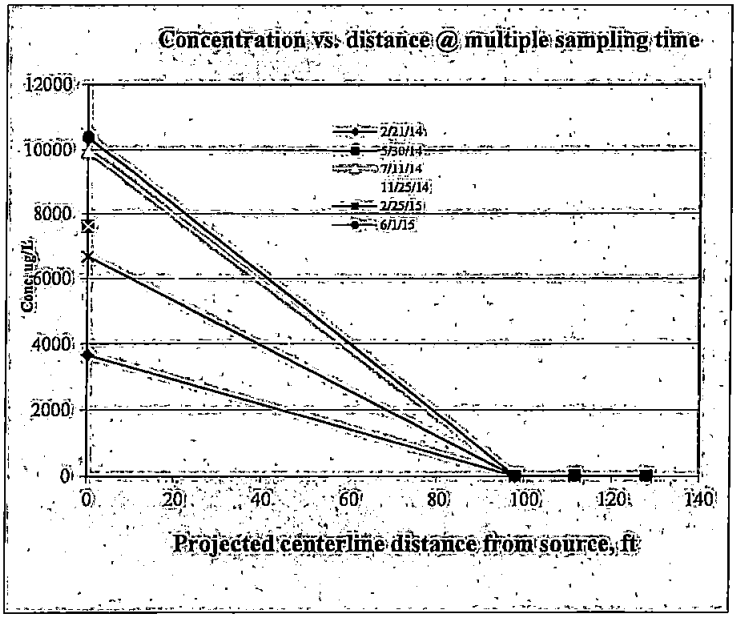




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15



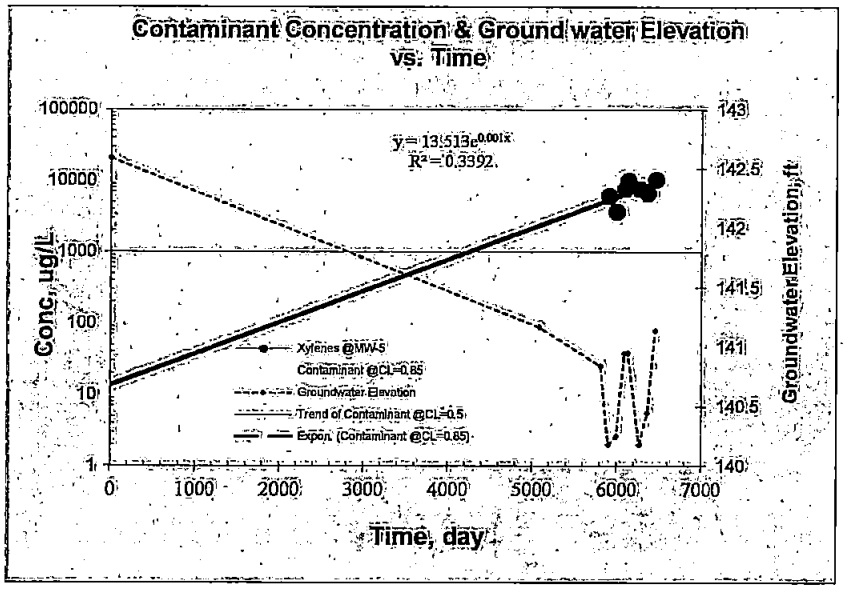


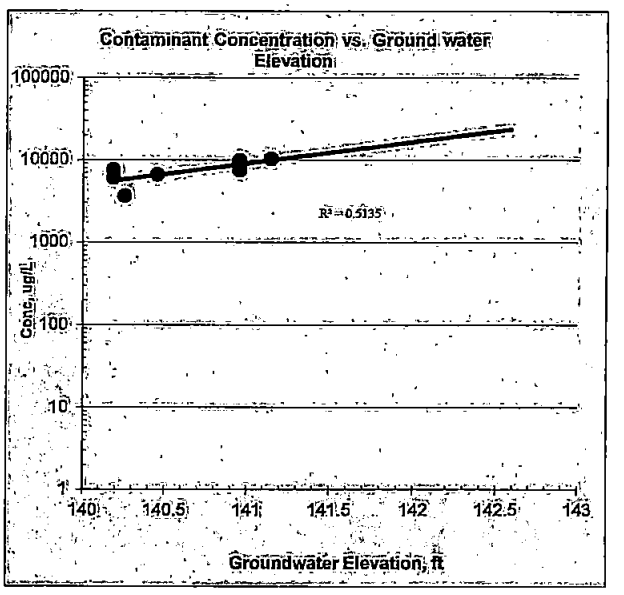
Module 2: Graphical Presentation of Historical Ground Water Data: (Well to Well Analysis)

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)

