Bioremediation Work Plan In Situ Enhanced Natural Attenuation of Petroleum Ken's Auto Wash Ellensburg, Washington

Prepared for
Ken's Auto

October 14, 2013
7168-09

HARTCROWSER

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FINAL 2011 BIOREMEDIATION WORK PLAN
IN SITU ENHANCED NATURAL ATTENUATION OF PETROLEUM
KEN'S AUTO WASH
ELLENSBURG, WASHINGTON

1.0 INTRODUCTION

This Work Plan describes the *in situ* bioremediation injection program and the sampling and analysis procedures to conduct groundwater sampling and analysis at the Ken's Auto Wash site, located at 1013 East University Way in Ellensburg, Washington (Figure 1). A draft final version of this Work Plan was originally issued on January 28, 2011. At the request of the Washington State Department of Ecology, we revised and finalized the plan to include a schedule for confirmational groundwater monitoring. The goal of this work is to accelerate biological degradation of residual gasoline-range hydrocarbon (TPH-G) in the former source area and reduce the likelihood of future groundwater concentration exceedances above the Washington State Model Toxics Control Act (MTCA) Method A cleanup levels (Chapter 173-340 WAC).

Following this introductory section that summarizes previous remedial actions and groundwater analytical results, we provide a description of Remedial Program Implementation, Groundwater Sampling and Analysis, Chemical Data Quality Review and Data Quality Assurance, and Evaluation and Reporting.

1.1 Site History and Background

The site is affected by a petroleum hydrocarbon release discovered during UST tightness testing in 1996 (Figure 2). Corrective actions were taken at that time, and the site USTs were subsequently removed in April 2005, as documented in the June 7, 2005, Gasoline UST Closure Report. Petroleum-impacted soils were removed downgradient of the UST area in October and November 2000, but a small volume of affected soil remained because of utilities at the site, as shown on Figure 2.

During the soil removal, oxygen-releasing compound (ORC) was added to the excavation backfill to promote biodegradation of residual petroleum hydrocarbons. ORC was also injected in the downgradient area of petroleum hydrocarbon-affected groundwater in February 2005, as documented in the April 6, 2005, Supplemental Strataprobe Exploration Report. Although concentrations of TPH in groundwater continued to decrease following UST removal, soil removal, and ORC injection, low-level TPH-G concentrations remain in groundwater downgradient of the residual source area.

Remedial alternatives were presented and evaluated in a Remedial Investigation and Feasibility Study (RI/FS) dated November 14, 2006. The RI/FS addressed requirements of an Agreed Order issued by the Washington State Department of Ecology (Ecology) for site cleanup assessment following an MTCA site hazard ranking of 2. Remedial technologies evaluated in the RI/FS were based on results of site investigation, soil cleanup, and monitoring efforts through 2006.

Monitored natural attenuation with free product removal was selected as the preferred remedial alternative following Ecology's review of the RI/FS. Monitored natural attenuation is a process where hydrocarbon-degrading microbes that occur naturally in subsurface soils degrade petroleum hydrocarbons. Appreciable free product has not been identified at the site since 2004, so current remedial actions have not incorporated sorbent socks to remove free product. Site monitoring continues in accordance with the selected RI/FS alternative. Ecology has not required any additional actions.

1.2 Site Groundwater Conditions

Petroleum-impacted soils remain downgradient of the former USTs beneath the adjacent sidewalk and portions of East University Way (Figure 2). This remaining source material is likely contributing to periodic exceedances of MTCA Method A cleanup criteria for TPH-G and benzene in groundwater near wells MW-14 and MW-6 (Table 1). The fluctuations in TPH-G and benzene concentrations appear to be related to seasonal groundwater level fluctuation.

1.2.1 TPH-G Testing Results Summary

The three most recent groundwater sampling and testing events were conducted in June 2008, October 2008, and October 2009. Historical data is presented in Table 1 and a brief summary of areas of interest are presented below.

- The October 2008 and 2009 groundwater samples from well MW-14 contained TPH-G concentrations of 2.04 and 2.03 milligrams per liter (mg/L), respectively. Although TPH-G was non-detect at a detection limit of 0.05 mg/L during June 2008, this was atypical for groundwater sampling results over the last five years, where TPH-G concentrations as high as 8.10 mg/L were detected.

- The June 2008, October 2008, and October 2009 samples from well MW-6 contained TPH-G at concentrations of 1.55, 0.855, and 0.501 mg/L, respectively.

For comparison, the MTCA Method A cleanup level for TPH-G in groundwater is 0.800 mg/L when benzene is present, and 1.00 mg/L when benzene is not present. Therefore, TPH-G concentrations in samples from well MW-14 exceeded the applicable MTCA Method A criteria in October 2008 and October 2009, as well as historically. The TPH-G concentration in the June 2008 sample from well MW-6 exceeded the MTCA criteria, but relatively low to non-detect benzene concentrations in October 2008 and October 2009 precluded TPH-G exceedances during these sampling events. TPH-G exceedances in MW-6 groundwater samples were common during previous sampling events.

1.2.2 Benzene Testing Results Summary

- Benzene was detected at a concentration of 4.76 micrograms per liter (ug/L) in the groundwater sample from well MW-14 in October 2008. Benzene was not detected above the 12.2 ug/L detection limit in October 2009. This reporting limit was unavoidably elevated above the 5 ug/L MTCA Method A cleanup level. Benzene was also was not detected at a detection limit of 0.5 ug/L during the June 2008 monitoring event.

- In well MW-6, benzene was detected at 1.93 ug/L in June 2008 and 3.1 ug/L in October 2008. The October 2009 benzene concentration in the MW-6 groundwater sample was non-detect at an unavoidably elevated detection limit of 7.59 ug/L.

1.3 Monitored Natural Attenuation Assessment

Natural attenuation appears to be progressing at the site within the relatively long-term time frame expected. During natural attenuation, hydrocarbon-degrading microbes oxidize and metabolize petroleum hydrocarbons using electron acceptors such as dissolved oxygen, nitrate, ferric iron, manganese, sulfate, and carbon dioxide. Groundwater monitoring data indicate that dissolved oxygen, nitrate, ferric iron, and sulfate are currently being used as electron acceptors. However, natural attenuation in the source area appears to be limited by the availability of these acceptors.

Figures 3 and 4 plot nitrate and sulfate groundwater data along the plume axis (MW-4R, MW-14, and MW-6). The plot demonstrates that nitrate and sulfate electron acceptor concentrations decline as groundwater moves through the plume. MW-4R has higher sulfate concentrations than the downgradient wells MW-14 and MW-6. MW-4R and MW-14 have higher nitrate concentrations than the downgradient well MW-6. This indicates that sulfate and nitrate are being consumed for oxidative purposes. As the gradient across the site increases because of seasonal precipitation, relative concentrations of nitrate and sulfate increase because of the influx of upgradient, naturally oxidative groundwater onto the site. As groundwater flux decrease and gradients flatten during the dry season, relative nitrate and sulfate concentration decline. This repeating trend is consistent with rate-limited desorption of TPH-G from the soil matrix and limited biological activity.

Groundwater data also suggests that much of the residual mass is located in the seasonal groundwater smear zone. Figure 5 shows the relationship between dissolved TPH-G concentrations and nitrate in MW-14, downgradient well MW-6, and groundwater elevations. Groundwater flux and the mass of incoming nitrate increases during the rainy season, as indicated in MW-14 data, but is consumed by the time groundwater reaches MW-6. At MW-6, seasonal high groundwater elevations, instead, result in higher dissolved TPH-G concentrations, an inverse relationship to that observed in the source area well (MW-14). This suggests that seasonal increases in oxidant loading through the source area are insufficient to quickly degrade the mobilized TPH-G.

As presented on Figure 6 and in Table 1, oxidative-reductive potential (ORP) values are predictably depressed around areas of residual contamination. ORP values less than -110 millivolts (mV) in MW-14 and MW-6 are consistent with sulfate reduction and methane production. These consistent ORP values in MW-14 and MW-6 area also suggest that native, bioavailable manganese and iron within the soil matrix has been converted to a reduced form. These reduced metals create additional oxidant demand in the form of reduced metal complexes such as ferrous sulfide.

Downgradient of MW-6, ORP values quickly rebound by the time groundwater reaches MW-13 and range from approximately +150 mV at the end of the rainy season to +250 mV at the end of the dry season. This abrupt shift in ORP is likely due to the seasonal infiltration of rainwater containing dissolved oxygen through the unpaved fairgrounds parking lot. This helps maintain an overall oxidized geochemistry in the vicinity of MW-13. Despite the seasonal mobilization of residual TPH-G from the source area, the contamination does not appear to represent a major threat to off-site receptors because rapid oxidation results in a highly truncated TPH-G plume.

2.0 REMEDIAL PROGRAM IMPLEMENTATION

The remedial program was formulated based on the nature of the contaminant (TPH-G), the target soil matrix (silty sand to sandy gravel with areas of gravel backfill), distribution (localized to shallow source area), and the availability of existing infrastructure (monitoring wells and air sparging pipe). The remedial program will focus on using aqeous-phase transport of supplemental electron acceptors to enhance the natural attenuation already occurring at the site.

To enhance performance of the remedial program, hydrocarbon-degrading bacteria will be introduced during the first injection to reduce the acclimation time and maximize amendment usage. Conservative tracers will be introduced at two locations during this first injection to track groundwater movement, flux, and amendment use. Electron acceptor and surfactant amendments will be introduced quarterly to sustain degradation activity. A detailed description of the amendments and injection protocols are presented below.

2.1 Amendment Descriptions

A total of five amendments will be introduced into the groundwater as part of the remedial approach: (1) sodium bromide groundwater tracer; (2) sodium chloride groundwater tracer; (3) PetroBac™, which is a combination of petroleum-degrading bacteria and surface-active agents designed to improve oxidant usage; (4) OxEA-aq™, which is a blend of natural microbial oxidants with macro- and micronutrients to enhance petroleum destruction; and (5) Ivey-sol® 103, which is a nonionic surfactant designed to improve bioremediation of TPH-G. Material Safety Data Sheets (MSDS) for these products are included in Appendix B. The five amendments are summarized below.

Tracers. Conservative groundwater tracers will be used to track groundwater flow, velocity, and effective amendment distribution. The tracers used will include sodium bromide and sodium chloride salts.

PetroBac. ETEC, LLC of Portland, Oregon, manufactures and supplies the PetroBac amendment. PetroBac is a liquid containing multiple strains of proven hydrocarbon-degrading bacteria and a biodegradable surface-active agent. PetroBac will be freshly batched by ETEC with a guaranteed active plate count of 10^8 colony-forming units per milliliter prior to injection. Fresh batching and plate count verification allows optimal activity. The biodegradable surface-active agent in PetroBac encourages the slow desorption of residual TPH-G from the soil matrix to improve petroleum degradation rates and overall oxidant consumption.

OxEA-aq. Bioremediation Specialists of Portland, Oregon, supplies the OxEA-aq amendment. OxEA-aq is a powder consisting of a highly soluble blend of nitrogen- and sulfur-based oxidants designed to enhance natural attenuation of petroleum by providing the same electron acceptors that existing site microbes are accustomed to using. The amendment also provides a diverse blend of both macro- and micronutrients to support the rapid development of these native bacteria to further enhance hydrocarbon destruction.

Ivey-sol 103. Ivey International Inc. manufacturers Ivey-sol 103 and makes it available through EnviroSupply & Service of Irvine, California. Ivey-sol 103 is a liquid consisting of a patented, biodegradable, nonionic surfactant blend that selectively desorbs gasoline-range petroleum hydrocarbons to improve bioavailability and overall oxidant consumption.

2.2 Oxidative Treatment Calculations

Recent groundwater data was used to estimate the mass of OxEA-aq required to oxide residual petroleum contamination and restore natural oxidative geochemistry at the site. The result of these calculations is presented in Table 2. Results suggest that 2,000 pounds of OxEA-aq should be sufficient to completely destroy both dissolved and adsorbed petroleum hydrocarbons as well as return the site's geochemistry from sulfate-reducing/methanogenic back to nitrate-reducing/aerobic conditions. Because of differences in contaminant distribution or amendment contact, these values only provide an estimate and actual performance will be verified with groundwater quality data and may be adjusted accordingly.

The calculation assumptions presented in Table 2 represent best professional judgment for this site given the age of the plume, remedial actions performed to date, and recent analytical data. These assumptions include:

- Generalizing a 1.5 mg/L TPH-G plume with a very low fraction of aromatics, based on available groundwater monitoring data;
- Incorporating a small concentration value for heavier diesel (0.005 mg/L) hydrocarbons because of the low percentage of aromatic TPH fractions. This captures the deviation from the normal heptane-range average for gasoline and accounts for bias toward heavier fractions commonly observed in weathered gasoline.
- Assuming dissolved hydrogen or equivalent organic acid concentrations sufficient to generate 5 mg/L of methane will be oxidized, based on ORP values; and
- Assuming that an average groundwater equivalent of 20 mg/L of sulfate, 15 mg/L of iron, and 2 mg/L of manganese will be reoxidized due to amendment addition.

As the treatment process proceeds, we will use groundwater data to assess the accuracy of these generalized assumptions. The amount of OxEA-aq being injected during the first three events will be sufficient to degrade between 200 and 1,000 pounds of petroleum. The actual mass degraded depends on how the hydrocarbons are incorporated into biomass (the species primarily responsible for oxidation) and the extent to which volatile organic compounds are generated as a degradation byproduct (instead of being completely oxidized). Subsequent injections may be modified for optimum remedy performance based on monitoring results.

2.3 Injection Protocol

The injection schedule is presented in Table 3 and is based on quarterly amendment additions. In general, all wells with recent groundwater quality measurements with ORP values lower than the surrounding aquifer ORP values will receive some level of oxidative treatment. These include wells MW-2, MW-4R, MW-5, MW-6, and MW-14 (Figure 7). MW-3 and the air sparging pipe will also be used to introduce amendments and enhance distribution based on their location along the plume axis. The estimated extent of oxidative treatment is presented on Figure 8.

All injections will be under pressure using municipal water pressure or a transfer pump. Pressures will be monitored in-line near the wellhead and will be limited to 15 pounds per square inch. This pressure has been found to preserve well seal integrity while pushing amendment into less-accessible pore spaces. Material will be conveyed to each injection location using a flexible garden hose and a secured high-pressure Furnco compression fitting. In-line valves located up-flow of the pressure gauge will be used to control flow rates and injection pressures. A flow meter will be used to monitor overall injection volumes at each location.

During the injection events, groundwater levels may also be measured in selected wells to help evaluate amendment distribution, overall rise in groundwater levels, and to indicate potential short circuiting of the injected amendments. A contingency plan is provided in Appendix A.

2.3.1 Event 1 - Initial Injection

During the initial injection event, groundwater tracers will be introduced into MW-3 and the air sparging pipe. Also during the initial injection event, PetroBac will be introduced into MW-4R, MW-6, MW-14, and the air sparging pipe since these locations are along the plume axis in areas of known contamination. The initial injection activities are described below for each injection location.

- **MW-2.** Dissolve 25 pounds of OxEA-aq in 25 gallons of municipal water to create a concentrated amendment solution and inject into the well. After the injection, chase the concentrated solution with municipal water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate to maximize amendment distribution away from the injection location and into the surrounding formation.

