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SUPPLEMENTAL SITE INVESTIGATION & CORRECTIVE ACTION REPORT

Property:

K-51 Pipeline Release
Sections 34 and 35, T26N, R6W
Rio Arriba County, New Mexico

October 5, 2011
SWG Project No. 0410003

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TABLE OF CONTENTS

LIST OF APPENDICES

SUPPLEMENTAL SITE INVESTIGATION & CORRECTIVE ACTION REPORT

K-51 Pipeline Release
Sections 34 and 35, T26N, R6W
Rio Arriba County, New Mexico
SWG Project No. 0410003

1.0 INTRODUCTION

1.1 SITE LOCATION AND HISTORY

The K-51 pipeline release site is located at the boundary of Sections 34 and 35, Township 26 North, Range 6 West, in Rio Arriba County, New Mexico, referred to hereinafter as the "Site" or "subject Site". The Site consists of silty/sandy canyon bottomland with native grasses, and is crossed by a natural gas pipeline operated by Enterprise Field Services, LLC (Enterprise).

On April 13, 2010, approximately 10 barrels of natural gas condensate were released from the Enterprise natural gas gathering pipeline at the Site, due to internal corrosion. Subsequent to the completion of excavation and off-site disposal of petroleum hydrocarbon affected soils, confirmation soil samples were collected from the excavation by Souder, Miller and Associates (SMA). In addition, one (1) groundwater sample was collected from the groundwater which recharged into the excavation. The excavation was then backfilled with unaffected soils.

In June 2010, eight (8) soil borings (BH-1 through BH-8) were advanced on-site by LT Environmental (LTE). Subsequent to advancement, four (4) of the soil borings were converted to groundwater monitoring wells (MW-1 through MW-4). Based on the results of soil and groundwater sampling activities, constituent of concern (COC) concentrations were identified in soil above the New Mexico Energy, Minerals and Natural Resources Department (EMNRD), Oil Conservation Division (OCD) *Remediation Action Levels* (RALs) and in groundwater above the New Mexico Water Quality Control Commission (WQCC) *Groundwater Quality Standards (GQSs).*

The Site is subject to regulatory oversight by the New Mexico Energy, Minerals, and Natural Resources Department OCD. To address activities related to condensate releases, the New Mexico OCD utilizes the *Guidelines for Remediation of Leaks, Spills and Releases* as guidance, in addition to the OCD rules, specifically NMAC 19.15.30 Remediation. These guidance documents establish investigation and abatement action requirements for sites subject to reporting and/or corrective action.

A topographic map is included as Figure 1, a 2005 aerial photograph of the Site vicinity is included as Figure 2, and a Site plan is included as Figure 3 of Appendix A.

1.2 CHEMICALS OF CONCERN

The soil and groundwater samples collected during initial corrective action and site investigation activities were analyzed for total petroleum hydrocarbons (TPH) gasoline range organics (GRO)/diesel range organics (DRO) utilizing EPA method SW-846 #8015M and benzene, toluene, ethylbenzene and xylenes (BTEX) using EPA SW-846 method #8021B.

- Based on the laboratory analytical results from the initial corrective action and site investigation activities, TPH GRO/DRO concentrations were identified in soil samples collected from soil boring BH-1 in exceedance of the New Mexico OCD *Remediation Action Level.*

- Based on the laboratory analytical results from the initial corrective action and site investigation activities, benzene, toluene and xylenes concentrations were identified in the groundwater samples collected from the excavation completed during initial corrective actions and from monitoring wells MW-1, MW-2, MW-3 and MW-4 in exceedance of the NMWQCC *Water Quality Standards.*

Figure 3 indicates the approximate locations of the soil borings/monitoring wells in relation to pertinent Site features and general Site boundaries. Figure 5 presents the *Remediation Action Level* Exceedance in soil based on the June 8, 2010 analytical data. Comprehensive soil and groundwater analytical results for the Site are included in Tables 1 and 2, respectively (Appendix B).

1.3 OBJECTIVES OF CORRECTIVE ACTION

The primary objective of the supplemental site investigation activities was to further evaluate the magnitude and extent of dissolved phase COCs in groundwater.

The primary objective of the corrective actions was to reduce COC concentrations in soil and groundwater at the Site to levels below the NMWQCC *Water Quality Standards* utilizing in-situ chemical oxidation (ISCO).

2.0 SITE CHARACTERIZATION

2.1 GEOLOGY & HYDROGEOLOGY

According to the New Mexico Bureau of Geology and Mineral Resource (Geologic Map of New Mexico 2003), the Site overlies the upper Nacimiento or lower San Jose geologic formation. The Nacimiento geologic formation is a heterogeneous non-marine formation composed of sandstone, siltstone, and shale, comprised of sediment eroded from the San Juan and Brazos-Sangre de Cristo uplifts. The Paleocene-age Nacimiento Group includes the Puerco and Torrejon Formations. The Eocene age San Jose geologic formation contains a mixture of clastic sedimentary rocks varying from siltstone to conglomerate, dominated by rocks containing sand-sized particles.The lithology encountered at the Site during boring activities are composed of Quaternary alluvial deposits derived from erosion of the parent San Jose sandstones and siltstones which comprise the canyon walls. Based on the data collected during the completion of soil borings, the alluvia generally consist of brown silty sands and silty clays from the ground surface to at least 20 feet bgs.

The lithology observed during the advancement of soil boring SB-9 at the Site included a moderate yellowish brown sand from the surface to approximately 8.0 feet bgs. The sand stratum was underlain by a moderate yellowish brown to grayish brown tight clay from 8.0 feet bgs to 11.0 feet bgs. A moderate brown sand was encountered from 11.0 feet bgs to 13.0 feet bgs. The sand stratum was underlain by a moderate yellowish brown to olive brown sandy clay to a terminus depth of 16.0 feet bgs. The lithologies observed in the remaining soil borings at the Site (SB-10 through MW-17) were similar to soil boring SB-9. Detailed lithologic descriptions are presented on the soil borings logs included in Appendix C.

The major aquifer underlying the Site vicinity is listed as the Colorado Plateaus Aquifer, which is made up of four smaller aquifers, the Uinta-Animas, the Mesa Verde, the Dakota-Glen, and the Coconino-De Chelly. The Uinta-Animas is the shallowest of these aquifers, and is present in the San Juan Basin. The general composition of the aquifers is moderately to well-consolidated sedimentary rocks of an age ranging from Permian to Tertiary. Each aquifer is separated from the others by an impermeable confining unit. Two of the confining units are completely impermeable and cover the entire area of the aquifers. The other two confining units are less extensive and are thinner. These units allow water to flow between the principal aquifers. There are countless streams, rivers, and lakes that overlay the Colorado Plateaus Aquifers. The surface water bodies in this region provide a place for the aquifers to discharge. Some of the high altitude rivers and lakes may also provide recharge.

The initial groundwater-bearing unit (GWBU) at the Site was encountered at depths ranging from 8 to 10 feet bgs during the investigation activities.

2.1.1 GROUNDWATER FLOW

Monitoring well top-of-casing (TOC) elevations were surveyed and referenced to Section corner benchmarks. Groundwater measurements were collected utilizing an interface probe capable of detecting the presence of light non-aqueous phase liquids (NAPL). NAPL was not observed in the monitoring wells during the completion of gauging activities.

Based on the groundwater elevations identified in association with each of the monitoring wells, the groundwater gradient at the Site slopes generally to the west-northwest at an average gradient of 0.015 ft/ft.

Figures 4A and 4B are Groundwater Gradient Maps which depict the groundwater elevations identified during the most recent gauging events. Table 3 (Appendix B) includes the gauging date, depth to groundwater and groundwater elevations for the gauging event(s) performed at the Site.

2.1.2 GROUNDWATER CLASSIFICATION

In accordance with 19.15.30 NMAC *Remediation*, a groundwater-bearing unit is classified as an "Underground Source of Drinking Water" provided the groundwater-bearing unit is capable of producing water for human consumption or that contains ground water having a TDS concentration of 10,000 mg/l or less and that is not an exempted aquifer".

2.2 LAND USE & CLASSIFICATION

Due to the absence of land use classification guidelines in the OCD *Guidelines for Remediation of Leaks, Spills and Releases* and/or NMAC 19.15.30 *Remediation*, land use was determined by comparison of existing land use of the Site to the definitions for residential and non-residential land use published in the available New Mexico Environment Department (NMED) regulatory guidance. Based on the available NMED guidance, non-residential land use encompasses all commercial and industrial land uses.

The Site, adjacent and surrounding (beyond adjacent) properties are currently utilized as undeveloped agricultural rangeland. Based on SWG's review of the available information and visual inspection of the Site and vicinity, the Site appears to meet the non-residential land use classification.

2.3 SITE RANKING & PROPOSED CLEANUP GOALS

The Site is subject to regulatory oversight by the New Mexico EMNRD OCD. To address activities related to condensate releases, the New Mexico EMNRD OCD utilizes the *Guidelines for Remediation of Leaks, Spills and Releases* as guidance, in addition to the OCD rules, specifically NMAC 19.15.30 *Remediation*. These guidance documents establish investigation and abatement action requirements for sites subject to reporting and/or corrective action.

In accordance with the OCD's *Guidelines for Remediation of Leaks, Spills and Releases*, SWG utilized the general site characteristics to determine the appropriate "ranking" for the Site. The ranking criteria and associated scoring are provided in the following table:

Ranking Criteria			Ranking Score
Depth to Groundwater	<50 feet	20	20
	50 to 99 feet	10	
	>100 feet	0	
Wellhead Protection Area • <1,000 feet from a water source, or; <200 feet from private domestic water source.	Yes	20	0
	No	0	
Distance to Surface Water Body	<200 feet	20	20
	200 to 1,000 feet	10	
	>1,000 feet	0	
Total Ranking Score			**40**

Based on SWG's evaluation of the scoring criteria, the Site would have a Total Ranking Score of 40. This ranking is based on the following:

- The depth to the initial groundwater-bearing zone is <50 feet at the Site.
- Nearby drinking water sources were not identified within 1,000 feet of the Site.

- Tapicito Creek is adjacent to the Site.

Based on a Total Ranking Score of 40, cleanup goals for soil located at the Site include: 10 mg/Kg for benzene, 50 mg/Kg for total BTEX and 100 mg/Kg for TPH GRO/DRO.

In addition, cleanup goals for groundwater located at the Site include the NMWQCC *Water Quality Standards* of: 10 µg/L for benzene, 750 µg/L for toluene, 750 µg/L for ethylbenzene, and 620 µg/L for xylenes.

3.0 SUPPLEMENTAL SITE INVESTIGATION

3.1 SOIL BORINGS & MONITORING WELLS

As part of the approved scope of work, nine (9) soil borings (SB-9, SB-10, MW-11 through MW-14, SB-15, MW-16, and MW-17) were advanced in and around the former K-51 release area during April 2011. Soil borings MW-11 and MW-12 were advanced upgradient of the former point of release. Soil boring MW-13 was advanced cross-gradient (north) of the former point of release, and soil borings SB-9, SB-10, MW-14, SB-15, MW-16, and MW-17 were advanced downgradient of the former point of release.

Figure 3 of Appendix A is a Site Map which depicts the location of the remediation injection points and monitoring wells.

Soil samples were collected continuously, utilizing four-foot core barrel samplers to the termination depth of each soil boring. Soil samples were observed to document soil lithology, color, moisture content, and visual and olfactory evidence of petroleum hydrocarbons. Field headspace analysis was conducted by placing the portion of the soil sample designated for field screening into a plastic Ziplock® bag. The plastic bag was sealed, and the sample allowed to volatilize. The air above the sample, the headspace, was then evaluated using a photoionization detector (PID) capable of detecting volatile organic compounds (VOCs). The PID was calibrated utilizing an isobutylene standard prior to use in the field.

During the completion of each soil boring, an on-Site geoscientist documented the lithology encountered and constructed a continuous profile of the soil column from the surface to the boring terminus. Soil samples from each boring location were visually inspected and classified in the field. The lithology observed during the advancement of soil boring SB-10 at the Site included moderate yellowish brown silty sands from the ground surface to approximately nine (9) feet bgs, overlying sandy and/or silty clay to a depth of approximately 12 feet bgs. A moderate yellowish brown to olive brown silty sand was observed from 12 feet bgs to the terminus of the boring at 16 feet bgs. The remaining soil borings advanced during the drilling activities exhibited lithologic columns similar to that observed at SB-10. Detailed lithologic descriptions are presented on the monitoring well soil boring logs included in Appendix C.

Overall, PID readings ranged from one (1) part per million (ppm) to 522 ppm. Soil borings SB-9, SB-10 and SB-15 exhibited PID readings above 100 ppm near the apparent capillary fringe zone, and subsequently were not completed as delineation monitoring wells. A PID reading of 32 ppm was documented near the capillary fringe zone in soil boring MW-14. Significant petroleum hydrocarbon vapors were not detected with the PID in soil samples collected from soil borings MW-11, MW-12, MW-13, MW-16 or MW-17. Field screening results are presented on soil boring logs included in Appendix C.