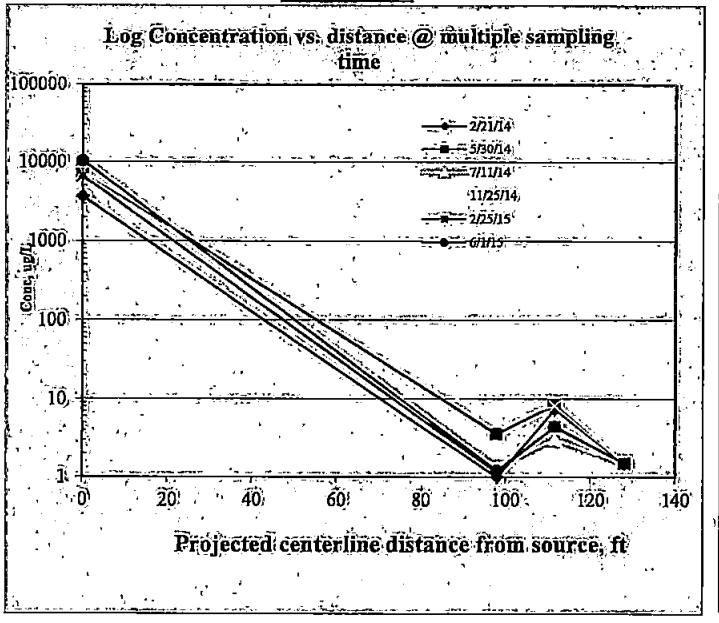
Name of Sampling Well?	MW-5	Confidence Level (Decision Criteria)?	85.0%
Confidence Level calculated with log-linear regression is?	*82.998%*		
Plume Stability?	Stable	; Decision Criteria is 85%.	
Slope: Point decay rate constant (k_{point}), yr^{-1}	*0.370* @50% C.L.;		*0.108* @85% C.L.
Half Life for k_{point}, yr	@50% C.L.;		*6.408* @85% C.L.

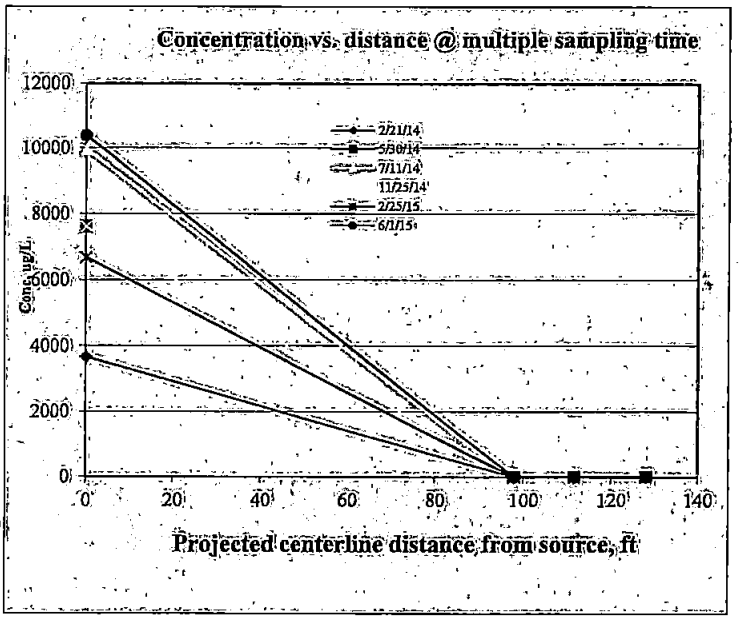




2. Spatial and Temporal Trend along Overall Plume Length for Multiple Wells:

Plot #1:	Sampling date #1	21-Feb-14
Plot #2:	Sampling date #2	30-May-14
Plot #3:	Sampling date #3	11-Jul-14
Plot #4:	Sampling date #4	25-Nov-14
Plot #5:	Sampling date #5	25-Feb-15
Plot #6:	Sampling date #6	1-Jun-15





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	-1.59	-10.71	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	2/22/96	1/13/87	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	-1.75	-13.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Date when the Criterion to be achieved	date	NA	12/25/95	4/7/84	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B Date of Prediction?	date	9/30/15	9/30/15	9/30/15	9/30/15												
B.1 Average conc predicted (@50% CL)	ug/L	NA	4.66	1.08	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
B.2 Boundary conc predicted (@85% CL)	ug/L	NA	7.33	2.60	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

3. Log-Linear Regression Results

Coefficient of Determination	r^2	0.339	0.947	0.782	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Correlation Coefficient	r	0.582	-0.973	-0.884	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Number of data points	n	7	10	10	10	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, %		82.998%	100.00%	99.932%	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?		NO!	YES!	YES!	NO!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Coefficient of Variation?		0.309	NA	NA	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Plume Stability?		Stable	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}	0.370	0.274	0.238	0.000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr^{-1}	0.108	0.249	0.189	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Half Life for (k_{point})	@50% CL	yr	1.872	2.532	2.915	#DIV/0!	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	@85% CL	yr	6.408	2.788	3.669	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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