- **MW-3.** The order of amendment addition to well MW-3 is tracer, chase water, OxEA-aq, and chase water. Dissolve 25 pounds of sodium chloride in 25 gallons of municipal water and inject into the well. After the tracer injection, add 25 gallons of municipal water to chase and distribute the tracer into the formation. Dissolve 250 pounds of OxEA-aq in 250 gallons of municipal water and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

- **MW-4R.** The order of amendment addition to well MW-4R is PetroBac, OxEA-aq, and chase water. Dilute PetroBac in municipal water to 5 percent strength or 5 gallons of PetroBac per 100 gallons of municipal water, and inject into the well. Dissolve 250 pounds of OxEA-aq in 250 gallons of municipal water and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

- **MW-5.** Dissolve 25 pounds of OxEA-aq in 25 gallons of municipal water and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

- **MW-6.** The order of amendment addition to well MW-6 is PetroBac, OxEA-aq, and chase water. Dilute PetroBac in municipal water to 5 percent strength, or 5 gallons of PetroBac per 100 gallons of water, and inject into the well. Dissolve 50 pounds of OxEA-aq in 50 gallons of municipal water and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

- **MW-14.** The order of amendment addition to well MW-14 is PetroBac, OxEA-aq, and chase water. Dilute PetroBac in municipal water to 5 percent strength, or 5 gallons of PetroBac per 100 gallons of water, and inject into the well. Dissolve 200 pounds of OxEA-aq in 200 gallons of municipal water and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

- **Air Sparging Pipe.** The order of amendment addition to the air sparging pipe is tracer, chase water, PetroBac, OxEA-aq, and chase water. Dissolve 25 pounds of sodium bromide in 25 gallons of municipal water and inject into the well. After the tracer injection, add 25 gallons of chase water to distribute the tracer into the formation. Dilute PetroBac in municipal water to 5 percent strength, or 10 gallons of PetroBac per 200 gallons of water, and inject into the well. Dissolve 250 pounds of OxEA-aq in 250 gallons of municipal water and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

2.3.2 Events 2 Though 4 - Quarterly Injections

During the quarterly injections, the amount of OxEA-aq and Ivey-sol 103 vary each quarter. Please refer to the injection schedule (Table 3) for the rate and frequency of the amendments. The quarterly injection activities are summarized below for each injection location.

- **MW-2.** No injections are scheduled for Events 2 through 4.

- **MW-3.** Dissolve the required amount of OxEA-aq in municipal water (at a concentration of 1 pound of amendment to 1 gallon of water) and inject into the well. After the injection, add chase water at a rate of 9 gallons of water per 1 gallon OxEA-aq concentrate.

- **MW-4R.** Dissolve the required amount of OxEA-aq in municipal water (at a concentration of 1 pound of amendment to 1 gallon of water). Then add Ivey-sol 103 to the OxEA-aq concentrated amendment solution. To achieve the manufacturer recommended application strength, add Ivey-sol 103 at a rate of 0.4 gallons per 50 pounds of OxEA-aq in 50 gallons of municipal water. Inject the solution into the well and then chase with municipal water at a rate of 1 part concentrate per 9 gallons of chase water.

- **MW-5.** No injections are scheduled for Events 2 through 4.

- **MW-6.** Dissolve the required amount of OxEA-aq in municipal water (at a concentration of 1 pound of amendment to 1 gallon of water). Then add the required amount of Ivey-sol 103 to the OxEA-aq concentrated amendment solution. Inject the solution into the well and then chase with municipal water at a rate of 1 part concentrate per 9 gallons of chase water. Note that no injections are scheduled for Event 3.

- **MW-14.** Dissolve the required amount of OxEA-aq in municipal water (at a concentration of 1 pound of amendment to 1 gallon of water). Then add the required amount of Ivey-sol 103 to the OxEA-aq concentrated amendment solution. Inject the solution into the well and then chase with municipal water at a rate of 1 part concentrate per 9 gallons of chase water.

- **Air Sparging Pipe.** Dissolve the required amount of OxEA-aq in municipal water (at a concentration of 1 pound of amendment to 1 gallon of water). Then add the required amount of Ivey-sol 103 to the OxEA-aq concentrated amendment solution. Inject the solution into the well and then chase with municipal water at a rate of 1 part concentrate per 9 gallons of chase water.

3.0 GROUNDWATER SAMPLING AND ANALYSIS

The monitoring schedule is presented in Table 4. Routine annual sampling was done in November 2010 and will be repeated in October 2011 for all monitoring wells. The October 2011 samples will be collected following the third injection event and will be used to assess oxidative treatment success.

Additional quarterly monitoring of wells MW-3, MW-4R, MW-6, MW-13, and MW-14 is needed to further evaluate treatment progress as the remedial program is implemented. Quarterly groundwater sampling and analysis before and during the quarterly injections is required to: (1) establish groundwater concentration of constituents over the course of seasonal groundwater changes; (2) determine the progress of the treatments; and (3) aid in any necessary adjustments as the injection program proceeds. An additional post-injection quarterly groundwater sampling and analysis event (Event 4) is scheduled to determine constituent concentrations for compliance monitoring. Additional groundwater sampling and analysis for compliance monitoring will be required to determine if petroleum concentrations in Site groundwater are below MTCA Method A groundwater cleanup levels. The scope and schedule for these post-injection compliance monitoring events are summarized in Table 5.

3.1 Groundwater Sampling Procedures

This section describes the procedure to be used for groundwater sampling at the site. Water levels will be measured in all wells before each sampling and/or injection event. Wells will be purged and sampled using low-flow groundwater sampling techniques. Purging and sampling will be conducted at a depth representing the middle of the screened interval of each well.

3.1.1 Sampling Equipment

Equipment used to collect groundwater samples includes:

- Horiba U-22 or equivalent water parameter instrument to collect pH, ORP, turbidity, dissolved oxygen, specific conductivity, and temperature measurements;

- Solinst or equivalent water level indicator;
- Peristaltic pump with disposable polyethylene tubing;
- Laboratory-supplied, pre-cleaned sample containers;
- Coolers with blue ice; and
- Hart Crowser Sample Custody Record and Groundwater Sampling Data forms.

3.1.2 Low-Flow Sampling

Upon arrival at the wellhead, field personnel record well conditions, depth to water, and depth to sediment in the well. Consistent with prior monitoring techniques and to minimize turbidity, low-flow purging methods are employed. Typical target flow rates range from 0.2 to 0.5 L/min. The wells will be purged and sampled with a peristaltic pump. Clean sample tubing is used for each well and disposed of after use.

The field parameters of pH, temperature, specific conductivity, dissolved oxygen, turbidity, and ORP will be measured and recorded periodically during well purging. Once the field parameters remain stable between measurements, groundwater samples will be collected by directly filling the laboratory-provided sample containers.

Blind field duplicate samples will be collected for the annual groundwater sampling events only and at a frequency of one duplicate for every 20 samples.

3.1.3 Field and Laboratory Analysis

During the annual groundwater sampling events, field kit sampling for ferrous iron will be performed on all monitoring wells. During the quarterly groundwater sampling events, field kit sampling for ferrous iron and nitrate will be performed on the five monitoring wells MW-3, MW-4R, MW-6, MW-13, and MW-14.

The groundwater sample containers will be placed in insulated coolers with blue ice. Samples will be transferred under chain of custody procedures to Analytical Resources Inc. in Tukwila, Washington, for laboratory analysis. Groundwater samples will be analyzed for the following analytes:

- TPH-G by Ecology Method NWTPH-Gx;
- Benzene, toluene, ethylbenzene, and xylene (BTEX) by EPA Method 8021B; and
- Nitrate, sulfate, chloride, and bromide by EPA Method 300.0.

3.1.4 Decontamination

All dedicated tubing will be disposed of after sampling. The only nondedicated equipment that will go down the well or come into contact with groundwater and require decontamination is the water level indicator. Decontamination will consist of washing with a detergent solution of Liquinox (or similar) in tap water, followed by a tap water rinse and a distilled water rinse.

3.1.5 Investigation-Derived Waste

Investigation-derived waste (IDW) includes wastewater from well purging and decontamination and used personal protective equipment (PPE), tubing and other solid materials. Wastewater will be temporarily stored on site in sealed, labeled drums. Analytical results from laboratory testing will be used for disposal characterization. Hart Crowser will coordinate off-site transport and disposal of wastewater by a qualified waste handling firm. PPE and other solid wastes will be removed from the site by sampling personnel and placed in a normal refuse container for disposal at a municipal solid waste landfill in accordance with applicable laws.

4.0 CHEMICAL DATA QUALITY REVIEW AND DATA QUALITY ASSURANCE

Data quality will be assessed by the contract laboratory and Hart Crowser to confirm that results meet quality control criteria. Hart Crowser's data review will include the following criteria to evaluate acceptability:

- Sample handling, holding times, and chain of custody;
- Accuracy as evaluated by:
    - Laboratory method blanks;
    - Matrix spike recovery;
    - Laboratory control sample recovery;
- Precision as evaluated by laboratory and field duplicate relative percent differences (RPD); and
- Data completeness.

Data qualifiers may be defined and reported by the laboratory to more completely explain quality control concerns regarding individual sample results. Data qualifiers will be defined in the laboratory's narrative reports associated with each case. Data qualifier flags, beyond any applied by the laboratory, will also be added by Hart Crowser if sample results fall outside acceptance criteria. Using results of the chemical data quality review, Hart Crowser will determine the acceptability of the data for project use.

4.1 Corrective Actions

If data review by the laboratory or Hart Crowser indicates unacceptable conditions or data (e.g., exceeding holding times, insufficient or inaccurate methods, improper equipment calibration, or other potential field or laboratory deviations from this Work Plan), actions specified in the laboratory SOPs will be taken. Corrective actions may include but are not limited to the following:

- Identifying the source of the violation;
- Reanalyzing samples if holding-time criteria permit;
- Resampling and analyzing;
- Evaluating and amending sampling and analytical procedures; and/or
- Accepting data and flagging it to indicate the level of uncertainty.

If unacceptable conditions occur, the laboratory will contact Hart Crowser to discuss the issues and determine the appropriate corrective action. Any corrective actions taken by the laboratory during sample analysis for this project will be documented by the laboratory in the case narrative associated with the impacted samples.

4.2 Sample Quality Assurance/Quality Control Samples

Field duplicates will be collected for QA/QC during the annual groundwater sampling event. The laboratory will supply trip blanks for those coolers transporting samples destined for volatile fraction analysis during the annual and quarterly groundwater sampling events.

4.2.1 Field Duplicate Samples

Field duplicate samples are used to assess combined field, sampling, and laboratory technique variability. For the annual groundwater sampling events only, one field duplicate will be collected for every 20 groundwater samples collected. The well location selected for a duplicate sample is MW-6. On the chain of custody, the duplicate sample will be designated as MW-KA. The collection time recorded for the duplicate will be one half hour past the actual time the sample was collected. The field duplicate will be analyzed for the same constituents as MW-6.

4.2.2 Trip Blanks

Trip blanks are used to monitor sample cross-contamination during shipment. One trip blank set will be placed in each cooler containing groundwater samples to be analyzed for NWTPH-Gx/BTEX. Sample identifiers for trip blanks will be assigned by the laboratory. Trip blanks will be submitted to the laboratory for NWTPH-Gx/BTEX analysis only.

5.0 EVALUATION AND REPORTING

Data collected during the injection events may be used to modify the program, depending on site-specific conditions. The data will assist with determining if the fourth amendment injection is necessary to achieve remedial goals.

We will prepare a report summarizing results of the remedial program after the Event 4 post-injection groundwater sampling event. The report will include the sample analytical results, groundwater quality data tables, and figures. The report will compare the constituents of concern, migration pathways, and receptors with the appropriate MTCA Method A cleanup levels. We will also provide recommendations for future remedial actions, as necessary. A draft report will be submitted to Ken Peterson, Steve Lathrop, and Sergio Honl at AIG for review and comments. Following incorporation of review comments and document edits, we will submit a revised report to Ecology.

Additionally, annual reports for the groundwater compliance monitoring will be required per the upcoming Agreed Order with Ecology. Therefore, we will prepare and submit these annual reports to Ken Peterson, Steve Lathrop, and Sergio Honl at AIG for review and comments prior to submitting to Ecology.

6.0 SCHEDULE

We expect to begin the field work after receiving approval from Ecology's UIC program. We submitted the UIC registration letter to Ecology on November 12, 2010. We will also submit this Work Plan to Ecology for their review. UIC registration could take 60 days or more after submitting the application to Ecology, depending on Ecology's level of review. For planning purposes, we propose to begin the initial injection event in January 2011. We expect the technical report to be completed three to four weeks after we have received the post-injection laboratory report.

Groundwater compliance monitoring will begin after the post-injection report has been submitted to Ecology. We expect the annual compliance monitoring reports will be completed three to four weeks after we have received laboratory reports for the last scheduled monitoring events for each year (annual fall events).

7.0 LIMITATIONS

Work for this project was performed, and this work plan prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of Ken's Auto Wash for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made. If you have any questions regarding this letter, please feel free to contact us.

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Table 1 - Summary of Groundwater Quality
Ken's Auto Wash
Ellensburg, Washington

		Millivolts	Concentration in mg/L		Concentration in µg/L						
Well ID	Date Sampled	ORP	Nitrate	Sulfate	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-1	4/8/1996	NR	--	--	**160,000**	**2,500**	**19,000**	**3,000**	**21,000**	**65**	--
	1/5/1998	NR	--	--	--	--	--	--	--	--	--
	4/6/1998	NR	--	--	**100,000**	**180**	260	**940**	**9,800**	**180**	--
	7/6/1998	NR	--	--	**93,000**	**110**	200	**760**	**8,800**	**220**	--
	10/5/1998	NR	--	--	--	--	--	--	--	--	--
	12/29/1999	NR	--	--	**21,600**	**87.4**	47.7	657	**3,900**	--	**21.3**
	3/21/2000	NR	--	--	**19,800**	**94.1**	59.6	479	**2,710**	--	**16.5**
	6/14/2000	NR	--	--	**18,800**	**94.9**	26.4	471	**2,870**	--	8
	9/12/2000	NR	--	--	**21,400**	**111**	35.1	496	**2,930**	--	6.54
MW-14 (Replaces MW-1)	1/30/2001	NR	--	--	**7,450**	**19.3**	14	424	673	--	--
	4/26/2001	NR	--	--	**26,100**	**37.2**	29.7	580	**2,680**	--	--
	7/29/2001	NR	--	--	**14,200**	**10.3**	14.2	318	**1,480**	--	--
	10/27/2001	NR	--	--	**9,970**	**46.4**	4.55	187	707	--	--
	11/15/2002	NR	--	--	**8,380**	**11**	2.5 U	122	357	--	--
	5/9/2003	NR	--	--	**4,520**	2.62	0.5 U	0.775	172	5.33	--
	9/30/2003	NR	0.349	0.40 U	**6,230** J	**11.7** J	1.61 J	151 J	369 J	4.56	--
	12/11/2003	NR	0.200 U	1.14	**5,890**	**12.6**	5.0 U	5.0 U	271	12.4	--
	3/31/2004	NR	0.200 U	1.08	**6,270**	**12.6**	5 U	80.4	168.4	4.85	--
	6/2/2004	NR	0.200 U	4.24	**3,790** J	2.36 J	0.5 U	26.9 J	88.1 J	4.12	--
	9/30/2004	NR	0.200 U	0.64	**5,700** J	**5.52**	2.5 U	82.1	256	4.29	--
	12/14/2004	NR	0.200 U	0.40 U	**5,500** J	4.36	0.643	66.1	178	--	--
	4/4/2005	NR	0.200 U	0.46	**8,100** J	**6.89**	0.746	75.8	221	--	--
	10/6/2005	NR	0.200 U	0.40 U	**4,070** J	**7.85**	0.5 U	43.1	62.8	3.7	--
	6/28/2006	NR	0.556	13.4	533	0.545	0.5 U	0.593	5.34	3.41	--
	11/13/2006	24	0.200 U	1.40	496	0.933	0.5 U	6.89	5.99	3.03	--
	5/25/2007	148	3.12	12.2	54	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	-125	0.010 U	0.90	**3,050**	**7.6**	2.58	28.1	20	2.31	--
	6/4/2008	39	1.87	9.97	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	-113	0.200 U	0.68	**2,040**	4.76	0.5 U	16.6	15.1	1.85	--
	10/14/2009	-106	0.900 UJ	1.20 U	**2,030**	12.2 U	0.844 U	18.9	33.8	2 U	--
MW-2	4/8/1996	NR	--	--	50 U	1 U	1 U	1 U	1 U	5 U	--
	1/5/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	15	5 U
	4/6/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	5 U	--
	7/6/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	**21**	--
	10/5/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	**34**	--
	12/29/1999	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	3/21/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	6/14/2000	NR	--	--	50 U	0.5 U	0.5 U	0.55	3.41	--	1 U
	9/12/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	1/30/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/26/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	NR	0.489	3.38	50 U	0.5 U	0.5 U	0.5 U	1 U	2.61	--
	12/11/2003	NR	1.080	3.79	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	NR	0.912	4.60	**13,000**	10 U	119	180	**2,541** J	1 U	--
	6/2/2004	NR	0.467	3.23	**1,480**	2.10	0.5 U	0.5 U	11.0	1 U	--
	9/30/2004	NR	0.443	2.93	**1,290** J	2.40	0.5 U	0.859	5.11	1 U	--
	12/14/2004	NR	0.922	3.05	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	NR	0.719	3.52	101	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	NR	0.219	3.75	160	0.741	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	NR	--	--	--	--	--	--	--	--	--
	11/13/2006	230	0.410	5.26	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	162	2.740	8.57	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	15	0.275	4.32	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	27	1.440	6.14	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	-9	0.200 U	3.21	50 U	0.5 U	0.5 U	0.5 U	1 U	**20.8**	--
	10/14/2009	163	0.900 U	6.50	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--