Subsequent to advancement, soil borings MW-11, MW-12, MW-13, MW-14, MW-16, and MW-17 were converted to permanent groundwater monitoring wells. The monitoring wells were completed using the following methodology:

- Installation of 10 feet of 2-inch inside diameter, 0.010-inch machine slotted PVC well screen with a threaded bottom cap;
- Installation of 2-inch inside diameter, threaded flush joint PVC riser pipe to the ground surface;
- Addition of a pre-sieved 10/20 grade annular silica sand pack from the bottom of the soil boring to 2-feet above the top of the well screen;
- Addition of a hydrated bentonite seal above the sand pack filter zone;
- Addition of grout to the surface; and,
- Installation of a locking well cap and protective steel riser.

Monitoring well construction details are presented on the monitoring well logs included in Appendix C.

3.2 INVESTIGATION SAMPLING PROGRAM

3.2.1 SOIL SAMPLING PROGRAM

Soils identified in exceedance of the New Mexico OCD *Remediation Action Levels* during the initial corrective actions and site investigation activities were limited to soil boring BH-1, near the former point of release. The remaining soil samples did not exhibit TPH GRO/DRO or total BTEX concentration in exceedance of the New Mexico OCD *Remediation Action Levels*, therefore, analytical soil samples were not collected from soil borings SB-9 through MW-17.

3.2.2 GROUNDWATER SAMPLING PROGRAM

Prior to sample collection, each monitoring well (MW-1 through MW-4, MW-11, MW-12, MW-13, MW-14, MW-16 and MW-17) was micro-purged utilizing low-flow sampling techniques. Low-flow refers to the velocity with which groundwater enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective was to pump in a manner that minimizes stress (drawdown) to the system to the extent practical taking into account established site sampling objectives. Flow rates on the order of 0.1 to 0.5 L/min were maintained during the sampling activities using dedicated sampling equipment.

The utilization of low-flow minimal drawdown techniques enables the isolation of the screened interval groundwater from the overlying stagnant casing water. The pump intake is placed within the screened interval such that the groundwater recovered is drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone.

The monitoring wells were purged until produced groundwater was consistent in color, clarity, pH, dissolved oxygen (DO), oxidation/reduction potential (ORP), temperature, and conductivity.

3.3 LABORATORY ANALYTICAL PROGRAM

The groundwater samples were analyzed for TPH GRO/DRO using EPA method SW-846 #8015B and BTEX using EPA method SW-846 method #8021B.

Laboratory results are summarized in the tables included in Appendix B. The executed chain-of-custody form and laboratory data sheets are provided in Appendix D.

3.4 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

All non-disposable sampling equipment was cleaned using an Alconox® wash and potable water rinse prior to the beginning of the project and before the collection of each sample.

Soil and groundwater samples were collected and placed in laboratory prepared glassware, sealed with custody tape and placed on ice in a cooler, which was secured with a custody seal. The sample coolers and completed chain-of-custody forms were relinquished to Hall Environmental Analytical Laboratory (HEAL) in Albuquerque, New Mexico for standard turnaround.

HEAL performed the analyses of samples under an adequate and documented quality assurance program to meet the project and data quality objectives. The laboratory's quality assurance program is generally consistent the quality standards outlined in the National Environmental Laboratory Accreditation Program, as amended. In addition, the data generated by HEAL meet the intralaboratory performance standards for the selected analytical method and the performance standards are sufficient to meet the bias, precision, sensitivity, representativeness, comparability, and completeness, as specified in the project data quality objectives.

3.5 DATA EVALUATION

The Site is subject to regulatory oversight by the New Mexico EMNRD OCD. To address activities related to crude oil/condensate related releases, the New Mexico EMNRD OCD utilizes the *Guidelines for Remediation of Leaks, Spills and Releases* as guidance, in addition to the EMNRD/OCD rules, specifically New Mexico Administrative Code (NMAC) 19.15.30 Remediation. These guidance documents establish investigation and abatement action requirements for sites subject to reporting and/or corrective action.

SWG compared BTEX concentrations or practical quantitation limits (PQLs) associated with the groundwater samples collected from the monitoring wells to the New Mexico WQCC *Groundwater Quality Standards*.

The groundwater samples collected from monitoring wells MW-2, MW-11, MW-12, MW-13, MW-16 and MW-17 during the April 2011 sampling event did not exhibit benzene, toluene, ethylbenzene or xylenes concentrations above the respective WQCC *Groundwater Quality Standards*.

The groundwater samples collected from monitoring wells MW-1, MW-3, MW-4 and MW-14 during the April 2011 sampling event did not exhibit toluene, ethylbenzene or xylenes concentrations above the WQCC *Groundwater Quality Standards*.

The groundwater samples collected from monitoring wells MW-1, MW-3, MW-4 and MW-14 during the April 2011 sampling event exhibited benzene concentrations ranging from 52 µg/L to 2,800 µg/L which exceed the WQCC *Groundwater Quality Standard* of 10 µg/L.

The results of the groundwater sample analyses are summarized in Table 2 of Appendix B. Figure 6A presents the *Groundwater Quality Standard* Exceedance Zone based on the April 21, 2011 groundwater analytical data.

4.0 CORRECTIVE ACTION

The corrective action completed at the Site included ISCO using VeruSolve-HP™, which is an active (vs. passive) remediation alternative.

4.1 INJECTION POINT INSTALLATION

Fifteen (15) injection points were advanced in and around the former K-51 release area during April 2011. Subsequent to advancement, each of the injection points were completed using the following methodology:

- Installation of 5 feet of 1.5-inch inside diameter, 0.010-inch machine slotted PVC well screen with a threaded bottom cap;
- Installation of 1.5-inch inside diameter, threaded flush joint PVC riser pipe to the ground surface;
- Hydration of a pre-packed bentonite seal above the screen;
- Addition of grout to the surface; and,
- Installation of a locking well cap and protective steel riser.

Please note, injection points installed within the former excavation were screened below the floor of the former excavation (approximately 8 feet bgs) to reduce saturation of the backfill material by the injectate.

4.2 IN-SITU CHEMICAL OXIDATION

ISCO is a common and effective corrective action alternative which involves injecting chemical oxidants into the vadose zone and/or groundwater to oxidize organic contaminants. However, the success of ISCO technologies is often significantly influenced by the ability to successfully contact the organic contaminants with the oxidant solution. Petroleum hydrocarbons sequestered within the interstitial pore space must be adequately contacted with an appropriate oxidant reagent dose for complete destruction. Aromatics and some straight chain alkanes have a particular affinity for strong sequestration between clay platelets ("van der Waals force") within the lattice structure). Inoculation of an oxidant reagent without proper adjustments for surface tension or ionization will result in inefficient oxidant-contaminant contact.

The in-situ oxidation inoculation procedures are designed with specific sequencing or phases that will maximize oxidative persistence, penetration into interstitial pore space and partially de-ionize clay platelets easing contaminant desorption. A reduction-oxidation (redox) reaction that reaches third order kinetics can be highly exothermic, quickly driving aqueous phase contaminants into the vapor phase. Controlling the reaction kinetics is essential in maximizing contaminant contact persistence. The in-situ oxidation procedures will form Windsor Type 1 micro-emulsion with petroleum hydrocarbons and the aqueous reagent maximizing destruction efficiency.

During the initial portion of the treatment, the formation was prepared for contaminant oxidation by inoculating the treatment area with an alkaline oxidative de-ionizing solution. This served as a wetting agent, de-ionizing clay platelets and optimizing aqueous reagent contact with contaminants. The initial reagent was delivered through a specifically sequenced treatment train. An aqueous solution containing sodium percarbonate and sodium persulfate was injected through the fifteen (15) injection points. The pre-oxidation alkaline de-ionizing solution also served as a persulfate catalyst (producing sulfate radicals).

The second portion of the treatment was conducted within twenty four (24) hours after injecting the de-ionizing/catalyst solution. During these activities, the treatment area was inoculated using VeruSolve-HP™ aqueous reagent as a Surfactant-Enhanced In-Situ Chemical Oxidation (S-ISCO™) Coelution Technology™. VeruSOLVE-HP™ is a stabilized surfactant-cosolvent/oxidant combination effective for surgical destruction of source term contaminants. Because the rate of partitioning of contaminants into the aqueous phase determines the overall rate of reaction, as the concentration of stabilized surfactant-cosolvent fraction is increased, the partitioning and subsequent rate of chemical oxidation is increased. VeruTEK's stabilized surfactant-cosolvent/oxidant blend achieves Winsor Type I solubilization, where the contaminant is solubilized as a single-phase micro-emulsion and dissolution of constituents occur without mobilization. This allows for the destruction of the contaminants that are currently in a non-aqueous phase (i.e. the source term). The resulting redox reaction will occur over a very long period of time. Reaction kinetics are controlled, sustaining a highly oxidative environment for weeks. Extended persistence greatly increases the contaminant-oxidant contact occurrence, thereby producing very favorable results. Photographic documentation is provided in Appendix E. Manufacturer's information for VeruSOLVE-HP™ is included in Appendix F.

SWG injected an estimated 10,500 gallons of aqueous reagent, proportionately, through each of the fifteen (15) injection points during the May 2011 ISCO event.

Due to the presumed aquifer properties, the aqueous solution of oxidant reagent was injected at a low flow rate and pressure (<30 psi at the well head) to ensure an effective distribution of oxidant in the subsurface.

Figure 3 indicates the approximate locations of the injection points and monitoring wells in relation to pertinent Site features and general Site boundaries.

Groundwater was continuously monitored during injection activities for temperature, electrical conductance, total dissolved solids, dissolved oxygen, pH, oxidation-reduction potential (ORP) and depth during injection through adjacent injection wells using YSI 556 multi-probe monitors and oil/water inter-phase probes.

5.0 CORRECTIVE ACTION EFFECTIVENESS

To evaluate the effectiveness of the VeruSolve-HP™ aqueous reagent on the COCs identified in groundwater at the Site, SWG collected groundwater samples from each of the monitoring wells during June 2011.

5.1 GROUNDWATER SAMPLING PROGRAM

Groundwater samples were collected from monitoring wells MW-1, MW-2, MW-3, MW-4, MW-11, MW-12, MW-13, MW-14, MW-16, and MW-17 approximately six (6) weeks following the conclusion of ISCO activities.

Prior to sample collection, the monitoring wells were micro-purged utilizing low-flow sampling techniques. Low-flow refers to the velocity with which groundwater enters the pump intake and that is imparted to the formation pore water in the immediate vicinity of the well screen. It does not necessarily refer to the flow rate of water discharged at the surface which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow-rate for a given hydrological situation. The objective was to pump in a manner that minimizes stress (drawdown) to the system to the extent practical taking into account established site sampling objectives. Flow rates on the order of 0.1 to 0.5 L/min were maintained during the sampling activities using dedicated sampling equipment.

The utilization of low-flow minimal drawdown techniques enables the isolation of the screened interval groundwater from the overlying stagnant casing water. The pump intake is placed within the screened interval such that the groundwater recovered is drawn in directly from the formation with little mixing of casing water or disturbance to the sampling zone.

The monitoring wells were purged until produced groundwater was consistent in color, clarity, pH, dissolved oxygen (DO), oxidation/reduction potential (ORP), temperature, and conductivity.

The groundwater samples were analyzed for TPH GRO/DRO using EPA method SW-846 #8015B and BTEX using EPA method SW-846 method #8021B. Laboratory results are summarized in Table 2, included in Appendix B. The executed chain-of-custody form and laboratory data sheets are provided in Appendix D.

5.2 LABORATORY ANALYTICAL RESULTS

SWG compared the identified BTEX concentrations or PQLs associated with the groundwater samples collected from the monitoring wells to the New Mexico WQCC *Groundwater Quality Standards.*

The groundwater samples collected from monitoring wells MW-2, MW-11, MW-12, MW-13, MW-16 and MW-17 during the June 2011 sampling event (post-ISCO) did not exhibit benzene, toluene, ethylbenzene or xylenes concentrations above the respective WQCC *Groundwater Quality Standards.*

The groundwater samples collected from monitoring wells MW-1, MW-3, MW-4 and MW-14 during the June 2011 sampling event (post-ISCO) did not exhibit toluene, ethylbenzene or xylenes concentrations above the WQCC *Groundwater Quality Standards.*

The groundwater samples collected from monitoring wells MW-1, MW-3, MW-4 and MW-14 during the June 2011 sampling event (post-ISCO) exhibited benzene concentrations ranging from 17 µg/L to 820 µg/L, which exceed the WQCC *Groundwater Quality Standard* of 10 µg/L.

The results of the groundwater sample analyses are summarized in Table 2 of Appendix B. Figure 6B presents the *Groundwater Quality Standard* Exceedance Zone based on the June 21, 2011 groundwater analytical data.

6.0 FINDINGS AND RECOMMENDATIONS

The primary objective of the supplemental site investigation activities was to further evaluate the magnitude and extent of dissolved phase COCs in groundwater. The primary objective of the corrective actions was to reduce COC concentrations in soil and groundwater at the Site to levels below the NMWQCC *Water Quality Standards* utilizing ISCO.