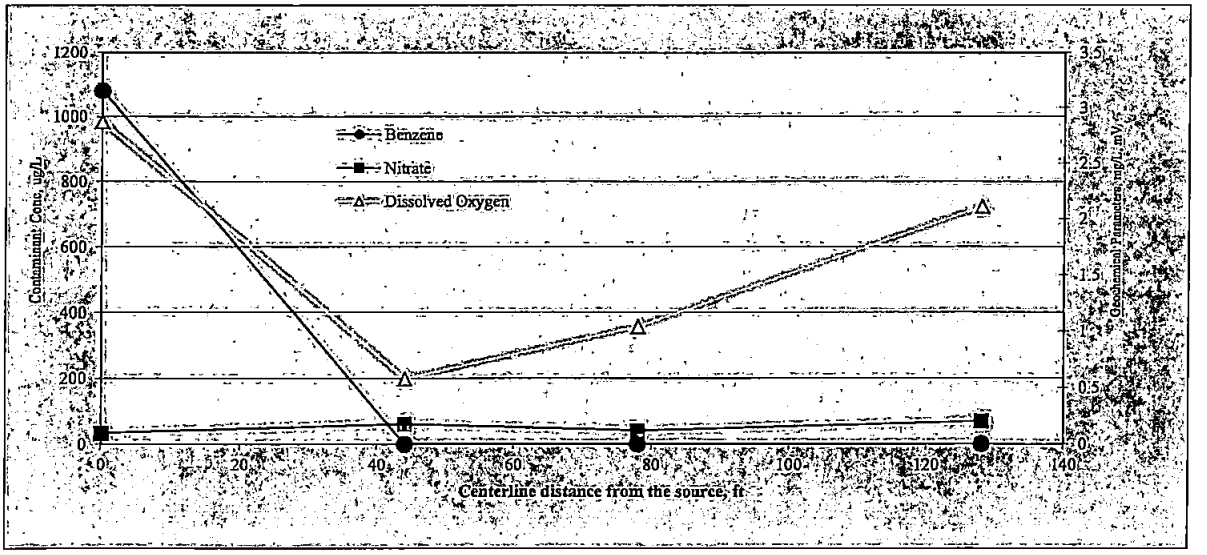
Contaminant for UF Selection: **Benzene**

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	0.0	0.8	0.6	0.3	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	0.0	0.0	-7.2	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	-0.2	-0.1	-0.2	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	0.6	0.5	-7.1	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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

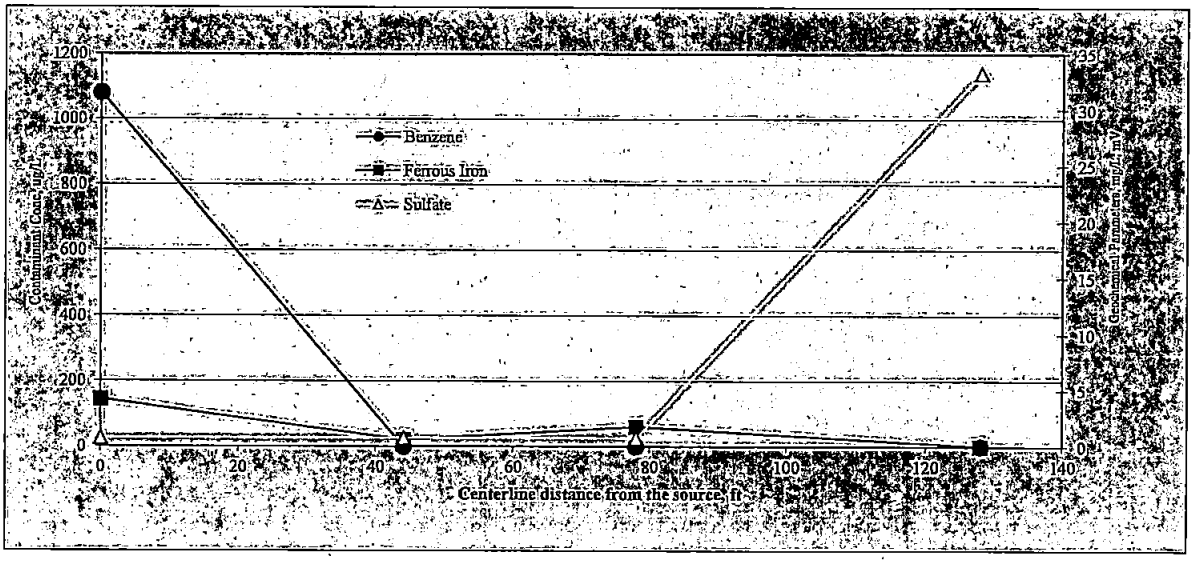
Contaminant for UF Selection: **Benzene**

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	0.0	0.8	0.6	0.3	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	0.0	0.0	-7.2	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	-0.2	-0.1	-0.2	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	0.6	0.5	-7.1	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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