Table 1 - Summary of Groundwater Quality
Ken's Auto Wash
Ellensburg, Washington

		Millivolts	Concentration in mg/L		Concentration in µg/L						
Well ID	Date Sampled	ORP	Nitrate	Sulfate	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-3	4/8/1996	NR	--	--	50 U	1 U	1 U	1 U	1 U	5 U	--
	1/5/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	5 U	--
	4/6/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	5 U	--
	7/6/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	5 U	--
	10/5/1998	NR	--	--	50 U	1 U	1 U	1 U	1 U	3.8	--
	12/29/1999	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	3/21/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	6/14/2000	NR	--	--	50 U	0.5 U	0.85	0.5 U	1 U	--	1 U
	9/12/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	1/30/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/26/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	NR	0.228	4.39	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/11/2003	NR	0.200 U	4.79	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	NR	0.812	5.53	50 U	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	NR	0.816	5.61	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2004	NR	0.253	4.43	50 UJ	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	NR	0.206	4.69	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	NR	0.358	4.23	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	NR	0.200 U	3.67	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	NR	--	--	--	--	--	--	--	--	--
	11/13/2006	304	0.370	6.1	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	149	1.520	6.43	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/8/2007	251	0.168	4.13	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	37	0.920	4.59	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	28	0.250	3.84	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/14/2009	68	0.90 UJ	3.20	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
MW-4	1/5/1998	NR	--	--	200	1 U	27	1	3	10	5 U
	4/6/1998	NR	--	--	400	3	14	1	6	5 U	--
	7/6/1998	NR	--	--	50 U	1 U	3	1 U	1 U	5 U	--
	10/5/1998	NR	--	--	150	1 U	7	1 U	1 U	2	--
	12/29/1999	NR	--	--	301	**51.4**	32.5	0.5 U	6.08	--	1 U
	3/21/2000	NR	--	--	414	**44.8**	28.2	1.92	3.2 U	--	1 U
	6/14/2000	NR	--	--	439	**69.7**	4.91	2.01	6.8	--	1 U
	9/12/2000	NR	--	--	101	4.49	0.5 U	0.5 U	0.5 U	--	1 U
MW-4R (Replaces MW-4)	1/31/2001	NR	--	--	182	2.22	1.17 U	0.5 U	1.33 U	--	--
	4/26/2001	NR	--	--	673	**8.79**	4.73	4.28	28.6	--	--
	7/29/2001	NR	--	--	402	**24.3**	16.3	2.84	14.8	--	--
	10/27/2001	NR	--	--	200	**24.9**	2.62	1.15	6.57	--	--
	11/15/2002	NR	--	--	75.6	0.858	0.5 U	0.5 U	1 U	--	--
	5/9/2003	NR	--	--	61.8	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	NR	0.200 U	4.57	161	0.730	0.5 U	2.59	2.59	1 U	--
	12/11/2003	NR	1.05	15.3	50 U	0.5 U	0.5 U	0.5 U	1 U	3.22	--
	3/31/2004	NR	0.200 U	7.41	267	**29.0**	1.43	1 U	2.94	1 U	--
	6/2/2004	NR	0.200 U	8.32	140	**46.4**	4.2	0.5 U	1 U	1 U	--
	9/30/2004	NR	0.200 U	4.91	88.7 J	0.5 U	0.5 U	1.83	1 U	1 U	--
	12/14/2004	NR	0.200 U	5.13	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	NR	0.200 U	5.79	112	1.93	0.5 U	0.5 U	1 U	--	--
	10/6/2005	NR	0.200 U	8.07	744	0.929	0.5 U	9.31	3.57	19	--
	6/28/2006	NR	0.200 U	16.0	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	11/13/2006	50	0.200 U	16.2	107	0.5 U	0.5 U	0.5 U	1 U	5.82	--
	5/25/2007	40	2.290	17.6	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	-46	0.031	10.3	75.2	0.5 U	0.5 U	0.5 U	1 U	0.325	--
	6/4/2008	-59	2.030	14.1	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/21/2008	-54	0.200 U	6.52	50 U	0.5 U	0.5 U	0.5 U	1 U	6.98	--
	10/14/2009	100	0.90 UJ	5.90	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--

Table 1 - Summary of Groundwater Quality
Ken's Auto Wash
Ellensburg, Washington

		Millivolts	Concentration in mg/L				Concentration in µg/L													
Well ID	Date Sampled	ORP	Nitrate		Sulfate		TPH-Gasoline		Benzene		Toluene		Ethyl-benzene		Total Xylenes		Total Lead		Diss. Lead	
MW-5	1/5/1998	NR	--		--		**6200**		1		57		3		160		5	U	--	
	4/6/1998	NR	--		--		**2800**		2		30		2		27		5	U	--	
	7/6/1998	NR	--		--		50	U	1	U	1	U	1	U	1	U	10		--	
	10/5/1998	NR	--		--		**4700**		2		39		16		94		7.4		--	
	12/29/1999	NR	--		--		779		2.96		0.69		9.03		27.4		--		1	U
	3/21/2000	NR	--		--		519		0.5	U	13.9		4.95		3.6		--		1	U
	6/14/2000	NR	--		--		708		3.45	U	1.17	U	1.08		1	U	--		1	U
	9/12/2000	NR	--		--		50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	4/26/2001	NR	--		--		**831**		**7.35**		0.516		15.3		1	U	--		--	
	7/29/2001	NR	--		--		53.8		0.5	U	0.5	U	0.5	U	1	U	--		--	
	10/27/2001	NR	--		--		552		3.29		0.5	U	1.28		1.58		--		--	
	11/15/2002	NR	--		--		108		0.5	U	0.5	U	0.5	U	0.5	U	--		--	
	5/9/2003	NR	--		--		78.7		0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	9/30/2003	NR	0.200	U	8.61		229		0.5	U	0.5	U	0.5	U	1.61		1	U	--	
	12/11/2003	NR	0.200	U	6.85		50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	3/31/2004	NR	1.32		16.1		53		0.2	U	0.2	U	0.2	U	0.5	U	1	U	--	
	6/2/2004	NR	1.36		11.7		92.8		0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	12/14/2004	NR	0.200	U	7.57		308		0.5	U	0.5	U	0.5	U	1	U	--		--	
	4/4/2005	NR	0.200	U	9.92		620		1.45		0.5	U	0.5	U	1.07		--		--	
	10/6/2005	NR	0.200	U	9.50		114		0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/28/2006	NR	2.59		16.0		50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	11/13/2006	279	2.99		11.7		50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	5/25/2007	169	3.400		19.9		50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	11/7/2007	199	0.110		7.75		50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	6/4/2008	52	1.730		11.8		50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/22/2008	91	0.220		6.35		50	U	0.5	U	0.5	U	0.5	U	1	U	1	U	--	
	10/15/2009	239	0.90	U	5.20		80	U	0.5	U	0.5	U	0.5	U	1	U	2	U	--	
MW-6	1/5/1998	NR	--		--		**2,200**		**53**		17		9		93		5	U	--	
	4/6/1998	NR	--		--		**4,200**		**51**		16		25		110		5	U	--	
	7/6/1998	NR	--		--		**6,900**		**11**		19		1		510		11		--	
	10/5/1998	NR	--		--		**5,800**		**43**		22		48		240		12		--	
	12/29/1999	NR	--		--		**2,090**		**11.5**		2		35.1		65.1		--		1	U
	3/21/2000	NR	--		--		**1,580**		0.75	U	14.3		28.7		61		--		1	U
	6/14/2000	NR	--		--		**2,170**		**9.78**		1.03	U	33.1		101		--		1	U
	9/12/2000	NR	--		--		**1,630**		**12.8**		1.2	U	27.9		75.7		--		1	U
	4/26/2001	NR	--		--		**1,320**		**11.3**		0.906		1.41		3.37		--		--	
	7/29/2001	NR	--		--		**5,050**		**8.71**		4.99		189		536		--		--	
	10/27/2001	NR	--		--		**1,910**		**15.3**		0.786		1.67		5.49		--		--	
	11/15/2002	NR	--		--		**1,270**		**9.01**		0.5	U	0.594		1.85		--		--	
	5/9/2003	NR	--		--		**1,710**		1.79		0.5	U	1.29		21.2		1.29		--	
	9/30/2003	NR	0.200	U	0.400	U	**1,610**		**16.7**		2.50	U	2.91		7.96		1	U	--	
	12/11/2003	NR	0.200	U	0.685		624		**5.67**		0.50	U	0.737	J	2.19	J	1	U	--	
	3/31/2004	NR	0.200	U	3.02		**1,160**		0.520		0.2	U	0.350		0.5	U	1	U	--	
	6/2/2004	NR	0.200	U	0.557		**2,300**	J	4.78	J	0.5	U	54.0	J	75.5	J	1.29		--	
	9/30/2004	NR	0.200	U	0.400	U	**1,150**	J	**8.34**	J	0.5	J	0.553	J	2.92	J	1	U	--	
	12/14/2004	NR	0.200	U	0.400	U	672		3.57		0.5	U	0.5	U	1.42		--		--	
	4/4/2005[b]	NR	0.200	U	3.19		**1,010**		**5.91**		0.5	U	0.5	U	1.86[c]		--		--	
	10/6/2005	NR	0.200	U	3.17		**1,380**	J	**8.10**		0.5	U	0.632		1.94		1	U	--	
	6/28/2006	NR	2.6		18.6		--		--		--		--		--		--		--	
	11/13/2006	-4	0.200	U	1.11		**826**		3.3		0.5	U	0.5	U	1.89		1	U	--	
	5/25/2007	-92	0.200	U	2.67		**1460**		0.5	U	0.5	U	25.6		1.22		--		--	
	11/7/2007	-77	0.010	U	2.24		729		3.53		0.5	U	0.5	U	1.69		1	U	--	
	6/4/2008	-118	0.200	U	3.68		**1550**		1.93		0.5	U	30.8		2.78		1	U	--	
	10/22/2008	-118	0.200	U	0.40	U	**855**		3.1		0.5	U	0.933		3.37		1	U	--	
	10/14/2009	-102	0.90	UJ	1.2	U	501		7.59	U	0.5	U	1.18	U	1	U	2	U	--	
MW-12	12/29/1999	NR	--		--		50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	3/21/2000	NR	--		--		50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	6/14/2000	NR	--		--		50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	9/12/2000	NR	--		--		50	U	0.5	U	0.5	U	0.5	U	1	U	--		1	U
	4/26/2001	NR	--		--		50	U	0.5	U	0.5	U	0.5	U	1	U	--		--	
	7/29/2001	NR	--		--		50	U	0.5	U	0.5	U	1.74		4.83		--		--	

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		Millivolts	Concentration in mg/L		Concentration in µg/L						
Well ID	Date Sampled	ORP	Nitrate	Sulfate	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-12 (cont.)	10/27/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	NR	0.452	5.32	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/11/2003	NR	0.200 U	2.77	50 U	0.5 U	0.5 U	0.5 U	1 U	1.47	--
	3/31/2004	NR	3.88	8.45	50 U	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	NR	3.64	11.7	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2004	NR	0.573	5.66	50 UJ	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	NR	0.200 U	2.95	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	NR	0.200 U	3.32	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/12/2005	NR	0.200 U	3.37	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	NR	2.57	11.5	50 U	0.5 U	0.5 U	0.5 U	1 U	2.98	--
	11/13/2006	299	0.590	6.89	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	183	7.140	18.4	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/8/2007	168	0.121	11.5	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	108	6.020	16.4	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/22/2008	69	0.330	10.1	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/14/2009	75	0.90 UJ	5.20	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
MW-13	12/29/99	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	3/21/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	6/14/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	9/12/2000	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	1 U
	4/26/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	9/30/2003	NR	0.455	4.91	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/11/2003	NR	0.477	5.56	50 U	0.5 U	0.5 U	0.5 U	1 U	1.56	--
	3/31/2004	NR	1.60	8.04	50 U	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	NR	1.05	6.52	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2004	NR	0.496	4.49	50 UJ	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	NR	0.412	5.10	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	NR	0.582	4.99	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	NR	0.348	3.68	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	NR	--	--	--	--	--	--	--	--	--
	11/13/2006	270	0.940	6.18	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	175	1.670	7.57	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/8/2007	254	0.490	4.09	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/4/2008	110	1.280	5.51	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/22/2008	219	0.440	3.56	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	10/15/2009	231	0.90 U	3.3	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
MW-15	1/30/2001	NR	--	--	161	1.53	0.5 U	0.5 U	1.18 U	--	--
	4/26/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	7/29/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/27/2001	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/15/2002	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	5/9/2003	NR	--	--	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2003	NR	0.282	5.02	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/11/2003	NR	0.415	8.52	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	3/31/2004	NR	0.200 U	8.42	50 U	0.2 U	0.2 U	0.2 U	0.5 U	1 U	--
	6/2/2004	NR	1.67	8.32	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	9/30/2004	NR	0.429	4.56	50 UJ	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	12/14/2004	NR	0.200 U	6.68	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	4/4/2005	NR	0.200 U	7.45	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	10/6/2005	NR	0.340	4.14	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/28/2006	NR	--	--	--	--	--	--	--	--	--
	11/13/2006	229	0.450	6.48	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	5/25/2007	113	3.070	10.4	50 U	0.5 U	0.5 U	0.5 U	1 U	--	--
	11/7/2007	435	0.220	5.21	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
	6/5/2008	109	2.010	8.02	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--

Table 1 - Summary of Groundwater Quality
Ken's Auto Wash
Ellensburg, Washington

		Millivolts	Concentration in mg/L		Concentration in µg/L						
Well ID	Date Sampled	ORP	Nitrate	Sulfate	TPH-Gasoline	Benzene	Toluene	Ethyl-benzene	Total Xylenes	Total Lead	Diss. Lead
MW-15	10/22/2008	86	0.280	3.81	50 U	0.5 U	0.5 U	0.5 U	1 U	1 U	--
(cont.)	10/14/2009	160	0.90 UJ	3.1	80 U	0.5 U	0.5 U	0.5 U	1 U	2 U	--
MTCA Method A Groundwater Cleanup Level					800/1,000 [a]	5	1000	700	1000	15	15

Notes:

TPH-G analyzed by EPA Method 8015 prior to 1999. After that, TPH-G was analyzed by NWTPH-G; BTEX Analyzed by EPA Method 8021B, except in March 2004 where BTEX was analyzed by EPA Method 8260B.