- SWG installed six (6) monitoring wells and fifteen (15) injection points at the former K-51 release Site utilizing a Geoprobe® drilling rig.

- The aqueous reagent was injected through the fifteen (15) injection points installed in the vicinity of the former point of release. SWG injected an estimated 10,500 gallons of aqueous reagent, proportionately, through the fifteen (15) injection wells during May 2011. Due to the presumed aquifer properties, the aqueous solution of oxidant reagent was injected at a low flow rate and pressure (<30 psi at the well head) to ensure an effective distribution of oxidant in the subsurface.

- To evaluate the effectiveness of the VeruSolve-HP™ aqueous reagent on the COCs identified in groundwater at the Site, SWG collected groundwater samples from the ten (10) monitoring wells approximately six (6) weeks following the conclusion of injection activities.
- Groundwater from four (4) monitoring wells (MW-1, MW-3, MW-4 and MW-14) currently exhibits benzene concentrations above the WQCC *Groundwater Quality Standard* of 10 µg/L. Two (2) monitoring wells, MW-4 and MW-14, exhibit benzene concentrations that have decreased by 97% and 83 %, respectfully, from the April 2011 quarterly monitoring event. The remaining two (2) monitoring wells exhibiting benzene exceedances, MW-1 and MW-3, exhibit benzene concentrations that are higher than those measured during the April 2011 quarterly monitoring event. The benzene concentration at monitoring well MW-1 has increased 91%, and the benzene concentration at MW-3 has increased 19%. These increases may be the result of the emulsification (by the surfactant) of contaminants in and above the capillary fringe reaching the groundwater after the injected oxidant had been expended. Overall, the concentrations at MW-1 and MW-3 are both 78% less than the twelve-month average benzene concentrations from these wells of 3,710 µg/L (MW-1) and 281 µg/L (MW-3).
- The groundwater samples collected from monitoring wells MW-2, MW-11, MW-12, MW-13, MW-16, and MW-17 did not exhibit BTEX constituent concentrations above the respective WQCC *Groundwater Quality Standards.*

Based on the results of the supplemental site investigation, additional monitoring wells would be required to delineate the extent of COCs in groundwater to below the New Mexico WQCC *Groundwater Quality Standards.*

Based on results of the ISCO activities, the VeruSolve-HP™ aqueous reagent was moderately effective a reducing the concentrations of COCs in groundwater at the source area. The apparent increase in concentrations at two (2) of the monitoring wells may further reinforce the effectiveness of the emulsification process in liberating adsorbed COCs from the soil, while also indicating that COCs were present in excess of the calculated mass used to determine the proper oxidant load.

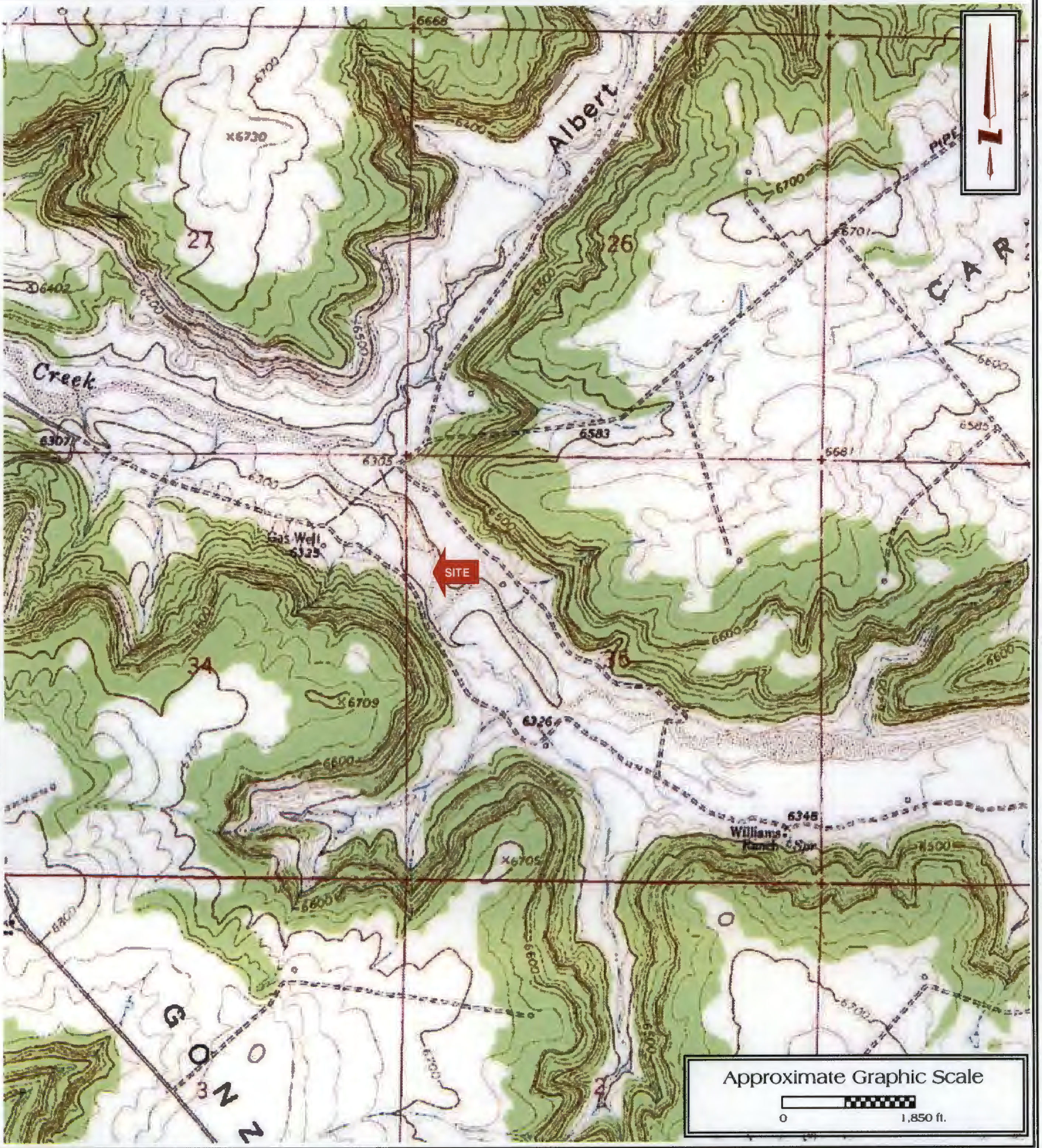
Based on the results of investigation and corrective action activities, SWG has the following recommendations:

- Report the results of the investigative and corrective actions to the OCD;
- Perform additional delineation activities to the west, to complete the delineation of the dissolve-phase plume; and,

- Pursuant to the completion of additional delineation activities, perform additional ISCO activities to reduce the concentrations of COCs in soil to below the OCD *Remediation Action Levels* and groundwater to below the New Mexico WQCC *Groundwater Quality Standards*.

APPENDIX A

Figures



K-51 Pipeline Release

N36° 26' 47.77"; W107° 26' 46.04"

Off County Road 537

Rio Arriba, New Mexico

SWG Project No. 0410003

Southwest GEOSCIENCE

FIGURE 1

Topographic Map

Gonzales Mesa, NM Quadrangle

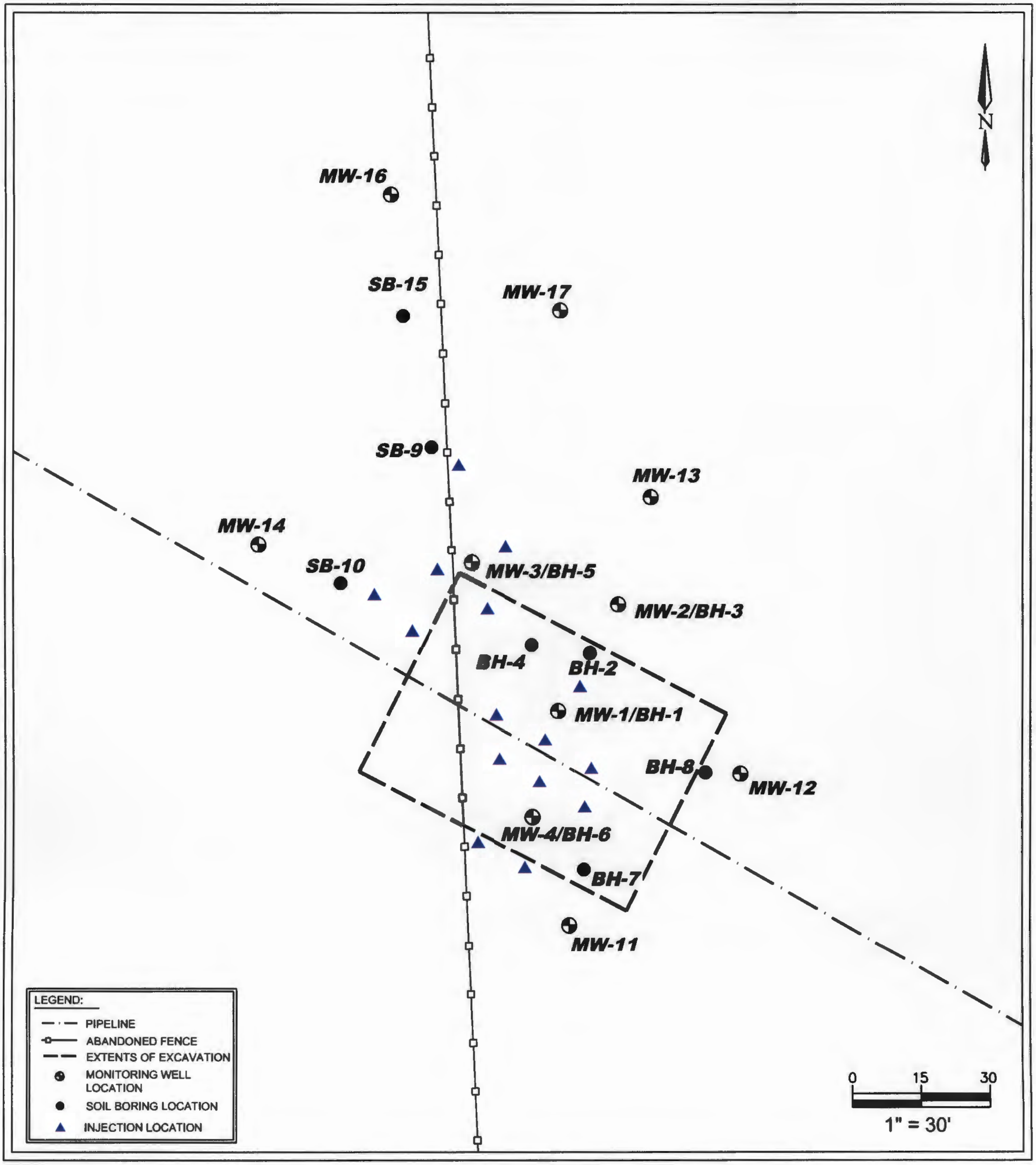
Contour Interval - 10 Feet

K-51 Pipeline Release
N36° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Arriba, New Mexico