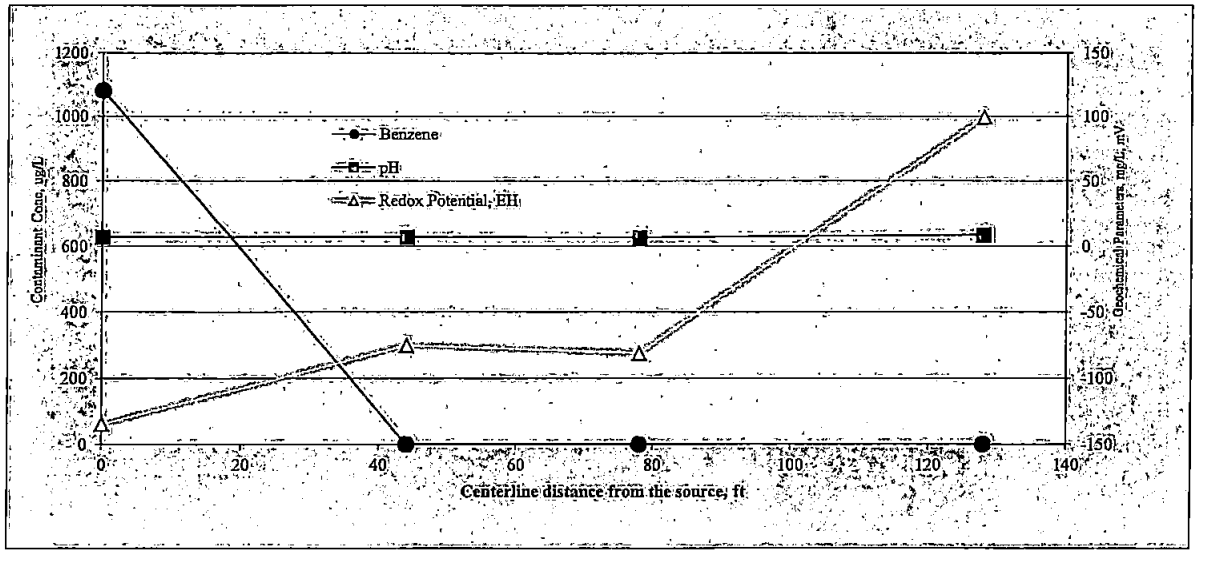
Contaminant for UF Selection: **Benzene**

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	0.0	0.8	0.6	0.3	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	0.0	0.0	-7.2	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	-0.2	-0.1	-0.2	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	0.6	0.5	-7.1	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

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



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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

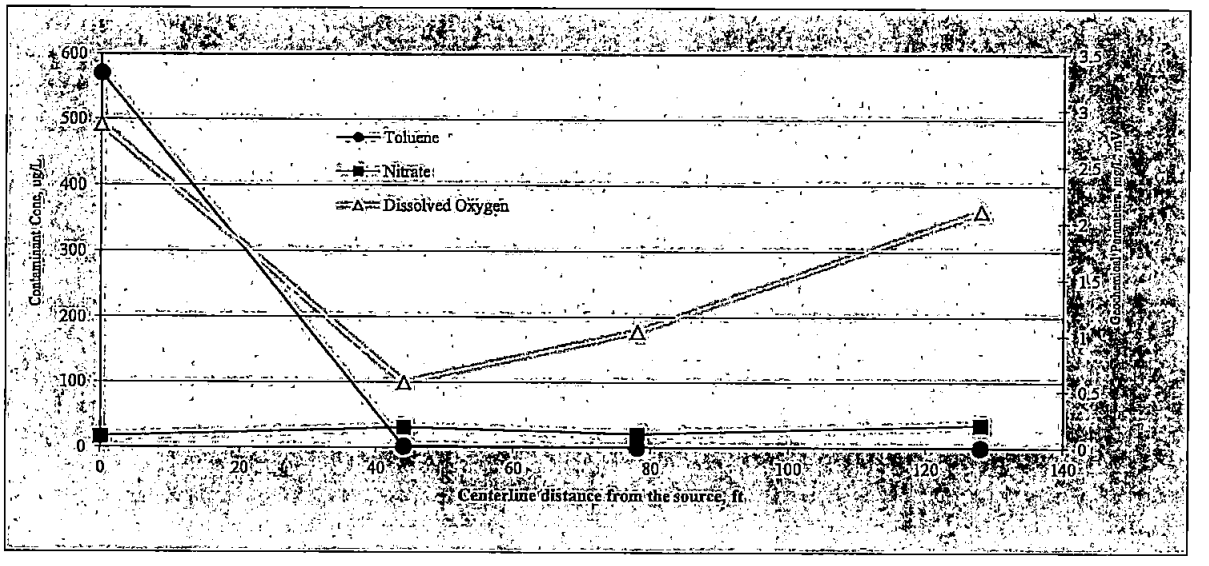
Contaminant for UF Selection: **Toluene**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Toluene
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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