Total and Dissolved Lead analyzed by EPA Method 6010 or 6020.

ORP = Oxidative-reductive potential.

mg/L = Milligrams per liter.

µg/L = Micrograms per liter.

-- Not analyzed.

U = Not detected at specified reporting limit.

J = Estimated concentration.

R = Rejected concentration.

ND = Not detected.

NR = Not reported.

Bolded concentrations exceed MTCA Method A cleanup levels.

Access to well MW-13 obstructed in November 2002 and May 2003.

Access to well MW-5 obstructed in September 2004.

Data from 1996 and 1998 collected by Sage Environmental.

Well MW-1 was removed during the October 2000 excavation. Wells MW-14 and MW-15 were installed in January 2001 after the excavation.

Well MW-4 was replaced as well MW-4R by Hart Crowser in October 2005, following removal of the well during UST removal activities in April 2005.

Dashed line indicates date of excavation.

a) Cleanup level for TPH-G with/without detectable benzene.

b) Values shown are the average of the results for the sample and its field duplicate.

c) The value is the result for the field duplicate. The result for the sample was ND (not detected at the detection limit of 1.0 µg/L).

Table 2 - Hydrogen Balance Calculations
Ken's Auto Wash
Ellensburg, Washington

Treatment Target Area Specifications	
Vertical Treatment (ft)	10
Treatment Width (ft)	80
Treatment Length (ft)	400
Effective Porosity	0.25
Foc	0.010

Treatment Area Pore Volume	2,264,000 L	597,361 Gallons

Hydrogen/Electron Donor Availability				
Constituent	**Groundwater Concentration (mg/L)**	**Molecular Weight (g/mol)**	**Moles of H_2 to Oxidize / Mole Analyte**	**Moles of H_2 Donor In Treatment Area**
Native Electron Donors				
Groundwater TPH-G	1.5	100	22	*747*
Approximate % Aromatic	1%			
Estimated Total Soil and GW TPH-G				3,896
Groundwater TPH-Dx	0.005	226	49	*2*
Estimated Total Soil and GW TPH-Dx				13,011
Estimated Moles of Petroleum Hydrogen Donor Available				**16,907**

Hydrogen/Electron Acceptors				
Constituent	**Groundwater Concentration (mg/L)**	**Molecular Weight (g/mol)**	**Moles of H_2 to Reduce Mole Analyte**	**Moles of H_2 Acceptor In Treatment Area**
Native Electron Acceptors				
Sulfate	-20.0	96.1	4	-1,885
Fe^{+2} Formation from Fe^{+3}	-15.0	55.8	0.5	-304
Mn^{+2} Formation from Mn^{+4}	-2.0	54.9	1	-82
Methane Formation	-5.0	16	4	-2,830
			Native Hydrogen Acceptor Subtotal	-5,101
Added Oxidative Amendment	**Added Amenment Mass (lbs.)**		**Moles H_2/lb.**	
OxEA-aq™	2,000		10.6	21,160
			Added Hydrogen Acceptor Subtotal	21,160
			Estimated Moles of Hydrogen Acceptor:	**16,059**
Estimated Oxidative Treatment Progress Based on Design Assumptions:				**95%**

Notes:

L = liters; gal = gallons; Fe = iron; Mn = manganese; 1ft^3 = 7.48 gals = 28.3L; 3.79L = 1 gal.

Negative values in Native Electron Acceptors indicates formation/reoxidation of reduced atomic forms within the treated plume.

Physical constants per Oregon DEQ Risk-Based Decision Making Guidance.

Electron and hydrogen equivalents per Principles and Practices of Enhanced Anaerobic Bioremediation of Chlorinated Solvents, Air Force Center for Environmental Excellence (August 2004) and Bioremediation Specialists product data for OxEA-aq.

OxEA-aq is a blend of oxidants with macro- and micronutrients to improve amendment use.

ft = feet; L = liters; mg/L = milligrams per liter; gal = gallons; H_2 = molecular hydrogen equivalents.

Table 3 - Enhanced Bioremediation Injection Schedule
Ken's Auto Wash
Ellensburg, Washington

Injection Location	Event 1 January 2011			Event 2 April 2011		Event 3 July 2011		**3-Event OxEA-aq Subtotal**	Event 4 October 2011		**4-Event OxEA-aq Total**
	OxEA-aq	PetroBac	Tracer	OxEA-aq	Ivey-sol	OxEA-aq	Ivey-sol		OxEA-aq	Ivey-sol	
MW-2	25 lbs							**25 lbs**			**25** lbs
MW-3	250 lbs		Cl 25 lbs	200 lbs		150 lbs		**600 lbs**	250 lbs		**850** lbs
MW-4R	250 lbs	5 gal		125 lbs	1.0 gal	25 lbs	0.2 gal	**400 lbs**	200 lbs	1.60 gal	**600** lbs
MW-5	25 lbs							**25 lbs**			**25** lbs
MW-6	50 lbs	5 gal		25 lbs	0.2 gal			**75 lbs**	25 lbs	0.20 gal	**100** lbs
MW-14	200 lbs	5 gal		100 lbs	0.8 gal	25 lbs	0.2 gal	**325 lbs**	75 lbs	0.60 gal	**400** lbs
Sparge	250 lbs	10 gal	Br 25 lbs	200 lbs	1.6 gal	100 lbs	0.8 gal	**550 lbs**	250 lbs	2.00 gal	**800** lbs
Event Total	1,050 lbs	25 gal	50 lbs	650 lbs	3.6 gal	300 lbs	1.2 gal	**2,000 lbs**	800 lbs	4.40 gal	**2,800** lbs

Notes:

PetroBac contains biodegradable surface-active agents and petroleum-degrading microbes to enhance amendment consumption and petroleum destruction.

OxEA-aq is a soluble blend of oxidants with macro- and micronutrients to enhance petroleum degradation.

Ivey-sol is a biodegradable, nonionic surfactant formulated to improve bioremediation of petroleum hydrocarbons.

Table presents maximum injection masses. Actual mass may be reduced based on performance and monitoring results.

Abreviations:

Br = Food-grade sodium bromide salt
Cl = Food-grade sodium chloride salt
lbs = pounds
gal = gallons

Table 4 - Enhanced Bioremediation Monitoring Schedule
Ken's Auto Wash
Ellensburg, Washington

Monitoring Well	Baseline November 2010				Event 2 April 2011				Event 3 July 2011				Event 4 October 2011					Post-Injection Event January 2012			
	G	V	Ions	F	G	V	Ions	F/N	G	V	Ions	F/N	G	V	Ions	F	N	G	V	Ions	F/N
Injection Wells																					
MW-2	X	X	X	X									X	X	X	X					
MW-3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-4R	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-5	X	X	X	X									X	X	X	X					
MW-6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
MW-14	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Downgradient Wells																					
MW-12	X	X	X	X									X	X	X	X					
MW-13	X	X	X	X			X	X			X	X	X	X	X	X	X			X	X
MW-15	X	X	X	X									X	X	X	X					

Notes:

Monitoring will be performed prior to any injection activities.

Water level elevations will be measured prior to well purging and sampling.

Samples will be collected using low-flow techniques and a flow-through cell, consistant with recent monitoring events.

Abreviations:

G = Gasoline-range petroleum hydrocarbons by Ecology Method NWTPH-Gx.

V = Volatile organic compounds benzene, toluene, ethylbenzene, and xylene by EPA Method 8021B.

Ions = Nitrate as nitrogen, sulfate, bromide, and chloride by EPA Method 300.0.

F = Field kit testing of ferrous iron.

N = Field kit testing of nitrate.

Table 5 - Groundwater Compliance Monitoring Schedule
Ken's Auto Wash
Ellensburg, Washington

Well	Purpose	2013-2017[a]	2018-2021	2022[b]
MW-2	Bound Plume - East	Annual[c]		Quarterly
MW-3	Background	Annual[c]	Biannual[e]	Quarterly
MW-4R	Source Area (Upgradient Edge)	Quarterly[d]	Biannual[e]	Quarterly
MW-5	Bound Plume - West	Annual[c]		Quarterly
MW-6	Plume Extent	Quarterly[d]	Biannual[e]	Quarterly
MW-12[f]	Bound Plume - Southwest	Annual[c]		Quarterly
MW-13	Downgradient Point of Compliance	Quarterly[d]	Biannual[e]	Quarterly
MW-14	Source Area	Quarterly[d]	Biannual[e]	Quarterly
MW-15	Bound Plume - Southeast	Annual[c]		Quarterly

Notes:

Monitoring will include groundwater level measurements, field parameter measurements, and groundwater sample collection for chemical analyses specified below. If injections are to be performed into the well, the well will be field-tested for nitrate, nitrite, ammonium, and ferrous iron.

[a] Timeline assumes injections are performed and amendment concentrations have not reduced to background levels. If the site enters monitored attenuation, sampling defaults to 2018 scope.

[b] Final compliance monitoring would include analysis for NWTPH-Gx, BTEX, and total lead.

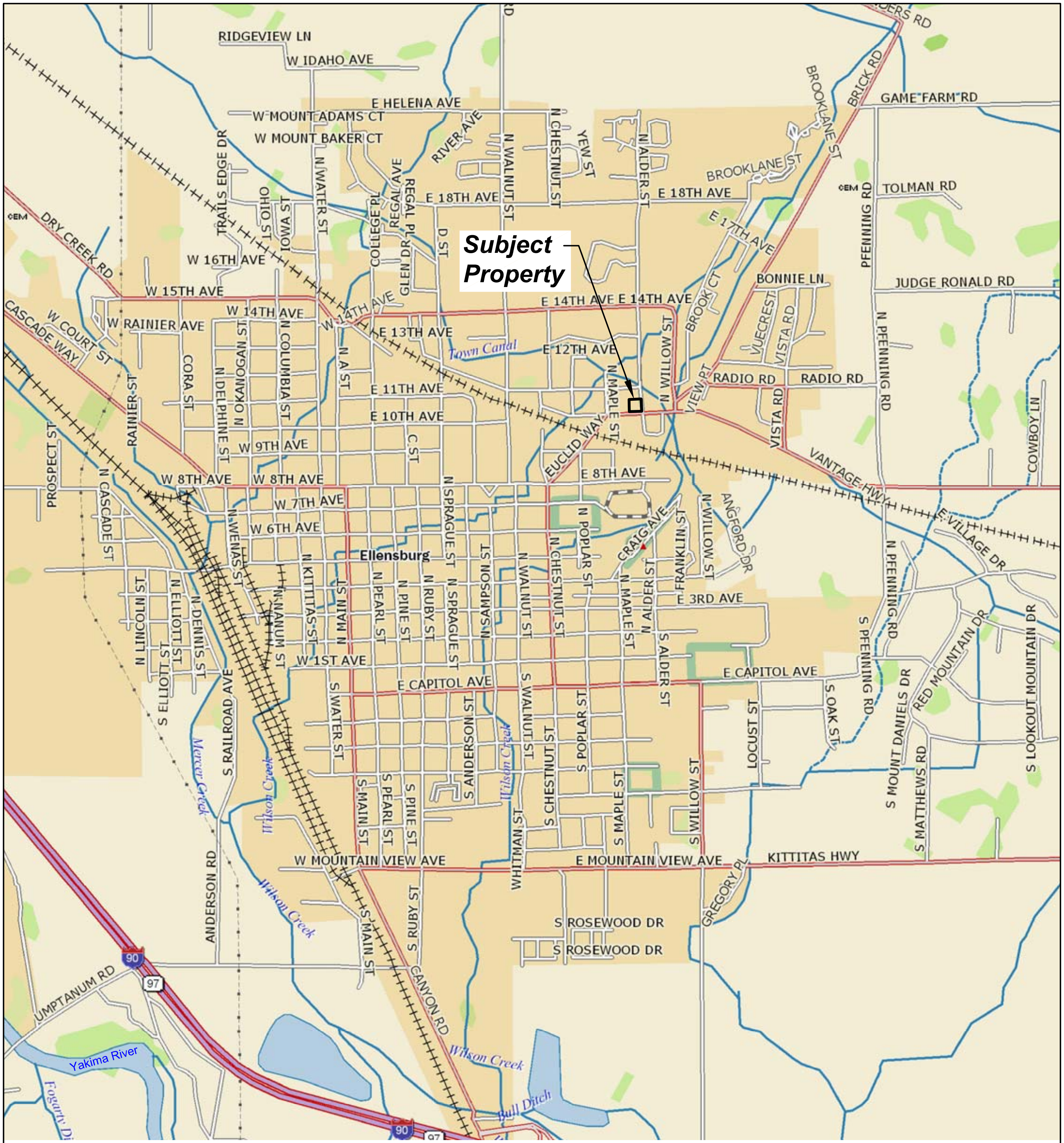
[c] Annual monitoring includes analysis of NWTPH-Gx, BTEX, nitrate, sulfate, and total lead.

[d] Quarterly monitoring includes analysis of NWTPH-Gx, BTEX, nitrate, and sulfate.

[e] Biannual refers to twice per year and would be based on typical high and low groundwater elevations at the site. Includes analysis of NWTPH-Gx, BTEX, nitrate, sulfate, and total lead.

[f] Well not located in May, August, and November 2012 and possibly destroyed.

Schedule assumes 5-year review by Ecology following 2013 sampling round.
Schedule after 2018 is tentative pending Ecology 5-year review.
Monitoring schedule after 2022, if necessary, will be based on review of previous data.
Blank entries indicate no monitoring planned in specific wells.



Source: DeLorme Topo USA®.