SWG Project No. 0410003

Southwest
GEOSCIENCE

FIGURE 2
Site Vicinity Map
2005 Aerial Photograph



K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Ariba County, New Mexico

SWG Project No. 0410003

Southwest
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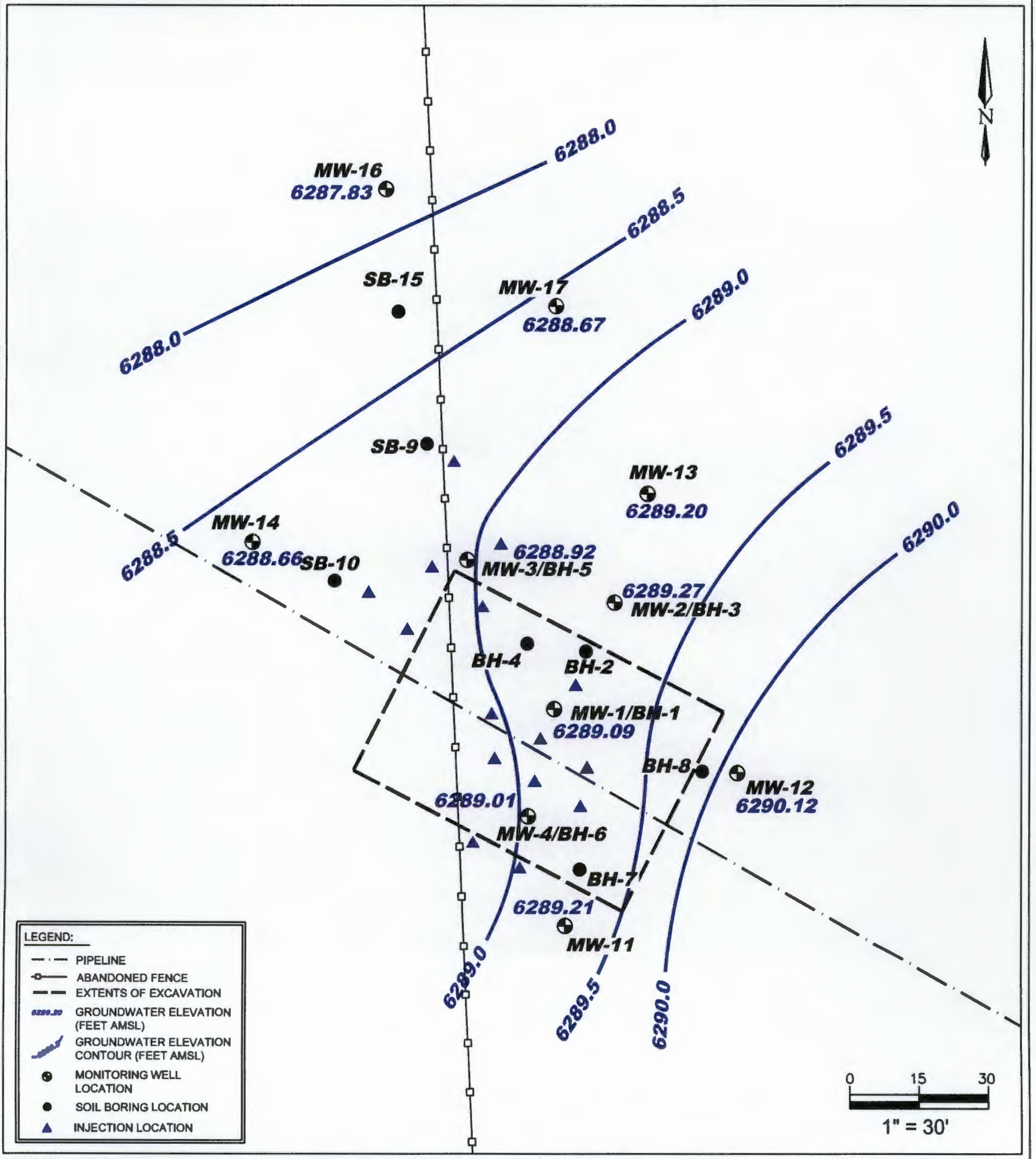
FIGURE 3

SITE MAP



K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Ariba County, New Mexico

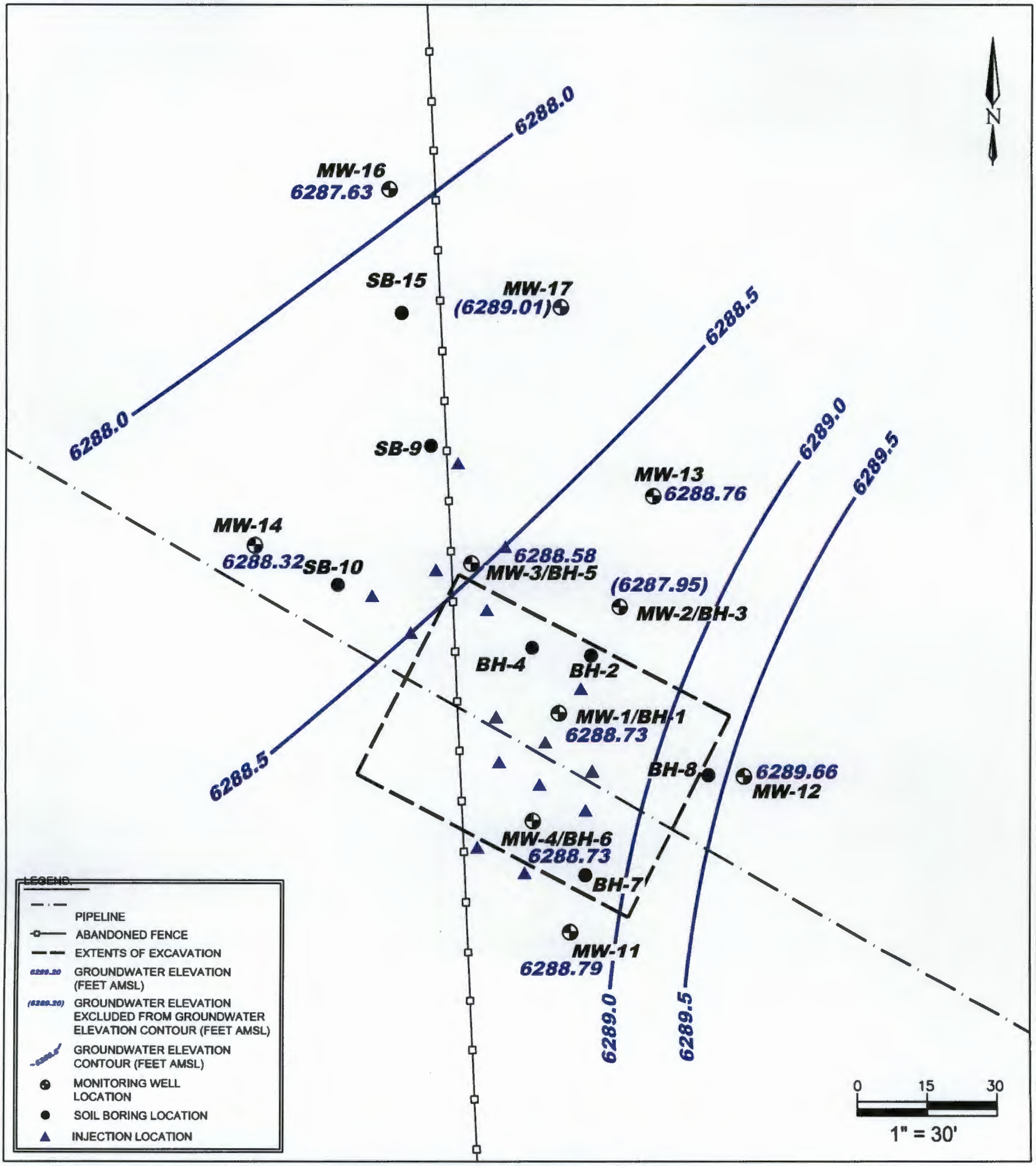
SWG Project No. 0410003

Southwest
GEOSCIENCE

FIGURE 4A

GROUNDWATER
GRADIENT MAP

APRIL 21, 2011



K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Ariba County, New Mexico

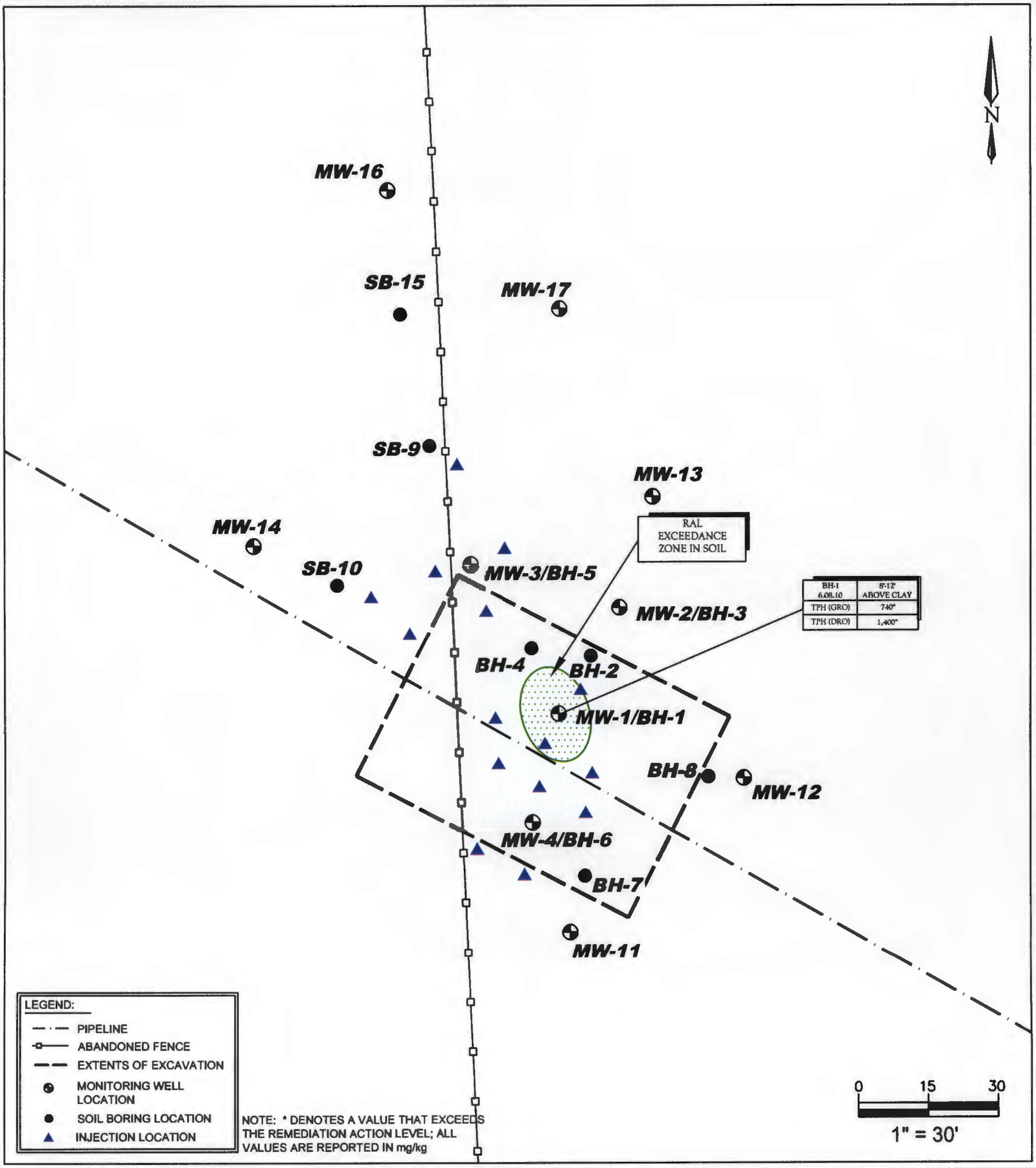
SWG Project No. 0410003

Southwest
GEOSCIENCE

FIGURE 4B

GROUNDWATER
GRADIENT MAP

JUNE 21, 2011



BH-1 6.08.10	8'-12' ABOVE CLAY
TPH (GRO)	740*
TPH (DRO)	1,400*

NOTE: * DENOTES A VALUE THAT EXCEEDS THE REMEDIATION ACTION LEVEL; ALL VALUES ARE REPORTED IN mg/kg

K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Ariba County, New Mexico

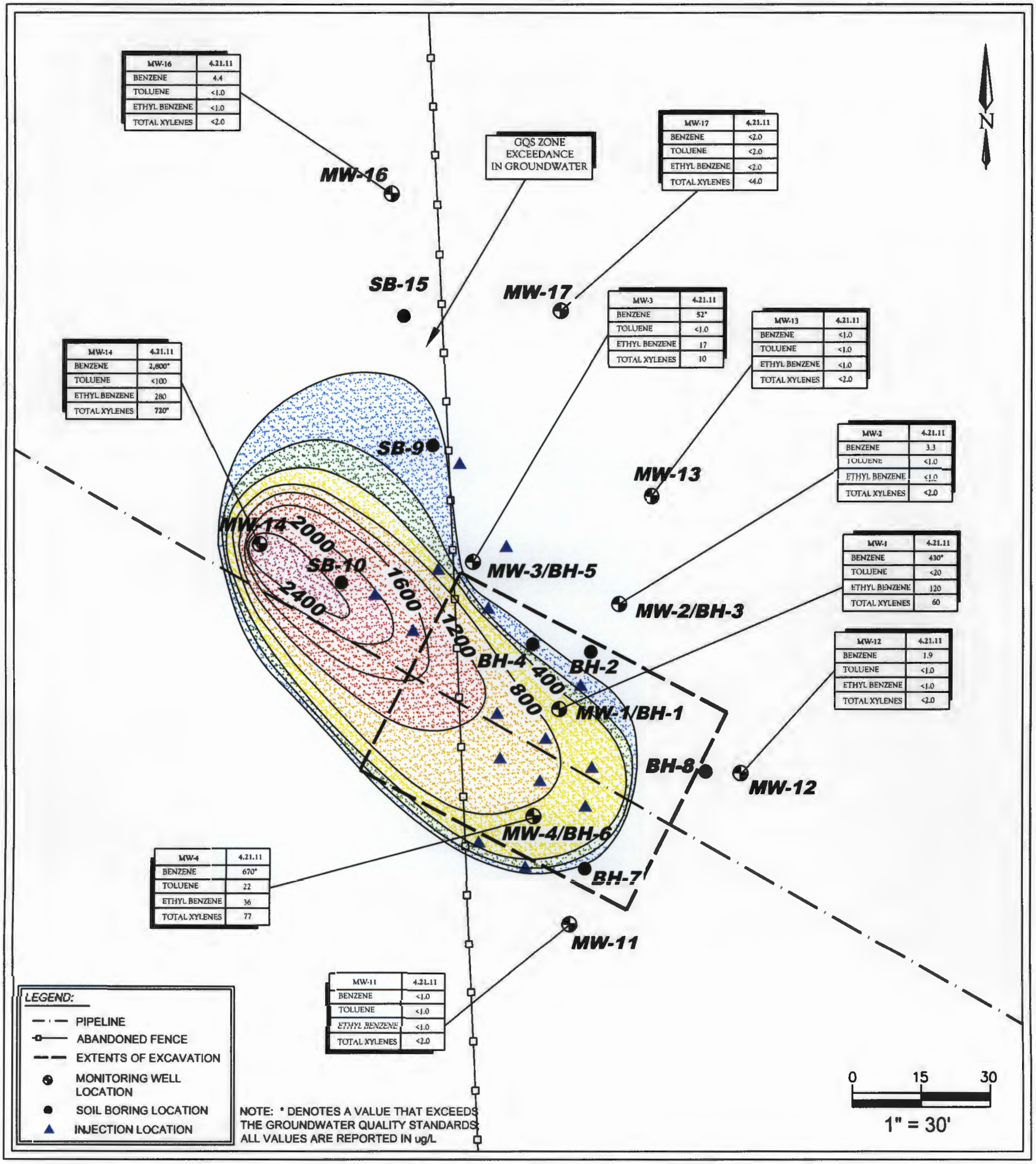
SWG Project No. 0410003

Southwest
GEOSCIENCE

FIGURE 5

REMEDIATION ACTION LEVEL (RAL) EXCEEDANCE ZONE IN SOIL MAP

JUNE 08, 2010



MW-16	4.21.11
BENZENE	4.4
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-17	4.21.11
BENZENE	<2.0
TOLUENE	<2.0
ETHYL BENZENE	<2.0
TOTAL XYLENES	<4.0