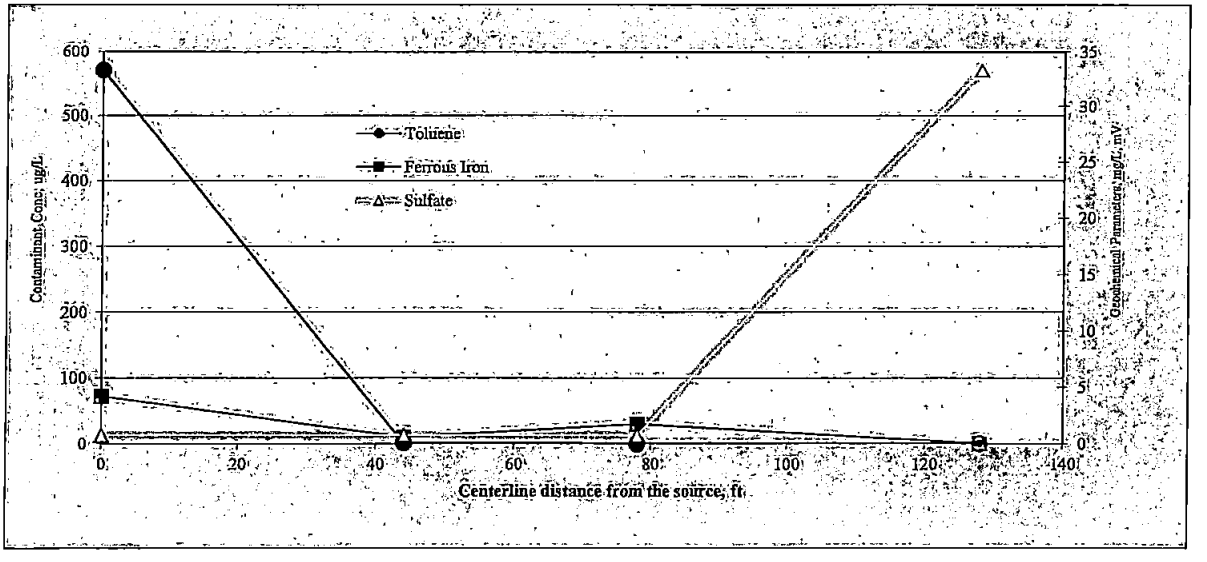
Contaminant for UF Selection: **Toluene**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

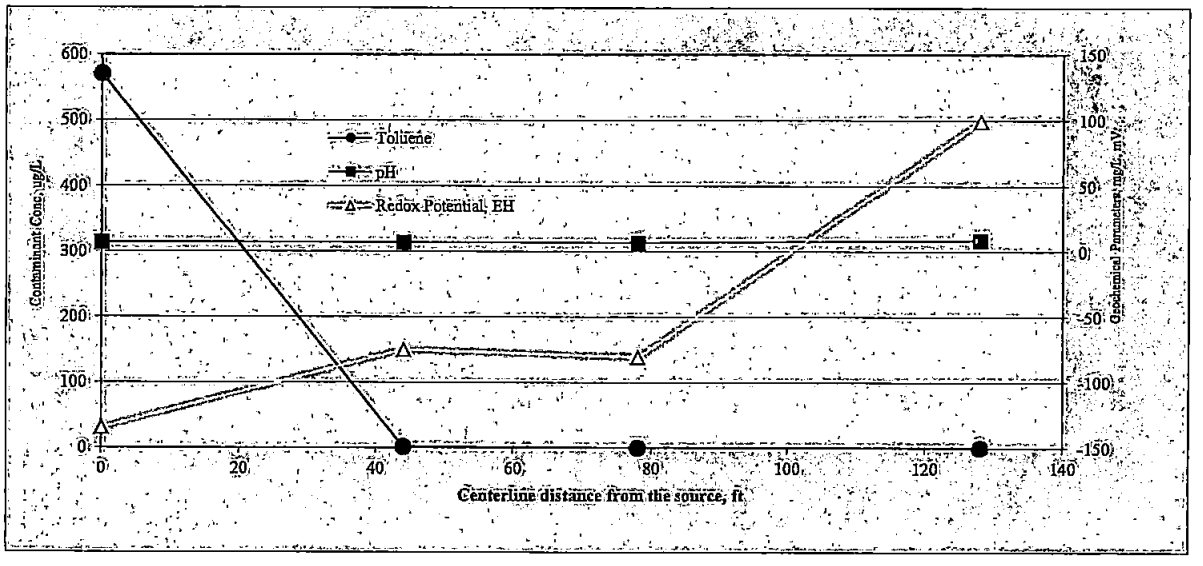
Contaminant for UF Selection: **Toluene**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

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



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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