Ken's Auto Wash
Ellensburg, Washington

Vicinity Map

7168-09 11/10

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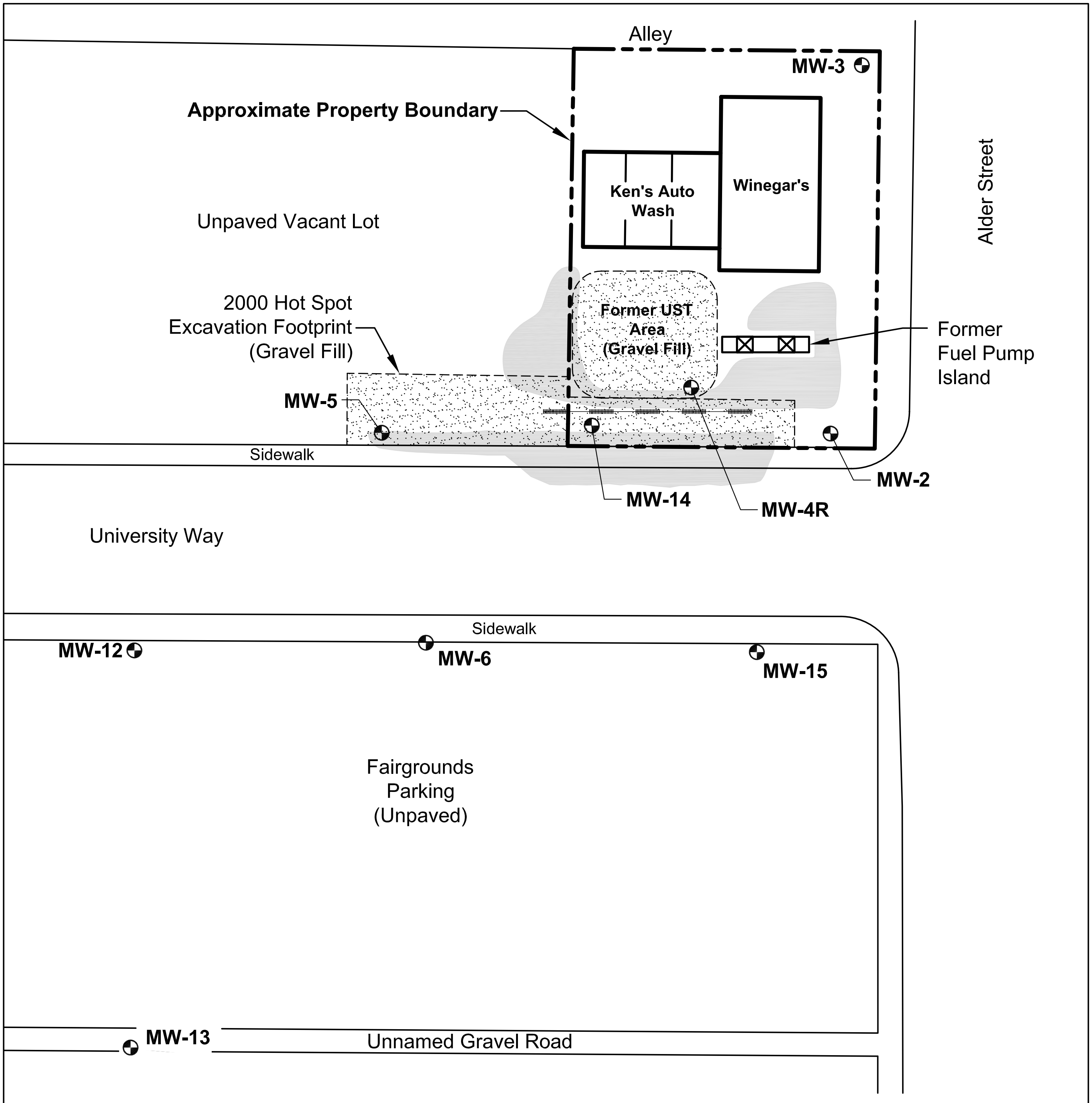
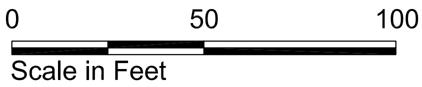
Figure
1

JAB 11/8/10 716809-001 (Vicinity Map-Bio).dwg



Note: Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.



⊕ **MW-6**	Hart Crowser Monitoring Well Location and Number
▨	Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels
―▬―▬―	Contingency Air Sparging Pipe

Ken's Auto Wash
Ellensburg, Washington

Site Plan

7168-09

11/10

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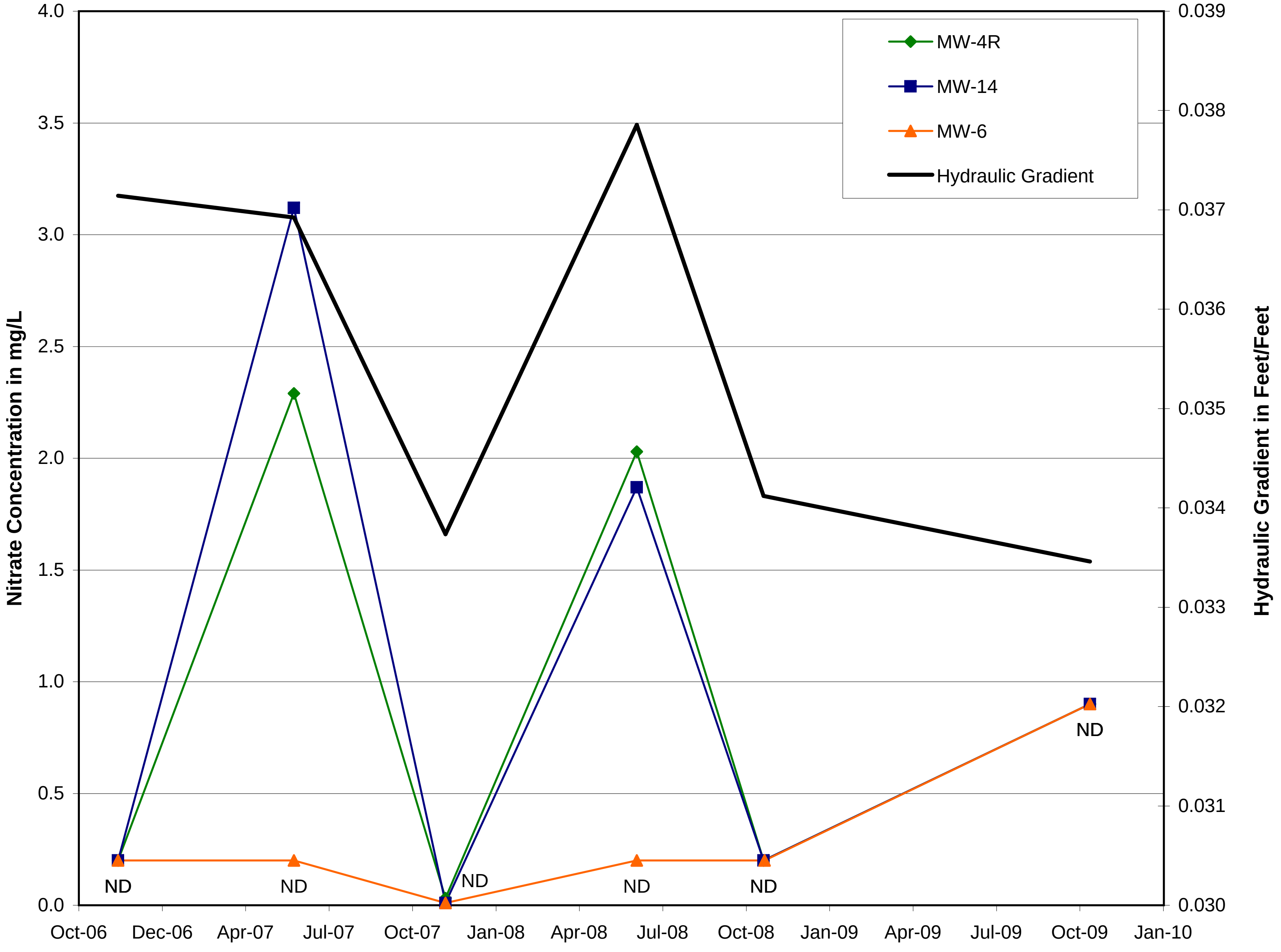
Figure

2

JAB 11/22/10 716809-002 (Site Plan-Bio-wp).dwg

AJG 11/17/10 716809\Work Plan\Figures.xls



Note: ND = Not detected at the specified detection limit.

Ken's Auto Wash
Ellensburg, Washington

Nitrate Electron Acceptor Plot - Plume Axis

7168-09
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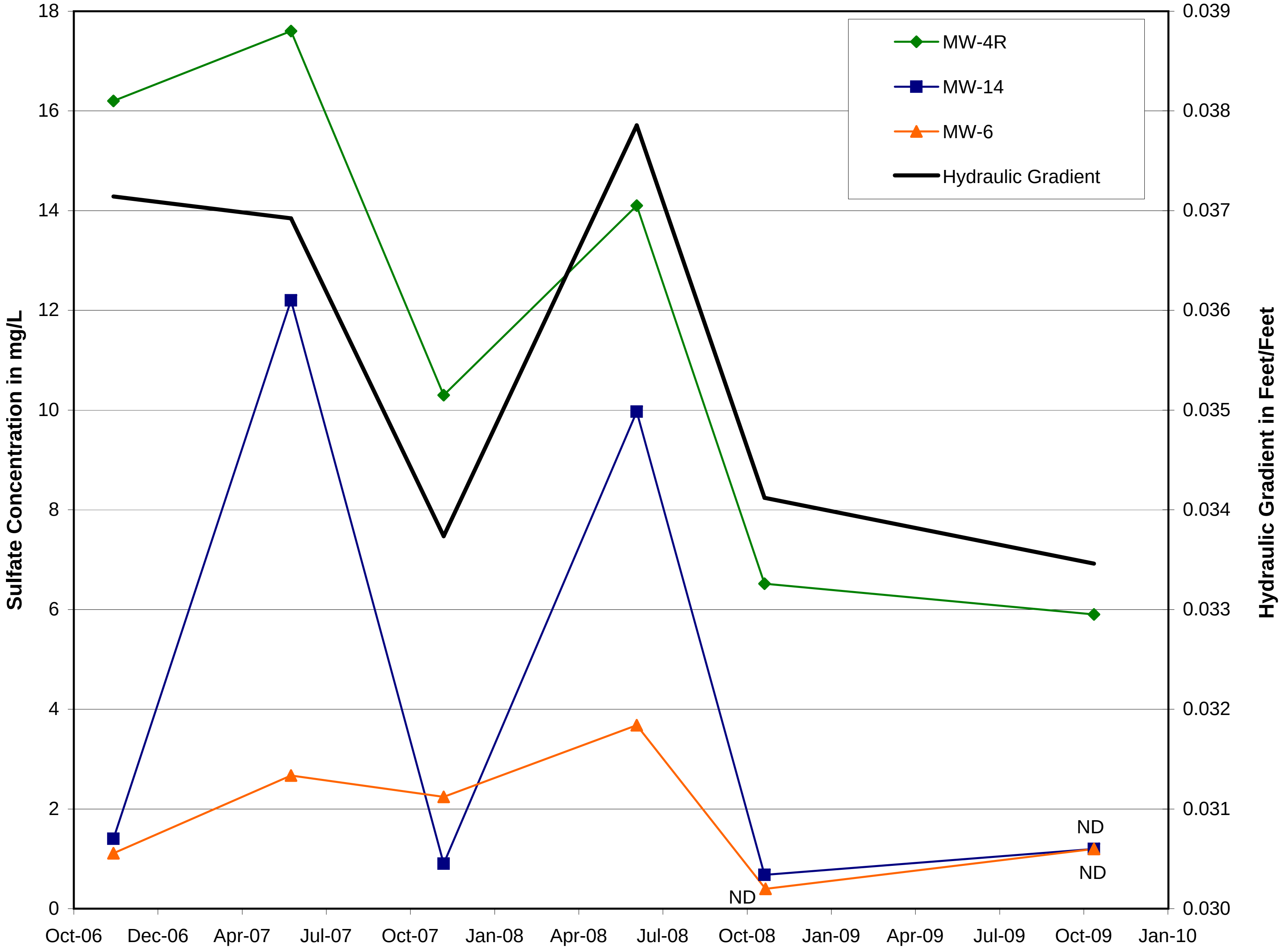
Figure
3

AJG 11/17/10 716809\Work Plan\Figures.xls



Note: ND = Not detected at the specified detection limit.

Ken's Auto Wash
Ellensburg, Washington

Sulfate Electron Acceptor Plot - Plume Axis

7168-09
11/10

Figure
4

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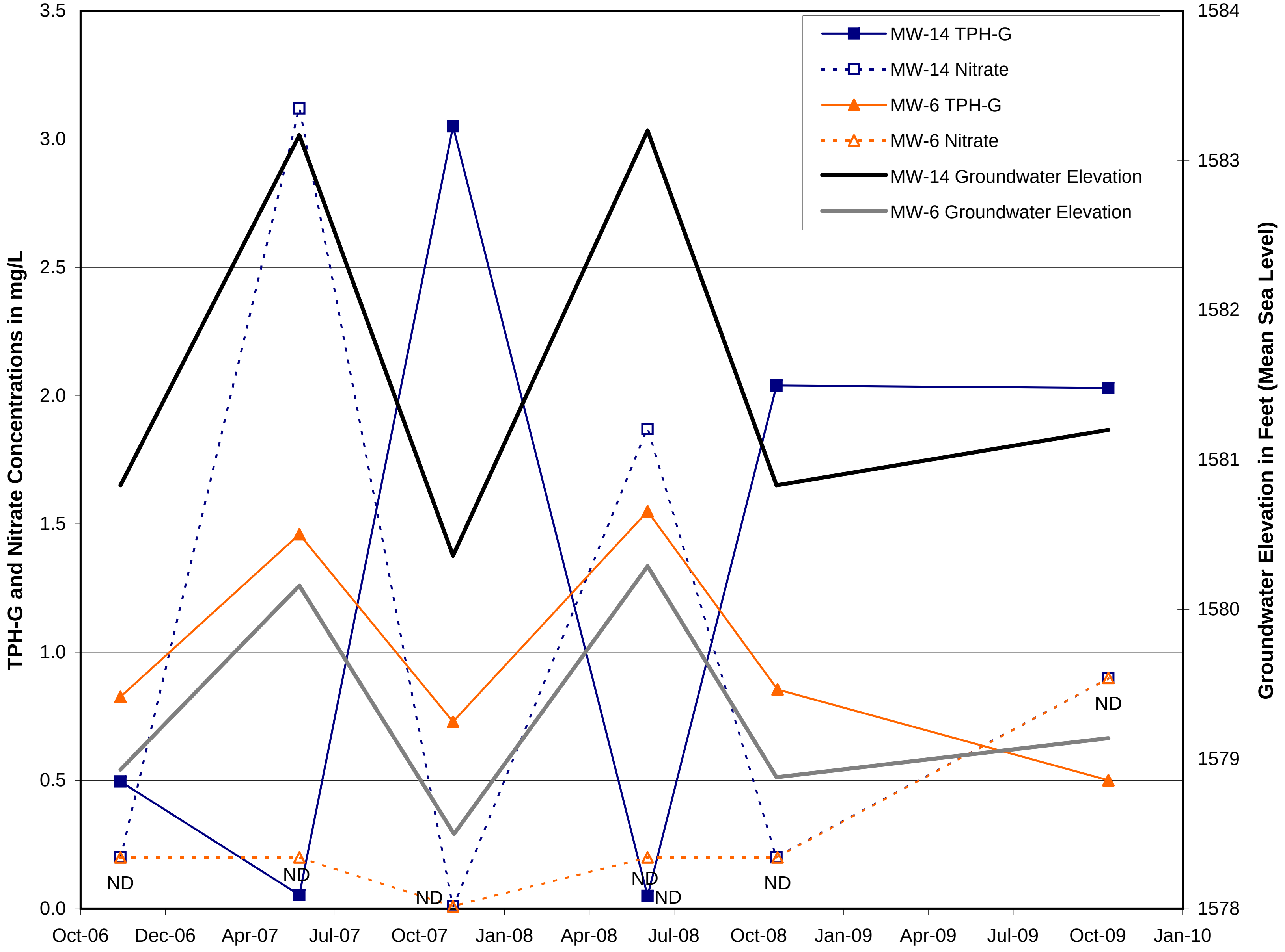
AJG 11/17/10 716809\Work Plan\Figures.xls



Note: ND = Not detected at the specified detection limit.