MW-3	4.21.11
BENZENE	52*
TOLUENE	<1.0
ETHYL BENZENE	17
TOTAL XYLENES	10

MW-13	4.21.11
BENZENE	<1.0
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-14	4.21.11
BENZENE	2,800*
TOLUENE	<100
ETHYL BENZENE	280
TOTAL XYLENES	720*

MW-2	4.21.11
BENZENE	3.3
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-1	4.21.11
BENZENE	430*
TOLUENE	<20
ETHYL BENZENE	120
TOTAL XYLENES	60

MW-12	4.21.11
BENZENE	1.9
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-4	4.21.11
BENZENE	670*
TOLUENE	22
ETHYL BENZENE	36
TOTAL XYLENES	77

MW-11	4.21.11
BENZENE	<1.0
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

NOTE: * DENOTES A VALUE THAT EXCEEDS THE GROUNDWATER QUALITY STANDARDS. ALL VALUES ARE REPORTED IN ug/L

K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Ariba County, New Mexico

SWG Project No. 0410003

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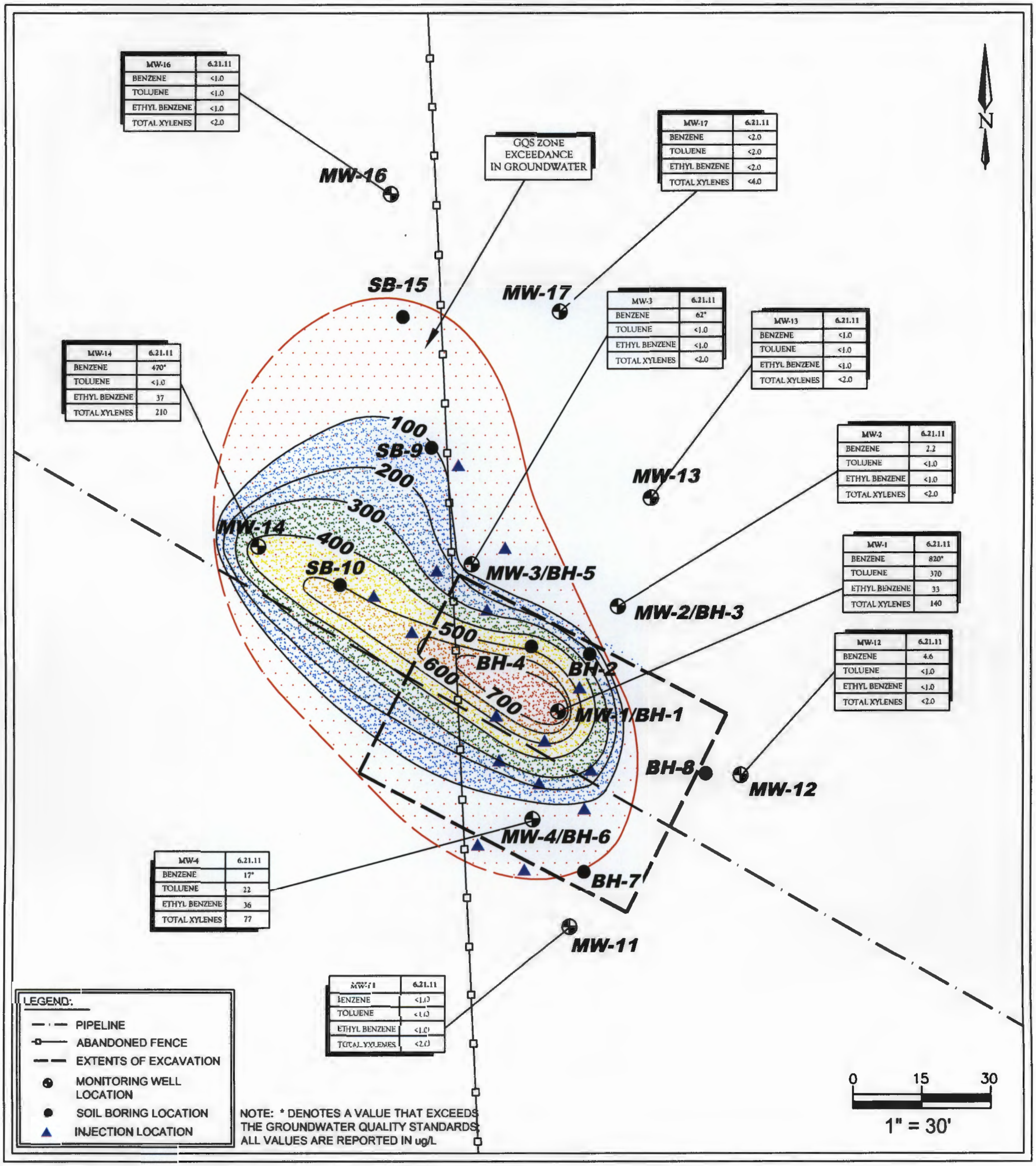
FIGURE 6A

GROUNDWATER QUALITY STANDARD (GQS) EXCEEDANCE ZONE IN GROUNDWATER MAP

APRIL 21, 2011



MW-16	6.21.11
BENZENE	<1.0
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-17	6.21.11
BENZENE	<2.0
TOLUENE	<2.0
ETHYL BENZENE	<2.0
TOTAL XYLENES	<4.0

MW-3	6.21.11
BENZENE	62*
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-13	6.21.11
BENZENE	<1.0
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-14	6.21.11
BENZENE	470*
TOLUENE	<1.0
ETHYL BENZENE	37
TOTAL XYLENES	210

MW-2	6.21.11
BENZENE	2.2
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-1	6.21.11
BENZENE	820*
TOLUENE	370
ETHYL BENZENE	33
TOTAL XYLENES	140

MW-12	6.21.11
BENZENE	4.6
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

MW-4	6.21.11
BENZENE	17*
TOLUENE	22
ETHYL BENZENE	36
TOTAL XYLENES	77

MW-11	6.21.11
BENZENE	<1.0
TOLUENE	<1.0
ETHYL BENZENE	<1.0
TOTAL XYLENES	<2.0

LEGEND:

—·—	PIPELINE
—□—	ABANDONED FENCE
— —	EXTENTS OF EXCAVATION
⊕	MONITORING WELL LOCATION
●	SOIL BORING LOCATION
▲	INJECTION LOCATION

NOTE: * DENOTES A VALUE THAT EXCEEDS THE GROUNDWATER QUALITY STANDARDS. ALL VALUES ARE REPORTED IN ug/L

K-51 Pipeline Release
N35° 26' 47.77"; W107° 26' 46.04"
Off County Road 537
Rio Ariba County, New Mexico

SWG Project No. 0410003

Southwest
GEOSCIENCE

FIGURE 6B

GROUNDWATER QUALITY STANDARD (GQS) EXCEEDANCE ZONE IN GROUNDWATER MAP

JUNE 21, 2011

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APPENDIX B

Tables

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TABLE 1
K-51 PIPELINE RELEASE
SOIL ANALYTICAL SUMMARY

Sample I.D.	Date	Sample Depth (feet)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	TPH GRO (mg/kg)	TPH DRO (mg/kg)
New Mexico Entergy, Mineral & Natural Resources Department, Oil Conservation Division, Remediation Action Level			10	NE	NE	NE	100	
SMA Confirmation Samples								
North Wall	4.21.10		<0.05	<0.05	<0.05	<0.1	<5.0	49
South Wall	4.23.10		<0.05	<0.05	<0.05	<0.1	<5.0	10
East Wall	4.23.10		<0.05	<0.05	<0.05	<0.1	<5.0	26
West Wall	4.24.10		<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
Soil Borings Installed by LTE								
BH-1	6.8.10	8-12 above clay	<2.5	31	6.8	72	**740**	**1,400**
BH-1	6.8.10	8-12 below clay	0.12	<0.05	<0.05	<0.1	<5.0	<10.0
BH-1	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-2	6.8.10	8-12	<0.05	0.062	<0.05	0.19	8.5	12
BH-2	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-3	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-4	6.8.10	8-12	0.055	0.74	0.12	1.3	25	45
BH-4	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-5	6.8.10	8-12	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-5	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-6	6.8.10	12-16	<0.05	0.72	0.12	1.2	16	<10.0
BH-7	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0
BH-8	6.8.10	12-16	<0.05	<0.05	<0.05	<0.1	<5.0	<10.0

Note: Concentrations in **bold** and yellow exceed the applicable OCD Remediation Action Level

NE = Not Established

Southwest
GEOSCIENCE

TABLE 2
K-51 PIPELINE RELEASE
GROUNDWATER ANALYTICAL SUMMARY

Sample I.D.	Date	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	TPH GRO (mg/L)	TPH DRO (mg/L)
New Mexico Water Quality Control Commmission Groundwater Quality Standards		10	750	750	620	NE	NE
SMA Data from Open Excavation							
Excavation	4.21.10	**7,000**	**13,000**	540	**5,200**	NA	NA
SWG Groundwater Samples							
MW-1	6.21.10	**8,400**	**1,300**	560	**4,200**	NA	NA
	9.24.10	**2,300**	28	200	520	8.4	<1.0
	4.21.11	**430**	<20	120	60	2.1	<1.0
	6.21.11	**820**	370	33	140	5.1	130
MW-2	6.21.10	**200**	53	14	96	NA	NA
	9.24.10	2.3	<1.0	<1.0	<2.0	<0.050	<1.0
	4.21.11	3.3	<1.0	<1.0	<2.0	0.065	<1.0
	6.21.11	2.2	<1.0	<1.0	<2.0	<0.050	<1.0
MW-3	6.21.10	**640**	57	72	**1,000**	NA	NA
	9.24.10	**150**	<1.0	16	28	0.48	<1.0
	4.21.11	**52**	<1.0	17	10	0.25	<1.0
	6.21.11	**62**	14	13	160	0.67	<1.0
MW-4	6.21.10	**3,600**	**10,000**	600	**6,600**	NA	NA
	9.24.10	**870**	**870**	260	**1,600**	12	1
	4.21.11	**670**	<20	520	**790**	6.3	<1.0
	6.21.11	**17**	22	36	77	0.64	1.1
MW-11	4.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
MW-12	4.21.11	1.9	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.11	4.6	<1.0	<1.0	<2.0	0.063	<1.0
MW-13	4.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
	6.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
MW-14	4.21.11	**2,800**	<100	280	**720**	8.7	<1.0
	6.21.11	**470**	<10	37	210	1.9	<1.0
MW-16	4.21.11	4.4	<2.0	<2.0	<4.0	<0.10	<1.0
	6.21.11	<1.0	<1.0	<1.0	<2.0	<0.050	<1.0
MW-17	4.21.11	<2.0	<2.0	<2.0	<4.0	<0.10	<1.0
	6.21.11	<2.0	<2.0	<2.0	<4.0	<0.10	<1.0

Note: Concentrations in **bold** and yellow exceed the applicable OCD Remediation Action Level