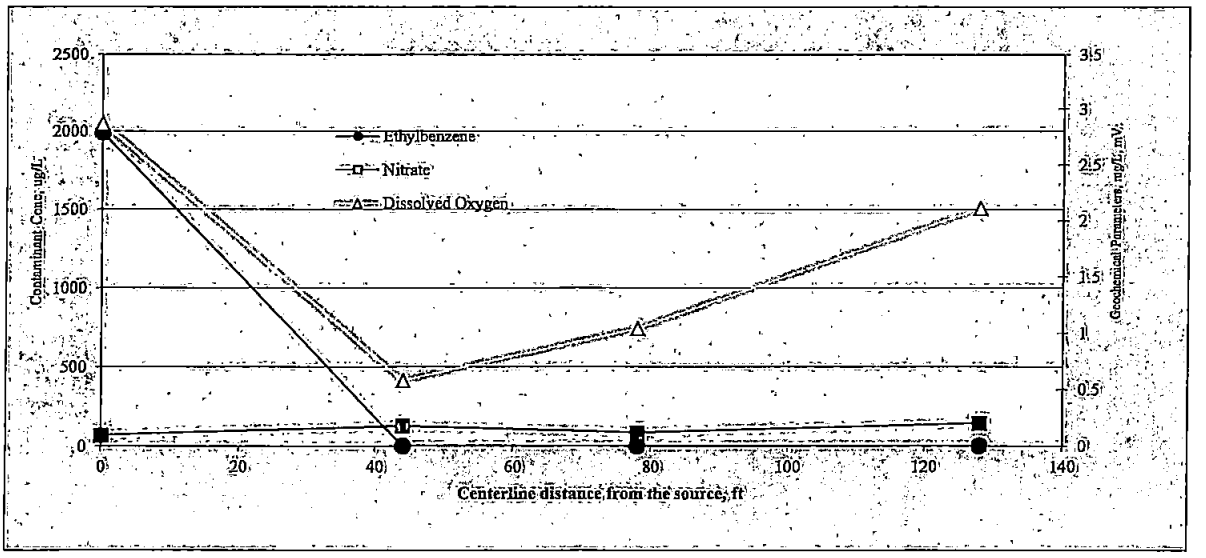
Contaminant for UF Selection: **Ethylbenzene**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Ethylbenzene
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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

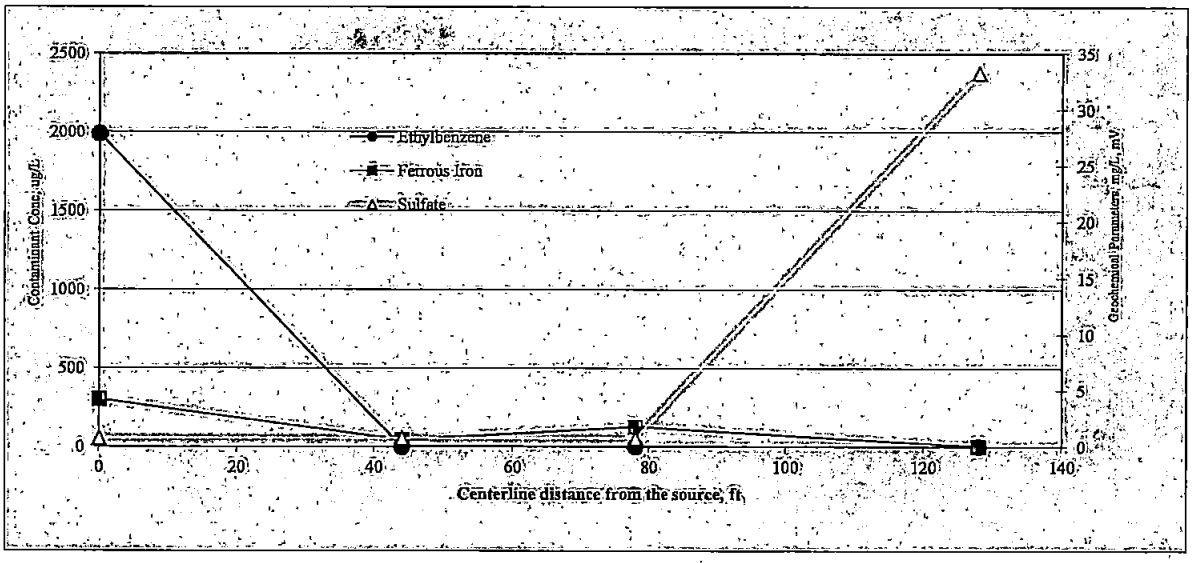
Contaminant for UF Selection: **Ethylbenzene**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