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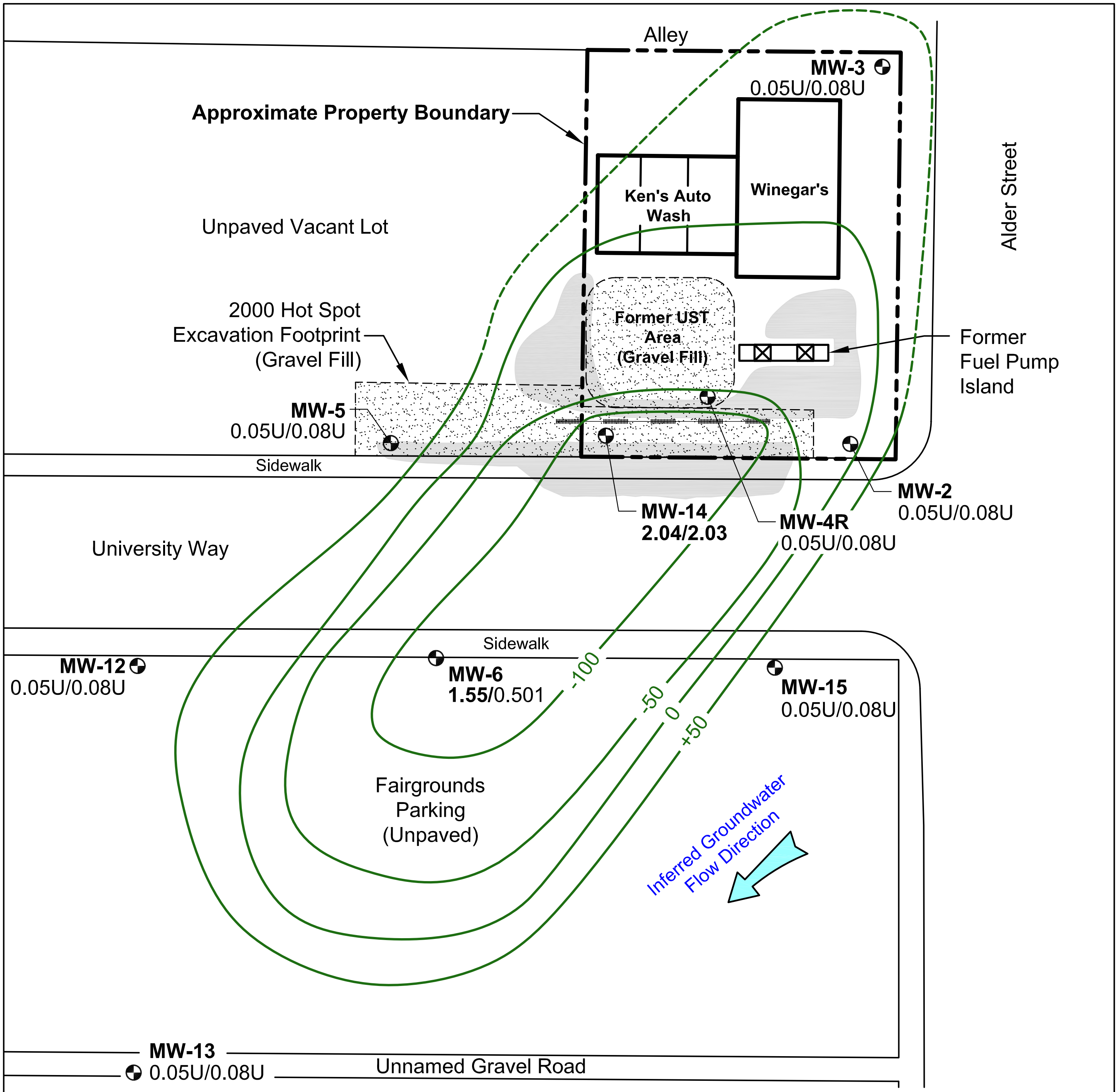
11/10

Natural Attenuation Plot - MW-14 and MW-6

Ken's Auto Wash
Ellensburg, Washington

Figure

5



MW-6	Hart Crowser Monitoring Well Location and Number
1.55/0.501	Maximum Groundwater TPH-G Concentration in mg/L for 2008/2009
	Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels
	Contingency Air Sparging Pipe
U	Not Detected at Specified Detection Limit
+50	October 2008 Oxidative-Reductive Potential (millivolts)

N

Notes:

1. Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.
2. Concentration exceeding the cleanup level are shown in bold.

0 50 100

Scale in Feet

Ken's Auto Wash
Ellensburg, Washington

Site Oxidative-Reductive Potential

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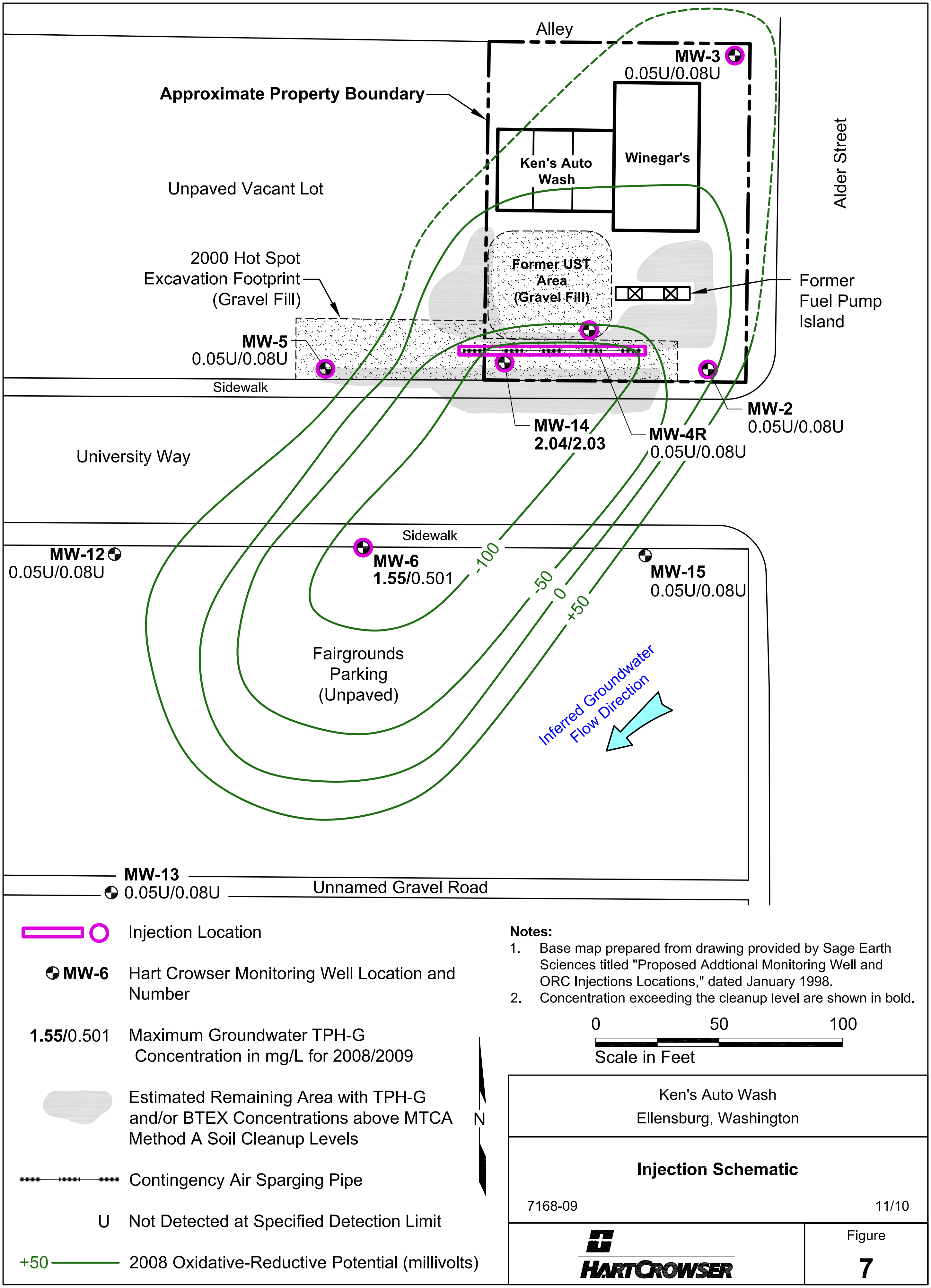
Figure

6

JAB 12/6/10 716809-006 (ORP-Bio-wp).dwg



▭ ○	Injection Location
MW-6	Hart Crowser Monitoring Well Location and Number
1.55/0.501	Maximum Groundwater TPH-G Concentration in mg/L for 2008/2009
▨	Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels
	Contingency Air Sparging Pipe
U	Not Detected at Specified Detection Limit
+50	2008 Oxidative-Reductive Potential (millivolts)

Notes:

1. Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.
2. Concentration exceeding the cleanup level are shown in bold.

Ken's Auto Wash
Ellensburg, Washington

Injection Schematic

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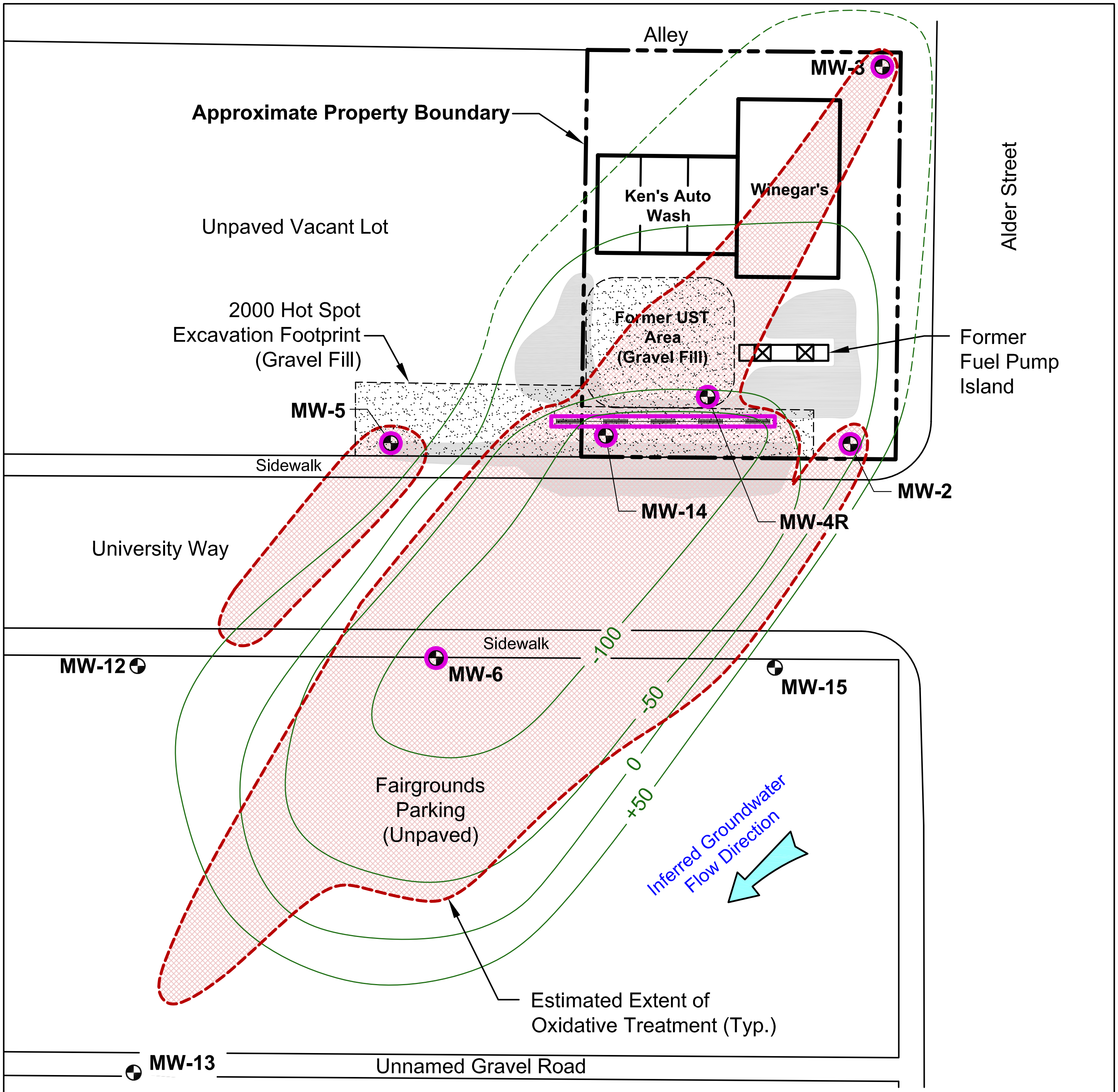
Figure
7

JAB 11/22/10 716809-007 (Inject-Schem-Bio-wp).dwg



▭ ○ Injection Location

MW-6 Hart Crowser Monitoring Well Location and Number

Estimated Remaining Area with TPH-G and/or BTEX Concentrations above MTCA Method A Soil Cleanup Levels

Contingency Air Sparging Pipe

U Not Detected at Specified Detection Limit

+50 —— 2008 Oxidative-Reductive Potential (millivolts)

N

Note: Base map prepared from drawing provided by Sage Earth Sciences titled "Proposed Addtional Monitoring Well and ORC Injections Locations," dated January 1998.

0 50 100

Scale in Feet

Ken's Auto Wash
Ellensburg, Washington

Estimated Extent of Treatment

7168-09 11/10

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Figure
8

JAB 11/22/10 716809-008 (Extent-Treat-Bio-wp).dwg

APPENDIX A
NONENDANGERMENT CONTINGENCY PLAN

APPENDIX A
NONENDANGERMENT CONTINGENCY PLAN

This contingency plan complies with the requirement of the Underground Injection (UIC) Program, which requires that discharge(s) from UIC injection wells must meet the nonendangerment standard of WAC 173-218-080. Contingency Plan elements include actions to be taken in case of spills, system failures, equipment breakdowns, and/or unforeseen environmental degradation caused by the cleanup activities. The Washington State Department of Ecology (Ecology) required preparation of a written Contingency Plan for the UIC Program at the Ken's Auto Wash site in its January 24, 2011, letter to Ken Peterson. Ecology's letter rule authorized the site for the planned underground injections of *in situ* remediation amendment products.

The site is registered as UIC site number 31210.