NA = Not Analyzed

NE = Not Established

TABLE 3

K-51 Pipeline Release

GROUNDWATER ELEVATIONS

Well I.D.	Date	Depth to Product (feet BTOC)	Depth to Water (feet BTOC)	Product Thickness	TOC Elevations (feet AMSL)	Groundwater Elevation* (feet AMSL)
MW-1	4.21.11	ND	11.80	ND	6300.89	6289.09
MW-1	6.21.11	ND	12.16	ND	6300.89	6288.73
MW-2	4.21.11	ND	10.55	ND	6299.82	6289.27
MW-2	6.21.11	ND	11.87	ND	6299.82	6287.95
MW-3	4.21.11	ND	11.30	ND	6300.22	6288.92
MW-3	6.21.11	ND	11.64	ND	6300.22	6288.58
MW-4	4.21.11	ND	11.90	ND	6300.91	6289.01
MW-4	6.21.11	ND	12.18	ND	6300.91	6288.73
MW-11	4.21.11	ND	11.98	ND	6301.19	6289.21
MW-11	6.21.11	ND	12.40	ND	6301.19	6288.79
MW-12	4.21.11	ND	8.96	ND	6299.08	6290.12
MW-12	6.21.11	ND	9.42	ND	6299.08	6289.66
MW-13	4.21.11	ND	9.07	ND	6298.27	6289.20
MW-13	6.21.11	ND	9.51	ND	6298.27	6288.76
MW-14	4.21.11	ND	12.54	ND	6301.20	6288.66
MW-14	6.21.11	ND	12.88	ND	6301.20	6288.32
MW-16	4.21.11	ND	12.06	ND	6299.89	6287.83
MW-16	6.21.11	ND	12.26	ND	6299.89	6287.63
MW-17	4.21.11	ND	9.90	ND	6298.57	6288.67
MW-17	6.21.11	ND	9.56	ND	6298.57	6289.01

BTOC - below top of casing
AMSL - aboce mean sea level
TOC - top of casing
* - corrected for presence of phase-sepated hydrocarbon using a site-specific density correction factor of 0.63
ND - Not Detected

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APPENDIX C

Monitoring Well Soil Boring Logs

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 1.5"
Sampler OD: 1.5"

Soil Boring / Monitoring Well Number: SB-9
Project #: 0410003
Drawn By: RDH
Approved By: KS

Well Diam: NA
Screen Size: NA
Screen Length: NA
Casing Length: NA

BORING METHOD
- HSA - HOLLOW STEM AUGERS
- CFA - CONTINUOUS FLIGHT AUGERS
- GP - GEOPROBE
- AR - AIR ROTARY

SAMPLER TYPE
- CB - FIVE FOOT CORE BARREL
- SS - DRIVEN SPLIT SPOON
- ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
- ▽ AT COMPLETION
- ▼ AT WELL STABILIZATION

Monitor Well Detail	SOIL CLASSIFICATION	Stratum Depth
	SURFACE ELEVATION:	
	SAND, Moderate Yellowish Brown, Moist, No Odor	░
	CLAY, Moderate Yellowish Brown to Grayish Brown, Tight, Moist to Wet, No Odor	▨
	SAND, Saturated, Hydrocarbon Odor	░
	SAND, Moderate Yellowish Brown, No Odor	░
	SANDY CLAY, Moderate Yellowish Brown to Olive Brown, No Odor	▨
	Bottom of Boring @ 16 ft bgs	

Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)
					4
					5
					10
					14
5					9
					22
					12
					6.1
					-
10				▼	522
					311
					252
					24
					1.5
15					1
					1
					-
20					
25					
30					

BORING AND SAMPLING NOTES

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 1.5"
Sampler OD: 1.5"

Soil Boring / Monitoring Well Number: SB-10
Project #: 0410003
Drawn By: RDH
Approved By: KS

Well Diam: NA
Screen Size: NA
Screen Length: NA
Casing Length: NA

BORING METHOD
- HSA - HOLLOW STEM AUGERS
- CFA - CONTINUOUS FLIGHT AUGERS
- GP - GEOPROBE
- AR - AIR ROTARY

SAMPLER TYPE
- CB - FIVE FOOT CORE BARREL
- SS - DRIVEN SPLIT SPOON
- ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
- ▽ AT COMPLETION
- ▼ AT WELL STABILIZATION

Monitor Well Detail

SOIL CLASSIFICATION

SURFACE ELEVATION:

Soil Classification	Stratum Depth
SAND, Moderate Yellowish Brown, Moist, No Odor	░
SANDY CLAY, Moderate Yellowish Brown, Wet, Slight Odor	▨
SILTY CLAY, Moderate Yellowish Brown to Olive Brown, Wet, Slight Hydrocarbon Odor	▨
SILTY SAND, Moderate Yellowish Brown to Olive Brown, No Odor	░

Bottom of Boring @ 16 ft bgs

Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)	BORING AND SAMPLING NOTES
					9	
					-	
5					14	
					29	
				▽	303	
10						Thin Apparent Staining @ 10 ft bgs
					253	
					50	
15					12	
20						
25						
30						

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 3.25"
Sampler OD: 1.5"

Well Diam: 2"
Screen Size: 0.01
Screen Length: 10'
Casing Length: 6'

Soil Boring / Monitoring Well Number: MW-11
Project #: 0410003
Drawn By: RDH
Approved By: KS

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
GP - GEOPROBE
AR - AIR ROTARY

SAMPLER TYPE
CB - FIVE FOOT CORE BARREL
SS - DRIVEN SPLIT SPOON
ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
▽ AT COMPLETION
▼ AT WELL STABILIZATION

Monitor Well Detail

SOIL CLASSIFICATION
SURFACE ELEVATION:

SAND & SILTY SAND, Moderate Yellowish Brown, Moist, No Odor

SILTY CLAY, Moderate Yellowish Brown, Wet, No Odor

SILTY SAND, Moderate Yellowish Brown to Olive Brown, Wet, No Odor

Bottom of Boring @ 16 ft bgs

Stratum Depth	Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)	BORING AND SAMPLING NOTES
						6	
						-	
	5					7	
						8	
						8	
	10				▽	8	
						10	
	15					8	
						7	
	20						
	25						
	30						

NOTE: This log is not to be used outside of the original report.

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GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 3.25"
Sampler OD: 1.5"

Well Diam: 2"
Screen Size: 0.01
Screen Length: 10'
Casing Length: 5'

Soil Boring / Monitoring Well Number: MW-12
Project #: 0410003
Drawn By: RDH
Approved By: KS

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
GP - GEOPROBE
AR - AIR ROTARY

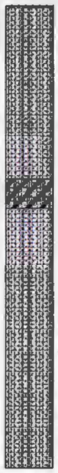
SAMPLER TYPE
CB - FIVE FOOT CORE BARREL
SS - DRIVEN SPLIT SPOON
ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
▽ AT COMPLETION
▼ AT WELL STABILIZATION

Monitor Well Detail

SOIL CLASSIFICATION
SURFACE ELEVATION:

Stratum Depth



SOIL CLASSIFICATION	Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)	BORING AND SAMPLING NOTES
SAND & SILTY SAND, Moderate Yellowish Brown, Moist, No Odor						-	
						2	
	5					3	
SILTY CLAY & CLAY, Moderate Yellowish Brown, Moist, No Odor SILTY SAND & CLAY, Moderate Yellowish Brown to Olive Brown, Wet @ 7 ft bgs, No Odor					▼	6	
						10	
	10					7	Interbedded Clay @ 10 - 11 ft bgs
						4	
	15					7	
Bottom of Boring @ 16 ft bgs							
	20						
	25						
	30						

NOTE: This log is not to be used outside of the original report.

Southwest
GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 3.25"
Sampler OD: 1.5"
Well Diam: 2"
Screen Size: 0.01
Screen Length: 10'
Casing Length: 5'

Soil Boring / Monitoring Well Number: MW-13
Project #: 0410003
Drawn By: RDH
Approved By: KS

BORING METHOD
- HSA - HOLLOW STEM AUGERS
- CFA - CONTINUOUS FLIGHT AUGERS
- GP - GEOPROBE
- AR - AIR ROTARY

SAMPLER TYPE
- CB - FIVE FOOT CORE BARREL
- SS - DRIVEN SPLIT SPOON
- ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
- ▽ AT COMPLETION
- ▼ AT WELL STABILIZATION

Monitor Well Detail

SOIL CLASSIFICATION

SURFACE ELEVATION:

SILTY SAND, Moderate Yellowish Brown, Moist, No Odor

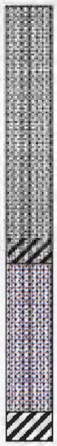
SILTY CLAY, Moderate Yellowish Brown, Wet @ 8 ft bgs, No Odor

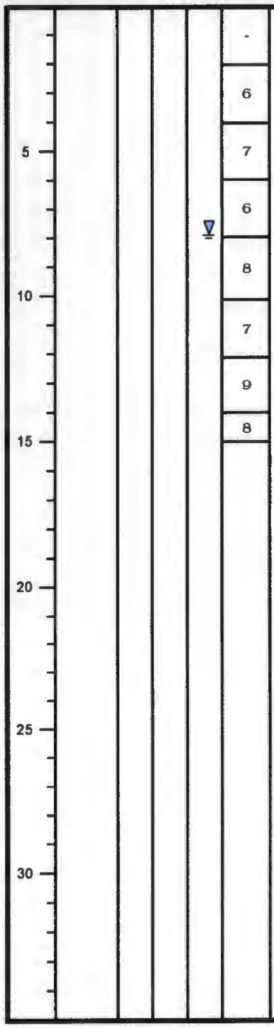
SILTY SAND & CLAY, Wet, No Odor

CLAY, Olive Brown, No Odor

Bottom of Boring @ 15 ft bgs

Stratum Depth





FID/PID Readings (ppm)
-
6
7
6
8
7
9
8

BORING AND SAMPLING NOTES

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/20/11
Date Completed: 4/20/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 3.25"
Sampler OD: 1.5"

Soil Boring / Monitoring Well Number: MW-14
Project #: 0410003
Drawn By: RDH
Approved By: KS

Well Diam: 2"
Screen Size: 0.01
Screen Length: 10'
Casing Length: 6'

BORING METHOD
- HSA - HOLLOW STEM AUGERS
- CFA - CONTINUOUS FLIGHT AUGERS
- GP - GEOPROBE
- AR - AIR ROTARY

SAMPLER TYPE
- CB - FIVE FOOT CORE BARREL
- SS - DRIVEN SPLIT SPOON
- ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
- ▼ AT COMPLETION
- ▼ AT WELL STABILIZATION

Monitor Well Detail

SOIL CLASSIFICATION

SURFACE ELEVATION:

SILTY SAND, Moderate Yellowish Brown, Moist, No Odor

SILTY SAND with Thin Silty Clay, Moderate Yellowish Brown, Wet @ 10 ft bgs, No Odor

Bottom of Boring @ 16 ft bgs

Stratum Depth

Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)
					-
					4
5					6
					7
					8
10				▼	
					32
					9
15					7
20					
25					
30					

BORING AND SAMPLING NOTES

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 1.5"
Sampler OD: 1.5"

Well Diam: NA
Screen Size: NA
Screen Length: NA
Casing Length: NA

Soil Boring / Monitoring Well Number: SB-15
Project #: 0410003
Drawn By: RDH
Approved By: KS

BORING METHOD
- HSA - HOLLOW STEM AUGERS
- CFA - CONTINUOUS FLIGHT AUGERS
- GP - GEOPROBE
- AR - AIR ROTARY

SAMPLER TYPE
- CB - FIVE FOOT CORE BARREL
- SS - DRIVEN SPLIT SPOON
- ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
- ▽ AT COMPLETION
- ▼ AT WELL STABILIZATION

SOIL CLASSIFICATION

SURFACE ELEVATION:

SILTY SAND, Moderate Brown, Thin Clay @ 8 ft bgs, Wet @ 8 ft bgs

SILTY SAND, Moderate Yellowish Brown to Grayish Brown, Stained @ 9 ft bgs, Hydrocarbon Odor

SILTY SAND & CLAY, Moderate Yellowish Brown to Olive Brown, Wet, No Odor

Bottom of boring @ 16 ft bgs

Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)
					-
					7
5					7
					8
				▼	393
10					
					411
					27
15					8
20					
25					
30					

BORING AND SAMPLING NOTES

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 3.25"
Sampler OD: 1.5"

Soil Boring / Monitoring Well Number: MW-16
Project #: 0410003
Drawn By: RDH
Approved By: KS

Well Diam: 2"
Screen Size: 0.01
Screen Length: 10'
Casing Length: 5'

BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
GP - GEOPROBE
AR - AIR ROTARY

SAMPLER TYPE
CB - FIVE FOOT CORE BARREL
SS - DRIVEN SPLIT SPOON
ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
▼ AT COMPLETION
▼ AT WELL STABILIZATION

Monitor Well Detail

SOIL CLASSIFICATION
SURFACE ELEVATION:

SILTY SAND, Moderate Yellowish Brown, Moist, No Odor

CLAY, Moderate Yellowish Brown to Grayish Brown, Wet @ 8 ft bgs, No Odor

SILTY SAND, Olive Brown, Wet, Slight Hydrocarbon Odor

Bottom of Boring @ 16 ft bgs

Stratum Depth	Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)	BORING AND SAMPLING NOTES
						-	
						7	
	5					7	
						9	
					▽	5	
	10					2	
						5	
	15					7	
	20						
	25						
	30						