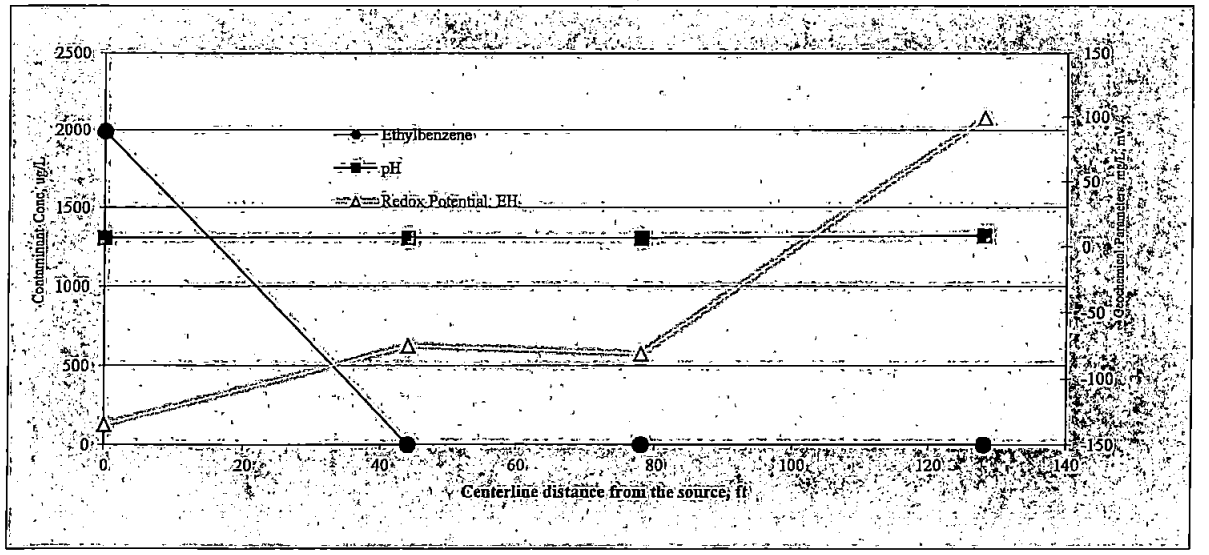
Contaminant for UF Selection: **Ethylbenzene**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

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



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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

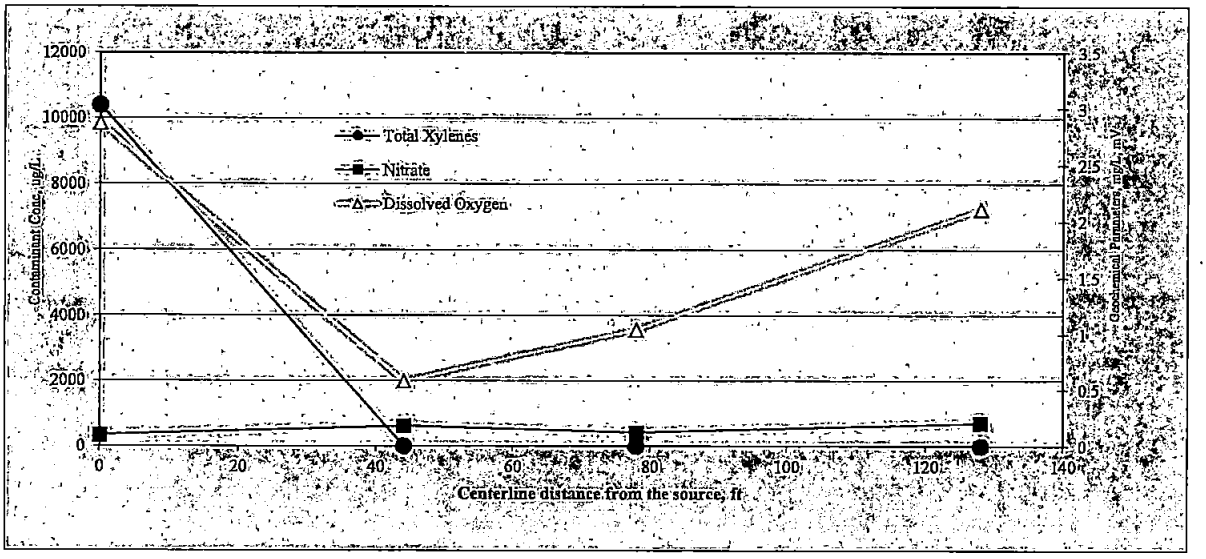
Contaminant for UF Selection: **Total Xylenes**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

Hazardous Substance	Total Xylenes
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				1080	0.5	0.5	0.5					
Toluene	ug/L				570	1.52	0.5	0.5					
Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