Emergency Contingency Information

SITE LOCATION	Ken's Auto Wash 1013 University Way Ellensburg, Washington Phone: (509) 925-7920
EMERGENCY RESPONDERS	Police Department .... 911 Fire Department .... 911 Ambulance 911
EMERGENCY CONTACTS	Hart Crowser, Seattle Office .... (206) 324-9530 • Mike Ehlebracht .... (206) 369-5164 (cell) • Angie Goodwin .... (206) 954-2549 (cell) • Troy Fowler .... (971) 678-0843 (cell) Client Contact – Ken Peterson .... (509) 929-0027 (cell) National Response Center .... (800) 424-8802 Washington Emergency Management .... (800) 258-5990 Ecology Central Regional Office .... (509) 575-2490 EPA Emergency Response Team .... (908) 321-6660 Poison Control Center .... (800) 222-1222 Chemtrec .... (800) 424-9300

Spill Containment

Chemical amendments that will be used on site include:

- OxEA-aq - manufactured by Bioremediation Specialists, LLC;
- PetroBac - manufactured by ETEC, LLC;
- Sodium bromide and potassium chloride salt tracers - purchased from Cascade Columbia Distribution Company; and
- Ivey-sol 103 - manufactured by Ivey International Inc.

OxyEA-aq and the tracers are dry powder products and will be picked up from the manufacturer in 50-pound bags. PetroBac is a liquid and will be picked up from the manufacturer in 5-gallon pails. Ivey-sol 103 is a liquid and will be shipped from the manufacturer to Hart Crowser in a 55-gallon drum. Ivey-sol 103 will be stored off site and only the volume needed during the quarterly injections will be transported to the site. The products will be mixed with water in small batches directly prior to injecting. Any vessel that contains products and water will be vented due to potential pressure buildup from fermentation gases. Material Safety Data Sheets (MSDS) for these products are included in Appendix B of this document. The use and control of the chemical amendments to be injected is described in Hart Crowser's Work Plan.

Container labels will contain the following information:

- Identity of hazardous chemicals;
- Appropriate hazard warnings; and
- Name and address of the chemical manufacturer and/or distributor.

Labels will not be removed or defaced. If a label is damaged or is not legible, a replacement label will be requested from the manufacturer.

When on site, Hart Crowser personnel will be equipped with sorbent pads and other materials capable of containing a relatively small spill. Dry material will be handled with care and any spill will be swept immediately. In the event of a tank rupture or other material spill of the liquid mixture, we will attempt to stop and contain the flow of material using absorbents, booms, dirt, or other appropriate material. The spill material will be drummed for proper disposal. As necessary, we will contact a spill removal firm through Chemtrec for material cleanup and disposal, as required. Sufficient empty drums will be kept on site as a contingency for spill containment.

Injectate Migration

Although the amendments are mobile products and travel with groundwater, the injections are designed to balance the amendment amounts to avoid over application and migration beyond the historically impacted area downgradient of the former USTs, near wells MW-14 and MW-6.

Preferential flow path formation will be minimized by using controlled flows and injection pressures as described in the Work Plan to the extent practical. During the injection events, groundwater levels will also be measured in selected wells to help evaluate amendment distribution, fluctuations in groundwater levels, and to determine whether potential short circuiting of the injected amendments could be occurring. Any apparent preferential flow path formation or short-circuiting will be documented and minimized by decreasing flow rates and injection pressures.

Groundwater Monitoring

Routine annual sampling was completed in November 2010 and will be repeated in October 2011 for all monitoring wells. Quarterly performance monitoring events are scheduled for April and July 2011 to monitor treatment progress in selected wells. The October 2011 samples will be collected following the third bioremediation amendment injection event and will be used to assess overall oxidative treatment success. A post-injection quarterly monitoring event is scheduled for January 2012 to determine groundwater concentrations for compliance monitoring.

Based on estimated groundwater travel times from the center of the treatment area to monitoring wells MW-6 and MW-13, we anticipate that quarterly groundwater monitoring frequency will provide sufficient data to evaluate treatment performance. Additional quarterly monitoring of wells MW-3, MW-4R, MW-6, MW-13, and MW-14 will also be conducted.

To confirm that over application or migration of amendment products beyond targeted area is not occurring, field sampling for nitrate will be performed in selected wells prior to each injection. Field nitrate results will determine whether conditions are appropriate for additional amendment application.

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APPENDIX B
MATERIAL SAFETY DATA SHEETS (MSDS)

Material Safety Data Sheet

Material Name: OxEA-*aq*

* * * Section 1 - Chemical Product and Company Identification * * *

Manufacturer Information

Bioremediation Specialists
8910 SW Gemini Drive
Beaverton, OR 97008-7123

Phone: (971) 327-9113
Fax: (503) 620-6918
EMERGENCY: (971) 678-0843 or (971) 781-2232

* * * Section 2 - Hazards Identification * * *

Emergency Overview

This product is not expected to produce any unusual hazards during normal use. Exposure to high dust levels may irritate the skin, eyes, nose, throat, or upper respiratory tract.

Potential Health Effects: Eyes

Airborne dust or direct contact can cause mechanical irritation of eyes. If burning, redness, itching, pain or other symptoms persist or develop, consult physician.

Potential Health Effects: Skin

Direct, prolonged or repeated contact with the skin may cause irritation.

Potential Health Effects: Ingestion

Not considered a likely route of exposure under normal product use conditions. May be harmful or fatal if swallowed.

Potential Health Effects: Inhalation

Dust exposures generated during the handling of the product may irritate eyes, skin, nose, throat, and upper respiratory tract. Persons subjected to large amounts of this dust will be forced to leave area because of nuisance conditions such as coughing, sneezing and nasal irritation. Labored breathing may occur after excessive inhalation. If respiratory symptoms persist, consult physician.

HMIS Ratings: Health: 1 **Fire:** 0 **HMIS Reactivity** 1

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

* * * Section 3 - Composition / Information on Ingredients * * *

CAS #	**Component**	**Percent**
Proprietary	Trade Secret #1	10-50
Proprietary	Trade Secret #2	0-50
Proprietary	Trade Secret #3	0-30
Proprietary	Trade Secret #4	0-30
Proprietary	Trade Secret #5	0-20

* * * Section 4 - First Aid Measures * * *

First Aid: Eyes

In case of contact, do not rub or scratch your eyes. Flush thoroughly with water for 15 minutes to remove particles. If irritation persists, consult physician.

First Aid: Skin

Wash with mild soap and water. A commercially available hand lotion may be used to treat dry skin areas. If skin has become cracked, take appropriate action to prevent infection and promote healing. If irritation persists, consult physician.

First Aid: Ingestion

This product is not intended to be ingested or eaten. May be harmful or fatal if swallowed. If ingested, call physician.

First Aid: Inhalation

Remove to fresh air. Leave the area of dust exposure and remain away until coughing and other symptoms subside. Other measures are usually not necessary, however if conditions warrant, contact physician.

* * * Section 5 - Fire Fighting Measures * * *

General Fire Hazards

See Section 9 for Flammability Properties.
Not expected to burn.

Hazardous Combustion Products

Not Determined

Extinguishing Media

Use extinguishing media appropriate for surrounding fire.

Fire Fighting Equipment/Instructions

Firefighters should wear full protective gear.

NFPA Ratings: Health: 1 **Fire:** 0 **Reactivity:** 1 **Other:** Oxidizer
Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

* * * Section 6 - Accidental Release Measures * * *

Containment Procedures

Wear appropriate personal protection. Stop the flow of material if this is without risk.

Clean-Up Procedures

Use normal clean up procedures. Wear appropriate protective equipment. Ventilate area. If dry, shovel or sweep up material from spillage and place collected material into a container for recovery or waste disposal. Avoid dust generation. Avoid inhalation of dust and contact with eyes and skin. Maintain proper ventilation. If vacuum is used to collect dust, use an industrial vacuum cleaner with a high efficiency air filter. If sweeping is necessary, use dust suppressant. Do not use compressed air for clean up. These procedures will help minimize potential exposures. Dispose in accordance with all local, state, provincial and federal regulations.

Evacuation Procedures

Isolate area. Keep unnecessary personnel away.

Special Procedures

None

* * * Section 7 - Handling and Storage * * *

Handling Procedures

Minimize dust generation and accumulation. Avoid breathing dust. Wear the appropriate respiratory protection against dust in poorly ventilated areas and if exposure limits are exceeded (see Sections 8). Avoid dust contact with eyes. Wear the appropriate eye protection against dust (See Section 8). Use good safety and industrial hygiene practices.

Storage Procedures

Store at room temperature in a dry location. Keep containers closed when not in use

* * * Section 8 - Exposure Controls / Personal Protection * * *

Engineering Controls

If user operations generate airborne dust, use ventilation to keep dust concentrations below permissible exposure limits. Where general ventilation is inadequate, use process enclosures, local exhaust ventilation, or other engineering controls to control dust levels below permissible exposure limits.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Wear eye protection (safety glasses or goggles) to avoid particulate irritation of the eye.

Personal Protective Equipment: Skin

Gloves or protective clothing are usually not necessary but may be desirable in specific work situations. For brief contact, no precautions other than clean body-covering clothing should be needed. Wear gloves and protective clothing to prevent repeated or prolonged skin contact. Barrier creams or skin lotion may be applied to face, neck, wrist and hands when skin is exposed to help prevent drying of skin.

Personal Protective Equipment: Respiratory

Use NIOSH approved respiratory protection if airborne dust is generated.

Personal Protective Equipment: General

None

* * * Section 9 - Physical & Chemical Properties * * *

Appearance:	White to off white	**Odor:**	Low to no odor
Physical State:	Solid (powder)	**pH:**	ca. 6.5-7.0
Vapor Pressure:	NA	**Vapor Density:**	NA
Boiling Point:	NA	**Melting Point:**	NA
Solubility (H2O):	32 g/100 g solution	**Specific Gravity:**	2.3-2.5
Evaporation Rate:	NA	**VOC:**	0
Octanol/H2O Coeff.:	ND	**Flash Point:**	None Known
Flash Point Method:	NA	**Upper Flammability Limit (UFL):**	NA
Lower Flammability Limit (LFL):	NA	**Burning Rate:**	NA
Auto Ignition:	NA		

* * * Section 10 - Chemical Stability & Reactivity Information * * *

Chemical Stability

This is a stable material under ordinary conditions of use and storage.

Chemical Stability: Conditions to Avoid

Heat, flames, ignition sources, and contact with incompatibles.

Incompatibility

Oxidizing and reducing agents, metals, metal hydrides, alkalis, moisture, strong acids, strong bases, and magnesium. Keep away from flammable and combustible substances.

Hazardous Decomposition

Not Determined

Possibility of Hazardous Reactions

Will not occur.

* * * Section 11 - Toxicological Information * * *

Acute Dose Effects

A: General Product Information

No information available for the product.

B: Component Analysis - LD50/LC50

Trade Secret #1 (Proprietary)

Oral LD50 Rat 3015 mg/kg

Trade Secret #2 (Proprietary)

Oral LD50 Rat 1267 mg/kg

Trade Secret #3 (Proprietary)

Oral LD50 Rat 6500 mg/kg; Dermal LD50 Rabbit >7950 mg/kg

Trade Secret #4 (Proprietary)

Oral LD50 Rat 2000 mg/kg

Carcinogenicity

A: General Product Information

No information available for the product.

B: Component Carcinogenicity

None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

* * * Section 12 - Ecological Information * * *

Ecotoxicity

A: General Product Information

No information available for the product.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Trade Secret #2 (Proprietary)

Test & Species		**Conditions**
96 Hr LC50 Lepomis macrochirus	2000 mg/L [static]	
96 Hr LC50 Oncorhynchus mykiss	994.4-1107 mg/L [static]	

Trade Secret #3 (Proprietary)

Test & Species		**Conditions**
96 Hr LC50 Oncorhynchus mykiss	26.5 mg/L	
96 Hr LC50 Oncorhynchus mykiss	24.8-29.4 mg/L [flow-through]	
96 Hr LC50 Pimephales promelas	3.3 mg/L	
96 Hr LC50 Pimephales promelas	33 mg/L [static]	

Trade Secret #4 (Proprietary)

Test & Species		**Conditions**
96 Hr LC50 Leuciscus idus	460 - 1000 mg/L [static]	
96 Hr LC50 Brachydanio rerio	250 mg/L	
96 Hr LC50 Brachydanio rerio	480 mg/L [flow-through]	
96 Hr LC50 Brachydanio rerio	420 mg/L [semi-static]	
96 Hr LC50 Cyprinus carpio	18 mg/L	
96 Hr LC50 Pimephales promelas	>100 mg/L	
96 Hr LC50 Oncorhynchus mykiss	32.2-41.9 mg/L [flow-through]	
96 Hr LC50 Oncorhynchus mykiss	5.2-8.2 mg/L [static]	
96 Hr LC50 Poecilia reticulata	123-128 mg/L [semi-static]	
96 Hr LC50 Poecilia reticulata	126 mg/L	
24 Hr EC50 Daphnia magna	423 mg/L	
48 Hr LC50 Daphnia magna	14 mg/L	

* * * Section 13 - Disposal Considerations * * *

US EPA Waste Number & Descriptions

Component Waste Numbers

No EPA Waste Numbers are applicable for this product's components.

Disposal Instructions

All wastes must be handled in accordance with local, state and federal regulations.
See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

* * * Section 14 - Transportation Information * * *

US DOT Information

Shipping Name: Not Regulated

* * * Section 15 - Regulatory Information * * *

US Federal Regulations

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), or CERCLA (40 CFR 302.4).

State Regulations

Component Analysis - State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Trade Secret #1	Proprietary	No	Yes	No	Yes	Yes	Yes
Trade Secret #2	Proprietary	No	Yes	No	No	Yes	Yes
Trade Secret #4	Proprietary	No	Yes	No	No	Yes	Yes

Component Analysis - WHMIS IDL

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List:

Component	CAS #	Minimum Concentration
Trade Secret #2	Proprietary	1 %
Trade Secret #4	Proprietary	1 %

Additional Regulatory Information

Component Analysis - Inventory

Component	CAS #	TSCA	CAN	EEC
Trade Secret #1	Proprietary	Yes	DSL	EINECS
Trade Secret #2	Proprietary	Yes	DSL	EINECS
Trade Secret #3	Proprietary	Yes	DSL	EINECS
Trade Secret #4	Proprietary	Yes	DSL	EINECS

* * * Section 16 - Other Information * * *

Other Information

The information herein is presented in good faith and believed to be accurate as of the effective date given. However, no warranty, expressed or implied, is given. It is the buyer's responsibility to ensure that its activities comply with Federal, State or provincial, and local laws.