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

Client: Enterprise Products Operating, LLC
Project Name: K-51 Pipeline Release
Project Location: Rio Arriba County, NM
Project Manager: K. Summers

SOIL BORING/MONITORING WELL LOG

DRILLING & SAMPLING INFORMATION

Date Started: 4/19/11
Date Completed: 4/19/11
Drilling Company: Earth Worx
Driller: Louis Trujillio
Geologist: K. Summers
Boring Method: GP
Bore Hole Dia: 3.25"
Sampler OD: 1.5"
Well Diam: 2"
Screen Size: 0.01
Screen Length: 10'
Casing Length: 5'

Soil Boring / Monitoring Well Number: MW-17
Project #: 0410003
Drawn By: BDH
Approved By: KS

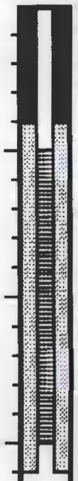
BORING METHOD
HSA - HOLLOW STEM AUGERS
CFA - CONTINUOUS FLIGHT AUGERS
GP - GEOPROBE
AR - AIR ROTARY

SAMPLER TYPE
CB - FIVE FOOT CORE BARREL
SS - DRIVEN SPLIT SPOON
ST - PRESSED SHELBY TUBE

GROUNDWATER DEPTH
▽ AT COMPLETION
▼ AT WELL STABILIZATION

BORING AND SAMPLING NOTES

Monitor Well Detail



SOIL CLASSIFICATION
SURFACE ELEVATION:

SILTY SAND, Moderate Yellowish Brown, Moist, No Odor
CLAY, Moderate Yellowish Brown, Wet, No Odor
SILTY SAND, Olive Brown, Wet No Odor
CLAY & SILTY CLAY, Moderate Yellowish to Olive Brown, Wet, No Odor
SILTY SAND, Moderate Yellowish to Olive Brown, Wet, No Odor
Bottom of Boring @ 16 ft bgs

Stratum Depth

Depth Scale	Sample No.	Sample Interval	% Recovery	Groundwater Depth	FID/PID Readings (ppm)
					-
					13
5					8
				▽	11
					11
10					11
					7
15					8
20					
25					
30					

NOTE: This log is not to be used outside of the original report.

Southwest GEOSCIENCE

APPENDIX D

Laboratory Data Reports & Chain of Custody Documentation

HALL ENVIRONMENTAL ANALYSIS LABORATORY

COVER LETTER

Tuesday, July 05, 2011

Kyle Summers
Southwest Geoscience
606 S. Rio Grande Unit A
Aztec, NM 87410

TEL: (214) 350-5469
FAX (214) 350-2914

RE: K-51 Release

Order No.: 1106972

Dear Kyle Summers:

Hall Environmental Analysis Laboratory, Inc. received 10 sample(s) on 6/23/2011 for the analyses presented in the following report.

These were analyzed according to EPA procedures or equivalent. Below is a list of our accreditations. To access our accredited tests please go to www.hallenvironmental.com or the state specific web sites. See the sample checklist and/or the Chain of Custody for information regarding the sample receipt temperature and preservation. Data qualifiers or a narrative will be provided if the sample analysis or analytical quality control parameters require a flag. All samples are reported as received unless otherwise indicated.

Please do not hesitate to contact HEAL for any additional information or clarifications.

Sincerely,

Andy Freeman, Laboratory Manager

NM Lab # NM9425 NM0901
AZ license # AZ0682

4901 Hawkins NE ■ Suite D ■ Albuquerque, NM 87109
505.345.3975 ■ Fax 505.345.4107
www.hallenvironmental.com

Hall Environmental Analysis Laboratory, Inc.

Date: *05-Jul-11*
Analytical Report

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-11
Lab Order:	1106972	**Collection Date:**	6/21/2011 10:00:00 AM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-01	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 3:30:48 AM
Surr: DNOP	113	97.7-132		%REC	1	6/24/2011 3:30:48 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/23/2011 3:25:37 PM
Surr: BFB	108	65.4-141		%REC	1	6/23/2011 3:25:37 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	ND	1.0		µg/L	1	6/23/2011 3:25:37 PM
Toluene	ND	1.0		µg/L	1	6/23/2011 3:25:37 PM
Ethylbenzene	ND	1.0		µg/L	1	6/23/2011 3:25:37 PM
Xylenes, Total	ND	2.0		µg/L	1	6/23/2011 3:25:37 PM
Surr: 4-Bromofluorobenzene	102	89.6-125		%REC	1	6/23/2011 3:25:37 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-12
Lab Order:	1106972	**Collection Date:**	6/21/2011 10:35:00 AM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-02	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 4:04:53 AM
Surr: DNOP	109	97.7-132		%REC	1	6/24/2011 4:04:53 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	0.063	0.050		mg/L	1	6/23/2011 3:54:33 PM
Surr: BFB	110	65.4-141		%REC	1	6/23/2011 3:54:33 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	4.6	1.0		µg/L	1	6/23/2011 3:54:33 PM
Toluene	ND	1.0		µg/L	1	6/23/2011 3:54:33 PM
Ethylbenzene	ND	1.0		µg/L	1	6/23/2011 3:54:33 PM
Xylenes, Total	ND	2.0		µg/L	1	6/23/2011 3:54:33 PM
Surr: 4-Bromofluorobenzene	102	89.6-125		%REC	1	6/23/2011 3:54:33 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: *05-Jul-11*

Analytical Report

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-2
Lab Order:	1106972	**Collection Date:**	6/21/2011 11:05:00 AM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-03	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 4:39:00 AM
Surr: DNOP	108	97.7-132		%REC	1	6/24/2011 4:39:00 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/23/2011 4:23:30 PM
Surr: BFB	114	65.4-141		%REC	1	6/23/2011 4:23:30 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	2.2	1.0		µg/L	1	6/23/2011 4:23:30 PM
Toluene	ND	1.0		µg/L	1	6/23/2011 4:23:30 PM
Ethylbenzene	ND	1.0		µg/L	1	6/23/2011 4:23:30 PM
Xylenes, Total	ND	2.0		µg/L	1	6/23/2011 4:23:30 PM
Surr: 4-Bromofluorobenzene	103	89.6-125		%REC	1	6/23/2011 4:23:30 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-13
Lab Order:	1106972	**Collection Date:**	6/21/2011 11:40:00 AM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-04	**Matrix:**	AQUEOUS

Analyses	**Result**	**PQL**	**Qual**	**Units**	**DF**	**Date Analyzed**
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 5:12:53 AM
Surr: DNOP	107	97.7-132		%REC	1	6/24/2011 5:12:53 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/23/2011 4:52:26 PM
Surr: BFB	110	65.4-141		%REC	1	6/23/2011 4:52:26 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	ND	1.0		µg/L	1	6/23/2011 4:52:26 PM
Toluene	ND	1.0		µg/L	1	6/23/2011 4:52:26 PM
Ethylbenzene	ND	1.0		µg/L	1	6/23/2011 4:52:26 PM
Xylenes, Total	ND	2.0		µg/L	1	6/23/2011 4:52:26 PM
Surr: 4-Bromofluorobenzene	104	89.6-125		%REC	1	6/23/2011 4:52:26 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

Page 4 of 10

4

Hall Environmental Analysis Laboratory, Inc.

Date: *05-Jul-11*

Analytical Report

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-3
Lab Order:	1106972	**Collection Date:**	6/21/2011 12:10:00 PM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-05	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 5:46:45 AM
Surr: DNOP	107	97.7-132		%REC	1	6/24/2011 5:46:45 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	0.67	0.050		mg/L	1	6/23/2011 5:21:19 PM
Surr: BFB	121	65.4-141		%REC	1	6/23/2011 5:21:19 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	62	1.0		µg/L	1	6/23/2011 5:21:19 PM
Toluene	14	1.0		µg/L	1	6/23/2011 5:21:19 PM
Ethylbenzene	13	1.0		µg/L	1	6/23/2011 5:21:19 PM
Xylenes, Total	160	2.0		µg/L	1	6/23/2011 5:21:19 PM
Surr: 4-Bromofluorobenzene	110	89.6-125		%REC	1	6/23/2011 5:21:19 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: *05-Jul-11*
Analytical Report

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-17
Lab Order:	1106972	**Collection Date:**	6/21/2011 12:40:00 PM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-06	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 6:20:37 AM
Surr: DNOP	112	97.7-132		%REC	1	6/24/2011 6:20:37 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/23/2011 6:19:06 PM
Surr: BFB	109	65.4-141		%REC	1	6/23/2011 6:19:06 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	ND	1.0		µg/L	1	6/23/2011 6:19:06 PM
Toluene	ND	1.0		µg/L	1	6/23/2011 6:19:06 PM
Ethylbenzene	ND	1.0		µg/L	1	6/23/2011 6:19:06 PM
Xylenes, Total	ND	2.0		µg/L	1	6/23/2011 6:19:06 PM
Surr: 4-Bromofluorobenzene	102	89.6-125		%REC	1	6/23/2011 6:19:06 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-16
Lab Order:	1106972	**Collection Date:**	6/21/2011 1:15:00 PM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-07	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 11:17:43 AM
Surr: DNOP	110	97.7-132		%REC	1	6/24/2011 11:17:43 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	ND	0.050		mg/L	1	6/23/2011 6:48:02 PM
Surr: BFB	114	65.4-141		%REC	1	6/23/2011 6:48:02 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	ND	1.0		µg/L	1	6/23/2011 6:48:02 PM
Toluene	ND	1.0		µg/L	1	6/23/2011 6:48:02 PM
Ethylbenzene	ND	1.0		µg/L	1	6/23/2011 6:48:02 PM
Xylenes, Total	ND	2.0		µg/L	1	6/23/2011 6:48:02 PM
Surr: 4-Bromofluorobenzene	104	89.6-125		%REC	1	6/23/2011 6:48:02 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-14
Lab Order:	1106972	**Collection Date:**	6/21/2011 1:50:00 PM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-08	**Matrix:**	AQUEOUS

Analyses	**Result**	**PQL**	**Qual**	**Units**	**DF**	**Date Analyzed**
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	ND	1.0		mg/L	1	6/24/2011 11:52:09 AM
Surr: DNOP	114	97.7-132		%REC	1	6/24/2011 11:52:09 AM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	1.9	0.50		mg/L	10	6/30/2011 6:36:14 PM
Surr: BFB	110	65.4-141		%REC	10	6/30/2011 6:36:14 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	470	10		µg/L	10	6/30/2011 6:36:14 PM
Toluene	ND	10		µg/L	10	6/30/2011 6:36:14 PM
Ethylbenzene	37	10		µg/L	10	6/30/2011 6:36:14 PM
Xylenes, Total	210	20		µg/L	10	6/30/2011 6:36:14 PM
Surr: 4-Bromofluorobenzene	100	89.6-125		%REC	10	6/30/2011 6:36:14 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: *05-Jul-11*
Analytical Report

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-4
Lab Order:	1106972	**Collection Date:**	6/21/2011 2:30:00 PM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-09	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	1.1	1.0		mg/L	1	6/24/2011 12:26:45 PM
Surr: DNOP	112	97.7-132		%REC	1	6/24/2011 12:26:45 PM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	0.64	0.50		mg/L	10	6/30/2011 7:34:07 PM
Surr: BFB	112	65.4-141		%REC	10	6/30/2011 7:34:07 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	17	10		µg/L	10	6/30/2011 7:34:07 PM
Toluene	22	10		µg/L	10	6/30/2011 7:34:07 PM
Ethylbenzene	36	10		µg/L	10	6/30/2011 7:34:07 PM
Xylenes, Total	77	20		µg/L	10	6/30/2011 7:34:07 PM
Surr: 4-Bromofluorobenzene	101	89.6-125		%REC	10	6/30/2011 7:34:07 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Date: *05-Jul-11*
Analytical Report

CLIENT:	Southwest Geoscience	**Client Sample ID:**	MW-1
Lab Order:	1106972	**Collection Date:**	6/21/2011 3:05:00 PM
Project:	K-51 Release	**Date Received:**	6/23/2011
Lab ID:	1106972-10	**Matrix:**	AQUEOUS

Analyses	Result	PQL	Qual	Units	DF	Date Analyzed
EPA METHOD 8015B: DIESEL RANGE						Analyst: **JB**
Diesel Range Organics (DRO)	130	10		mg/L	10	6/24/2011 1:38:18 PM
Surr: DNOP	0	97.7-132	S	%REC	10	6/24/2011 1:38:18 PM
EPA METHOD 8015B: GASOLINE RANGE						Analyst: **RAA**
Gasoline Range Organics (GRO)	5.1	1.0		mg/L	20	6/23/2011 8:14:50 PM
Surr: BFB	109	65.4-141		%REC	20	6/23/2011 8:14:50 PM
EPA METHOD 8021B: VOLATILES						Analyst: **RAA**
Benzene	820	20		µg/L	20	6/23/2011 8:14:50 PM
Toluene	370	20		µg/L	20	6/23/2011 8:14:50 PM
Ethylbenzene	33	20		µg/L	20	6/23/2011 8:14:50 PM
Xylenes, Total	140	40		µg/L	20	6/23/2011 8:14:50 PM
Surr: 4-Bromofluorobenzene	104	89.6-125		%REC	20	6/23/2011 8:14:50 PM