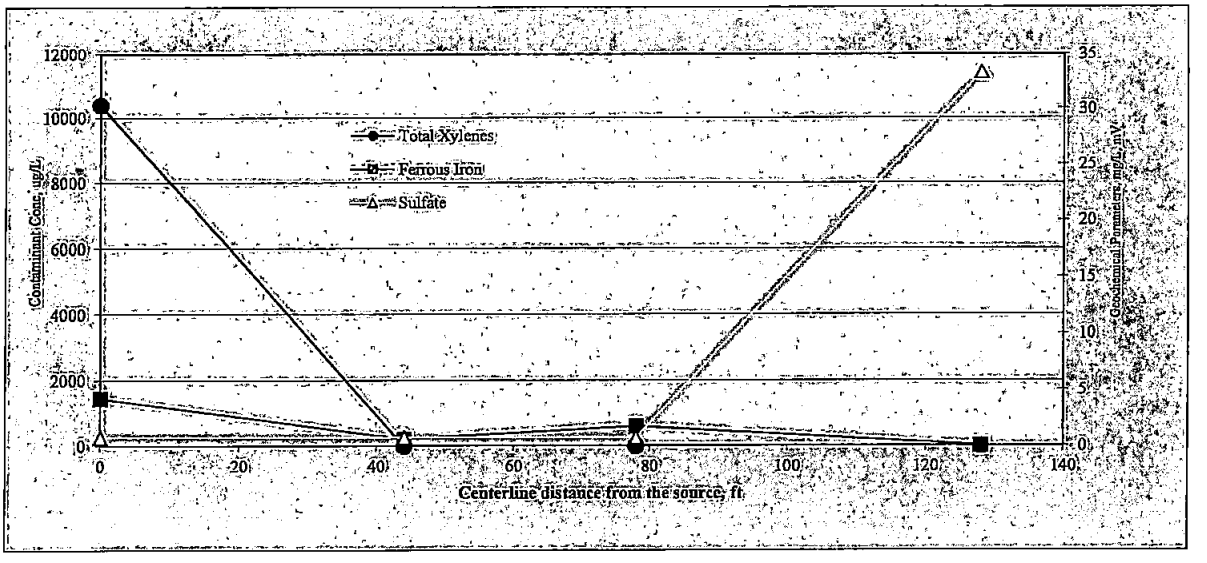
Contaminant for UF Selection: **Total Xylenes**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	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					
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Benzene	ug/L				1080	0.5	0.5	0.5					
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Ethylbenzene	ug/L				1990	1.96	0.5	0.5					
Total Xylenes	ug/L				10390	4.48	1.21	1.5					
Gasoline	ug/L				60900	1030	152	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	2.87				2.87	0.58	1.04	2.11					
Nitrate	mg/L	0.0965				0.0965	0.178	0.118	0.201					
Sulfate	mg/L	0.75				0.75	0.75	0.75	33.3					
Manganese	mg/L													
Ferrous Iron	mg/L	4.2				4.2	0.6	1.75	0.015					
Methane	mg/L													
Redox Potential, E_H	mV	-134.8				-134.8	-74.9	-80.8	99.4					
Alkalinity	mg/L													
pH	unitless	6.95				6.95	6.98	6.87	8.61					

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

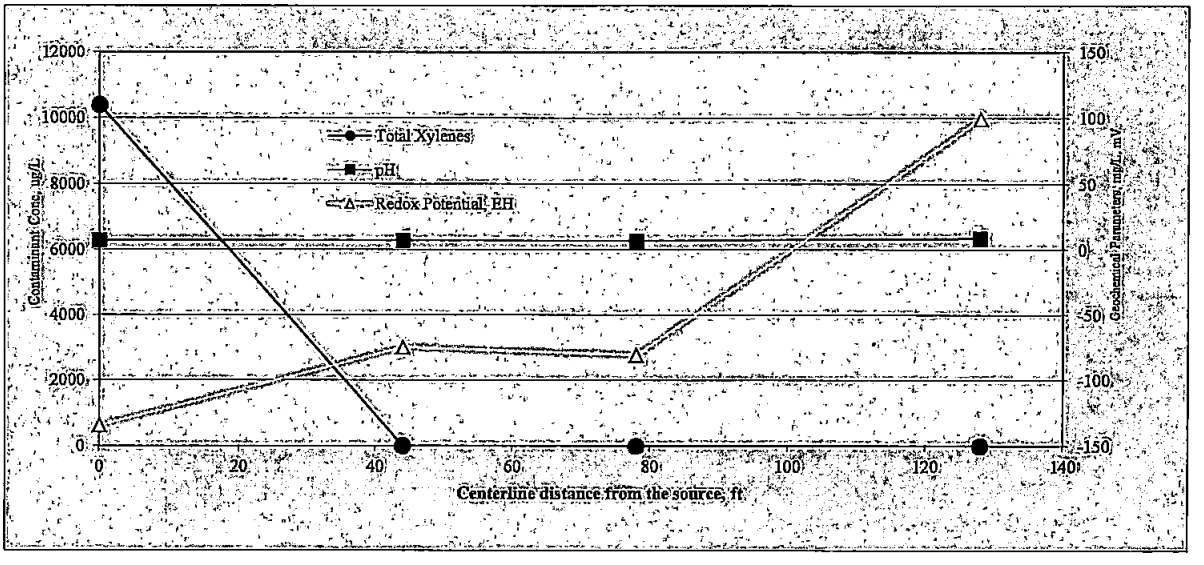
Contaminant for UF Selection: **Total Xylenes**

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	0.0	0.7	0.6	0.2	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	0.0	0.0	-6.8	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	-0.2	-0.1	-0.2	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	0.6	0.5	-6.8	N/A	N/A	N/A	N/A	N/A

4. Geochemical Indicator Plot

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



Appendix C

Appendix C

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: August 2015

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