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act; ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration., NJTSR = New Jersey Trade Secret Registry, DSL= Domestic Substance List, EINECS= European Inventory of Existing Commercial Chemical Substances

MATERIAL SAFETY DATA SHEET

This MSDS complies with OSHA'S Hazard Communication Standard 29 CFR 1910.1200 and OSHA Form 174

IDENTITY AND MANUFACTURER'S INFORMATION

NFPA Rating: Health-1; Flammability-0; Reactivity-0; Special- -

HMIS Rating: Health-1; Flammability-0; Reactivity-0; Personal Protection-D

Manufacturer's Name: ETEC, LLC

DOT Hazard Classification: None

Address:
6635 NE 59th Place
Portland, OR 97218

TRADE NAME: **EZT-A2**

Date Prepared: 2/1/07

Prepared By: BT

MSDS Number: 010

Revision - 2

Information Calls: **(503) 260-3799**

NOTICE: JUDGMENT BASED ON INDIRECT TEST DATA

SECTION 1 - MATERIAL IDENTIFICATION AND INFORMATION

COMPONENTS-CHEMICAL NAMES AND COMMON NAMES (Hazardous Components 1% or greater; Carcinogens 0.1% or greater)	ACS Number	SARA III LIST	OSHA PEL (ppm)	ACGIH TLV (ppm)	Carcinogen Ref. Source **
Bacterial Consortium	N/A	No	N/E	N/E	N/E

SECTION 2 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: 212 F

Specific Gravity (H2O=1): 1.00

Vapor Pressure: PSIG @ 70 F (Aerosols): N/A

Vapor Pressure (Non-Aerosols)(mm Hg and Temperature): 18 @75^0 F

Vapor Density (Air = 1): .62

Evaporation Rate (BUAC = 1): 1.00

Solubility in Water: Complete

Water Reactive: No

Appearance and Odor: Thin brown / tan liquid with slightly sour odor

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY as per USA flame projection test (aerosols): N/A

Auto Ignition Temperature: N/A

Flammability Limits in Air by % in Volume:

% LEL: N/A % UEL: N/A

FLASH POINT AND METHOD USED N/A

EXTINGUISHER MEDIA: Non-Combustible

SPECIAL FIRE FIGHTING PROCEDURES: None

Unusual Fire & Explosion Hazards: None

SECTION 4 - REACTIVITY HAZARD DATA

STABILITY: [X] STABLE [ ] UNSTABLE

HAZARDOUS POLYMERIZATION: [ ] WILL [X] WILL NOT OCCUR

Incompatibility (Mat. to avoid): None Identified

Conditions to Avoid: None Identified

Hazardous Decomposition Products: None

SECTION 5 - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY: [ ] INHALATION [X] INGESTION [X] SKIN ABSORPTION [X] EYE [ ] NOT HAZARDOUS

ACUTE EFFECTS: None

Inhalation: None

Eye Contact: May be an irritant

Skin Contact: May be an irritant.

Ingestion: Gastrointestinal irritant

CHRONIC EFFECTS: None known.

Medical Conditions Generally Aggravated by Exposure: None Identified

SECTION 6 - EMERGENCY FIRST AID PROCEDURES

Eye Contact: Flush with water for 15 minutes. If irritation persists get medical attention.

Skin Contact: Wash with soap and water.

Inhalation: Move to fresh air. No adverse effects noted.

Ingestion: **DO NOT INDUCE VOMITING.** Drink large quantity of water. Get immediate medical attention.

SECTION 7 - CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (specify type):. None normally needed

Protective Gloves: Rubber if desired

Eye Protection: Safety glasses.

Ventilation Requirements: Normal room ventilation.

Other Protective Clothing & Equipment: Apron and boots if desired.

Hygienic Work Practices: Wash with soap and water after contact.

SECTION 8 - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps To Be Taken If Material Is Spilled Or Released: Dike and contain. Collect and re-use.

Waste Disposal Methods: Rinse container with water and dispose of accordingly

Precautions To Be Taken In Handling & Storage: Recommended storage temperature is 50 F. Seal container after use.

Other Precautions &/or Special Hazards: KEEP OUT OF REACH OF CHILDREN.

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind.

**** Chemical Listed as Carcinogen or Potential Carcinogen. [a] NTP [b] IARC Monograph [c] OSHA [d] Not Listed [e] Animal Data Only**

MATERIAL SAFETY DATA SHEET

This MSDS complies with OSHA'S Hazard Communication Standard 29 CFR 1910.1200 and OSHA Form 174

IDENTITY AND MANUFACTURER'S INFORMATION

NFPA Rating: Health-1; Flammability-0; Reactivity-0; Special- -		**HMIS Rating:** Health-1; Flammability-0; Reactivity-0; Personal Protection-G	
Manufacturer's Name:	ETEC, LLC	**DOT Hazard Classification: None**	
Address:	6635 NE 59th Place Portland, OR 97218	**TRADE NAME:**	**Enzyme Accelerator**
Date Prepared: 2/1/07	**Prepared By: BT**	**MSDS Number: 011**	Revision - 0
Information Calls:	**(503) 260-3799**	NOTICE: JUDGMENT BASED ON INDIRECT TEST DATA	

SECTION 1 - MATERIAL IDENTIFICATION AND INFORMATION

COMPONENTS-CHEMICAL NAMES AND COMMON NAMES (Hazardous Components 1% or greater; Carcinogens 0.1% or greater)	ACS Number	SARA III LIST	OSHA PEL (ppm)	ACGIH TLV (ppm)	Carcinogen Ref. Source **
MONOCYCLIC TERPENE	5989-27-5	No	N/E	N/E	d
NATURAL ENZYMES	N/A	No	N/E	N/E	N/E

SECTION 2 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point:	220 F	Specific Gravity (H2O=1):	1.00
Vapor Pressure: PSIG @ 70 F (Aerosols):	N/A	Vapor Pressure (Non-Aerosols)(mm Hg and Temperature):	18 @75^0 F
Vapor Density (Air = 1):	.62	Evaporation Rate (BUAC = 1):	1.20
Solubility in Water:	Complete	Water Reactive:	No
Appearance and Odor:	Tan colored liquid with citrus odor.		

SECTION 3 - FIRE AND EXPLOSION HAZARD DATA

FLAMMABILITY as per USA flame projection test (aerosols): N/A	Auto Ignition Temperature: N/E	Flammability Limits in Air by % in Volume:
FLASH POINT AND METHOD USED 115 F (T.C.C.)		% LEL: N/E % UEL: N/E
EXTINGUISHER MEDIA: Non-Combustible	**SPECIAL FIRE FIGHTING PROCEDURES**: None	

Unusual Fire & Explosion Hazards: Provide shielding to protect personnel.

SECTION 4 - REACTIVITY HAZARD DATA

STABILITY: [X] STABLE [ ] UNSTABLE	**HAZARDOUS POLYMERIZATION:** [ ] WILL [X] WILL NOT OCCUR
Incompatibility (Mat. to avoid): None Identified	**Conditions to Avoid:** None Identified

Hazardous Decomposition Products: None

SECTION 5 - HEALTH HAZARD DATA

PRIMARY ROUTES OF ENTRY: [X] INHALATION [X] INGESTION [X] SKIN ABSORPTION [X] EYE

ACUTE EFFECTS:	**None**		
Inhalation:	Can cause headache, dizziness.		
Eye Contact:	Irritating	**Skin Contact:**	May be an irritant.
Ingestion:	Chemical pneumonitis if aspirated into lungs.		
CHRONIC EFFECTS:	None known.		

Medical Conditions Generally Aggravated by Exposure: Asthma

SECTION 6 - EMERGENCY FIRST AID PROCEDURES

Eye Contact:	Flush with water for 15 minutes. Get medical attention.
Skin Contact:	Wash with soap and water.
Inhalation:	Move to fresh air.
Ingestion:	**DO NOT INDUCE VOMITING.** Drink large quantity of water. Get immediate medical attention.

SECTION 7 - CONTROL AND PROTECTIVE MEASURES

Respiratory Protection (specify type):.	None normally needed		
Protective Gloves:	Solvent resistant	**Eye Protection:**	Safety glasses.
Ventilation Requirements:	Normal room ventilation.		
Other Protective Clothing & Equipment:	None		
Hygienic Work Practices:	Wash with soap and water after contact.		

SECTION 8 - PRECAUTIONS FOR SAFE HANDLING AND USE

Steps To Be Taken If Material Is Spilled Or Released: Cover with absorbent material and scoop up. Flush area with water.

Waste Disposal Methods: Dispose of in accordance with local, state and federal regulations.

Precautions To Be Taken In Handling & Storage: Keep away from temperatures above 130 F.

Other Precautions &/or Special Hazards: KEEP OUT OF REACH OF CHILDREN.

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind.

**** Chemical Listed as Carcinogen or Potential Carcinogen. [a] NTP [b] IARC Monograph [c] OSHA [d] Not Listed [e] Animal Data Only**

Ivey International Inc.

MSDS NUMBER: 100609-01

MATERIAL SAFETY DATA SHEET
DECON-IT All-Purpose Cleaner

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name:	DECON-IT All-Purpose Cleaner
Chemical Name:	Not Applicable (mixture)
Chemical Family:	Non-ionic Surfactants
Formula:	Not Applicable (mixture)
Synonym(s):	DECONIT

COMPANY IDENTIFICATION United States:

Enviro Supply & Services Inc.	1791 Kaiser Ave., Irvine, California, United States 92614 Tel: + 1 949 757 0353 www.EnviroSupply.net
Prepared By:	Technical Products Department (Ivey International Inc.)
Telephone Number:	+ 1 250 923 6326 or Toll Free + 1 800 246 2744
Prepared (Last Updated):	June 11, 2010

Ivey International Inc. (IVEY) urges each customer or recipient of this MSDS to study it carefully to become aware of and understand the proper use and handling of the subject product. The reader should consider consulting reference materials, and/or IVEY technical support personnel, and/or other recognized experts, as necessary or appropriate to the use and understanding of the data contained in this MSDS. To promote the safe handling, storage and use of this product, each customer or recipient should (1) notify his employees, agents, contractors, and others whom he knows or believes will use this product, of the information in this MSDS and any other information regarding product use, storage and handling, (2) furnish this same information to each of his customers for the product, and (3) request his customers to notify their employees, customers, and other users of the product, and of this information.

SECTION 2: COMPOSITION INFORMATION

Components:	DECON-IT
Generic Description:	Water based biodegradable wetting agents and surfactants.

DECON-IT™ Technology-Stock Mixtures. Patented and/or proprietary blends. Information in this MSDS is applicable for all products listed.

SECTION 3: HAZARDS IDENTIFICATION

Effects of a Single Exposure

Swallowing:	Non to slightly toxic. May cause abdominal discomfort and nausea for some individuals.
Skin Absorption:	No evidence of harmful effects.
Inhalation:	No evidence of harmful effects.
Skin Contact:	Brief contact should not result in any significant effects. Prolong exposure may cause mild irritation with local itching and redness for individuals with sensitive skin.
Eye Contact:	May cause mild to moderate irritation.
Effects of Repeated Exposure:	Repeated skin contact may cause mild dermatitis (dryness of skin).
Medical Conditions:	Existing dermatitis may be aggravated through repeated skin contact.

Section 4: FIRST AID MEASURES

Swallowing:	If patient if fully conscious, give two glasses of water
Skin Absorption:	Wash exposed skin with soap and water. Obtain medical attention if irritation or dermatitis persists. Wash exposed clothing before reuse.
Inhalation:	Not applicable.
Eye Contact:	Immediately flush eyes with water and continue to flush as required. Remove any contact lenses, if worn. Obtain medical attention if deemed necessary.

Note to Physician:	There is no required antidote. Treatment should be directed at the control of symptoms and the clinical condition of the patient.

Section 5: FIRE FIGHTER MEASURES

Flammability:	Not Flammable
Auto Ignition Temp.	Not Available
Upper Flammable Limit	Not Established
Lower Flammable Limit	Not Established
Explosive Date:	Explosive Power - Not Available Rate of Burning - Not Available
Hazardous Combustion Products:	Not applicable
Special Protective Equipment:	Not Applicable
Extinguishing Media:	Not Applicable
Extinguishing Media To Be Avoided:	Not Applicable
Special Fire Fighting Procedures:	Not Applicable

Section 6: ACCIDENTAL RELEASE MEASURES

Step to be Taken if Material is Released or Spilled:	Eliminate and/or contain source with inert material (sand, earth, absorbent pads, etc.). Wear basic eye and skin protection. Floor may be slightly slippery; so use care to avoid falling. Avoid discharge to natural waters, and/or dilute with water. Transfer liquids to suitable containers for recovery, re-use or disposal. Contact IVEY for technical assistance if required.

Section 7: HANDLING AND STORAGE

Handling Procedures:	Avoid contact with eyes, skin, and clothing. Do not swallow. Keep containers closed or sealed when not in use. Wash thoroughly after handling.
Storage:	Keep closed or sealed when not in use. Do not allow to freeze.
Ventilation:	General mechanical room ventilation is expected to be satisfactory.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Gloves / Type Gloves / Type:	Latex, or similar would be sufficient.
Respiratory / Type:	None expected to be needed. However, if an engineered / industrial application where vapors and/or misting may occur, wear MSHA/NIOSH approved half mask air purifying respirator.
Eye / Type:	Mono Goggles or similar.
Footwear / Type:	No special requirements.
Clothing / Type:	Wear an apron and /or coveralls.
Other / Type:	Eye bath.
Engineering Controls:	General mechanical room ventilation is expected to be satisfactory.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical state:	Water Based Liquid
Appearance:	Clear to slightly Cloudy White Color
Odor:	Mild
Molecular Weight:	Mixture (Not Applicable)
Boiling Point:	Not Applicable
Freezing Point:	Around 0°C (32 °F)
Pour Point:	Not Applicable
Melting Point:	Not Applicable
Specific Gravity:	0.99-1.04 (Water = 1.0)
Vapor Pressure:	<0.01 mm Hg
Vapor Density:	> 1 (Air = 1.00)
pH:	Not Available (Typically 6.5-7.5 Range)
Solubility In Water:	100%
Evaporation Rate:	<0.01
Coefficient of Oil/Water Distribution	Not Determined

Section 10: STABILITY AND REACTIVITY

Stability:	Stable
Conditions to Avoid:	Prolonged excessive heat may cause product decomposition. Freezing should also be avoided as it may cause product decomposition. In some cases it may cause irreversible changes.
Incompatible Materials:	Normally un-reactive; however avoid strong bases at high temperatures, strong acids, strong oxidizing agents, and materials with reactive hydroxyl compounds. These compounds would damage the mixture and reduce its effectiveness during application.
Hazardous Decomposition Products:	Not applicable.
Hazardous Polymerization:	Will not occur.

Section 11: TOXICOLOGICAL INFORMATION

Exposure Limit of Material:	Not Established
LD/50:	Not Available
LC/50:	Not Available
EL:	Not Established
Carcinogenicity of Material:	None Known
Reproductive Effects:	Not Available
Irritancy of Material:	See Section 3
Sensitizing Capability:	Not Available
Synergistic Materials:	Not Available

LD: Lethal Dose LC: Lethal Concentration EL: Exposure Limit

Section 12: ECOLOGICAL CONSIDERATIONS

Environmental Toxicity:	Low Potential to affect aquatic organisms*
Biodegradability:	>90% in 28 days**
LC/50:	48 Hour: 0.11 %, Species: Daphnia magna
LC/50:	96 Hour: 0.07695%, Species: Rainbow Trout

* When used in accordance with Ivey International Inc. In-situ and Ex-situ Remediation Application Guidelines.

** Based on actual testing or on data for similar material(s). Degradation Biodegradation reached in Modified OECD Screening Test (OECD Test No.301 E) after 28 days: 90 %. Biodegradation reached in CO2 Evolution Test (Modified Sturm Test, OECD Test No. 301 B) after 28 days: 70 %.

All available ecological data have been taken into account for the development of the hazard and precautionary information contained in this Material Safety Data Sheet.

Section 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method:	For aqueous DECON-IT mixture solutions; aerobic biological wastewater treatment systems are effective in treating said mixtures. DECON-IT does not have any known negative affect on coagulant or flocculent water treatment processes.

Section 14: TRANSPORTATION INFORMATION

UN Number:	Not Applicable
TDG Classification:	Not Required
Shipping Name:	DECON-IT
Packing Group:	Not Applicable
Special Shipping Instructions:	Do not allow to freeze

Section 15: REGULATORY INFORMATION

WHMIS Classification:	Not Controlled as per WHMIS Regulation.
CPR Compliance:	This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
CEPA Compliance:	All ingredients of this product are listed on the DSL.

Ref:DECON-IT/MSDS/100609-01(Revised June 11, 2010)