Qualifiers:

*	Value exceeds Maximum Contaminant Level	B	Analyte detected in the associated Method Blank
E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	MCL	Maximum Contaminant Level
NC	Non-Chlorinated	ND	Not Detected at the Reporting Limit
PQL	Practical Quantitation Limit	S	Spike recovery outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: Southwest Geoscience
Project: K-51 Release
Work Order: 1106972

Analyte	Result	Units	PQL	SPK Va	SPK ref	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Method: EPA Method 8015B: Diesel Range											
Sample ID: MB-27335		*MBLK*				Batch ID:	**27335**	Analysis Date:	6/24/2011 1:48:25 AM		
Diesel Range Organics (DRO)	ND	mg/L	1.0								
Sample ID: LCS-27335		*LCS*				Batch ID:	**27335**	Analysis Date:	6/24/2011 2:22:34 AM		
Diesel Range Organics (DRO)	5.803	mg/L	1.0	5	0	116	74	157			
Sample ID: LCSD-27335		*LCSD*				Batch ID:	**27335**	Analysis Date:	6/24/2011 2:56:41 AM		
Diesel Range Organics (DRO)	5.600	mg/L	1.0	5	0	112	74	157	3.55	23	
Method: EPA Method 8015B: Gasoline Range											
Sample ID: 1106972-02A MSD		*MSD*				Batch ID:	**R46114**	Analysis Date:	6/24/2011 12:05:42 AM		
Gasoline Range Organics (GRO)	0.5124	mg/L	0.050	0.5	0.0628	89.9	75.4	121	9.73	10.5	
Sample ID: 5ML RB		*MBLK*				Batch ID:	**R46114**	Analysis Date:	6/23/2011 9:47:52 AM		
Gasoline Range Organics (GRO)	ND	mg/L	0.050								
Sample ID: 5ML-RB		*MBLK*				Batch ID:	**R46270**	Analysis Date:	6/30/2011 10:27:38 AM		
Gasoline Range Organics (GRO)	ND	mg/L	0.050								
Sample ID: 2.5UG GRO LCS		*LCS*				Batch ID:	**R46114**	Analysis Date:	6/23/2011 11:43:39 AM		
Gasoline Range Organics (GRO)	0.5478	mg/L	0.050	0.5	0	110	81.8	120			
Sample ID: 2.5GRO LCS		*LCS*				Batch ID:	**R46270**	Analysis Date:	6/30/2011 12:23:32 PM		
Gasoline Range Organics (GRO)	0.5318	mg/L	0.050	0.5	0	106	81.8	120			
Sample ID: 1106972-02A MS		*MS*				Batch ID:	**R46114**	Analysis Date:	6/23/2011 11:36:51 PM		
Gasoline Range Organics (GRO)	0.5648	mg/L	0.050	0.5	0.0628	100	75.4	121			

Qualifiers:

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	NC	Non-Chlorinated
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits

QA/QC SUMMARY REPORT

Client: Southwest Geoscience
Project: K-51 Release
Work Order: 1106972

Analyte	Result	Units	PQL	SPK Va	SPK ref	%Rec	LowLimit	HighLimit	%RPD	RPDLimit	Qual
Method: EPA Method 8021B: Volatiles											
Sample ID: 1106972-01A MSD		*MSD*				Batch ID:	**R46114**	**Analysis Date:**		**6/23/2011 11:07:55 PM**	
Benzene	15.95	µg/L	1.0	20	0	79.7	92.7	114	6.16	14	S
Toluene	15.65	µg/L	1.0	20	0	78.2	94.6	116	5.53	16.2	S
Ethylbenzene	15.67	µg/L	1.0	20	0	78.4	94.3	114	5.44	12.6	S
Xylenes, Total	46.98	µg/L	2.0	60	0	78.3	95.7	116	5.64	11.9	S
Sample ID: 5ML RB		*MBLK*				Batch ID:	**R46114**	Analysis Date:		6/23/2011 9:47:52 AM	
Benzene	ND	µg/L	1.0								
Toluene	ND	µg/L	1.0								
Ethylbenzene	ND	µg/L	1.0								
Xylenes, Total	ND	µg/L	2.0								
Sample ID: 5ML-RB		*MBLK*				Batch ID:	**R46270**	Analysis Date:		6/30/2011 10:27:38 AM	
Benzene	ND	µg/L	1.0								
Toluene	ND	µg/L	1.0								
Ethylbenzene	ND	µg/L	1.0								
Xylenes, Total	ND	µg/L	2.0								
Sample ID: 100NG BTEX LCS		*LCS*				Batch ID:	**R46114**	Analysis Date:		6/23/2011 12:12:35 PM	
Benzene	18.79	µg/L	1.0	20	0	94.0	80	120			
Toluene	19.01	µg/L	1.0	20	0	95.1	80	120			
Ethylbenzene	18.91	µg/L	1.0	20	0	94.5	80	120			
Xylenes, Total	57.72	µg/L	2.0	60	0	96.2	80	120			
Sample ID: 100NG BTEX LCS		*LCS*				Batch ID:	**R46270**	Analysis Date:		6/30/2011 12:52:27 PM	
Benzene	20.05	µg/L	1.0	20	0	100	80	120			
Toluene	20.27	µg/L	1.0	20	0	101	80	120			
Ethylbenzene	20.48	µg/L	1.0	20	0	102	80	120			
Xylenes, Total	61.35	µg/L	2.0	60	0	102	80	120			
Sample ID: 1106972-01A MS		*MS*				Batch ID:	**R46114**	Analysis Date:		6/23/2011 10:39:08 PM	
Benzene	16.96	µg/L	1.0	20	0	84.8	92.7	114			S
Toluene	16.54	µg/L	1.0	20	0	82.7	94.6	116			S
Ethylbenzene	16.55	µg/L	1.0	20	0	82.7	94.3	114			S
Xylenes, Total	49.71	µg/L	2.0	60	0	82.8	95.7	116			S

Qualifiers:

E	Estimated value	H	Holding times for preparation or analysis exceeded
J	Analyte detected below quantitation limits	NC	Non-Chlorinated
ND	Not Detected at the Reporting Limit	R	RPD outside accepted recovery limits

Hall Environmental Analysis Laboratory, Inc.

Sample Receipt Checklist

Client Name SOUTHWEST GEOSCIENCE

Date Received: 6/23/2011

Work Order Number 1106972

Received by: AT

Sample ID labels checked by: JB/ AT
Initials

Checklist completed by: 06/23/11
Signature Date

Matrix:

Carrier name: Greyhound

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	
Custody seals intact on shipping container/cooler?	Yes ☑	No ☐	Not Present ☐	Not Shipped ☐
Custody seals intact on sample bottles?	Yes ☐	No ☐	N/A ☑	
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		Number of preserved bottles checked for pH:
Water - VOA vials have zero headspace?	No VOA vials submitted ☐	Yes ☑	No ☐	
Water - Preservation labels on bottle and cap match?	Yes ☐	No ☐	N/A ☑	
Water - pH acceptable upon receipt?	Yes ☐	No ☐	N/A ☑	*<2 >12 unless noted below.*
Container/Temp Blank temperature?	1.7°	*<6° C Acceptable* If given sufficient time to cool.		

COMMENTS:

Client contacted

Date contacted:

Person contacted

Contacted by:

Regarding:

Comments:

Corrective Action

CHAIN OF CUSTODY RECORD

Southwest GEOSCIENCE
Environmental & Hydrogeologic Consultants

Office Location Aztec, NM

Project Manager K. Summers

Laboratory: HALL
Address: Albuquerque, NM
Contact: Andy Freeman
Phone: 505. 345. 3975
PO/SO #:

Sampler's Name Jordan Dubuisson
Sampler's Signature

Proj. No. 0410003
Project Name K-51 Release

ANALYSIS REQUESTED
TPH GEO/DRO 8015
BTEX 8021B

Lab use only
Due Date:

Temp. of coolers when received (C°):

1	2	3	4	5

Page 1 of 1

1.7°

Matrix	Date	Time	Comp	Grab	Identifying Marks of Sample(s)	Start Depth	End Depth	VOA	A/G 1 Lt.	250 ml	P/O	TPH GEO/DRO 8015	BTEX 8021B	Lab Sample ID (Lab Use Only)
W	6-21-11	1000		X	MW-11	—	—	5				X	X	1106972 -1
↓	↓	1035		↓	MW-12	↓	↓	↓				↓	↓	-2
↓	↓	1105		↓	MW-2	↓	↓	↓				↓	↓	-3
↓	↓	1140		↓	MW-13	↓	↓	↓				↓	↓	-4
↓	↓	1210		↓	MW-3	↓	↓	↓				↓	↓	-5
↓	↓	1240		↓	MW-17	↓	↓	↓				↓	↓	-6
↓	↓	1315		↓	MW-16	↓	↓	↓				↓	↓	-7
↓	↓	1350		↓	MW-14	↓	↓	↓				↓	↓	-8
↓	↓	1430		↓	MW-4	↓	↓	↓				↓	↓	-9
W	6-21-11	1505		X	MW-1	—	—	5				X	X	-10

Turn around time ☒ Normal ☐ 25% Rush ☐ 50% Rush ☐ 100% Rush

Relinquished by (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
	6-22-11	1425		6/22/11	1425
	6/22/11	1632		6/23/11	0930

NOTES:

Matrix WW - Wastewater W - Water S - Soil SD - Solid L - Liquid A - Air Bag C - Charcoal tube SL - sludge O - Oil
Container VOA - 40 ml vial A/G - Amber / Or Glass 1 Liter 250 ml - Glass wide mouth P/O - Plastic or other

Southwest
GEOSCIENCE

APPENDIX E

Photographic Documentation

1.) General view of injection point field looking west.

2.) View of the ISCO pump trailer.

3.) Injection points connected via manifold to the pumping trailer.

4.) Making flow/pressure adjustments at the injection pumps.

5.) Monitoring groundwater parameters during ISCO activities.

6.) General view of the injectate formulation/mixing prior to injection.

APPENDIX F

Remediation Technologies Information

VeruSOLVE™
MATERIAL SAFETY DATA SHEET

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Manufacturer: VeruTEK Technologies, Inc.
Address: 65 West Dudley Town Road, Suite 100, Bloomfield, CT 06002
Phone Number: (860) 242-9800

Product Name: VeruSOLVE™
Issue Date: January 2010

Section 2: HAZARDS IDENTIFICATION

Emergency Overview

Appearance/Odor: Clear liquid with mild citrus odor.

Stability: Product is stable under normal conditions, but is very sensitive to contamination. Decomposition yields oxygen gas that supports combustion of organic matter and can cause over pressure if confined.

Slippery when spilled.

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact, skin contact, inhalation.

Eye:	Causes moderate to severe irritation.
Skin:	May cause slight redness. Prolonged or repeated exposure may cause drying of the skin.
Inhalation:	May cause nose, throat, and respiratory tract irritation, coughing, headache.
Ingestion:	Not likely to be toxic, but may cause vomiting, headache, or other medical problems.

Medical Conditions Aggravated By Exposure: May irritate the skin of people with pre-existing skin conditions.

This product does not contain any carcinogens or potential carcinogens as listed by OSHA, IARC, or NTP.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

	Percent	TLV	Carcinogenic (OSHA,TP,IARC)
Hydrogen Peroxide	< 4		No
VeruSOL® 3	1 – 5		No
Water	91-95		No

Section 4: FIRST AID MEASURES

Eye Contact:
Flush with water for at least 15 minutes. If irritation persists, seek medical attention.

Skin Contact:
Wash affected area with copious amounts of soap and water for at least 15 minutes. Remove contaminated clothing. If irritation develops, seek medical attention.

Inhalation:
Move to fresh air immediately. If breathing is difficult or discomfort persists, seek medical attention.

Ingestion:
Seek medical attention.

Section 5: FIRE FIGHTING MEASURES

Flash Point (Method): N/A **Explosion Limits**: Upper: N/A Lower: N/A

Suitable Extinguishing Media:
Flood area with water. Product is not combustible but during decomposition will produce oxygen gas which may intensify a fire.

.

Protection of Firefighters:
Vapors may be irritating to eyes, skin and respiratory tract. Firefighters should wear self-contained breathing apparatus (SCBA) and full fire-fighting turnout gear.

Section 6: ACCIDENTAL RELEASE MEASURES

Methods for Accidental Release:
Combustible materials exposed to product should be immediately submerged or rinsed with water to ensure that all hydrogen peroxide is removed. Residual peroxide that may be left after evaporation may cause certain materials to ignite and result in a fire.

Dike spill area and cap leaking containers as necessary to prevent further spreading of spilled material. Absorb small spills with suitable material and put into approved containers.
Larger spills should be contained by blocking nearby sewers, drains, or bodies of water. Dilute with large amounts of water and hold in a dike for disposal or until all hydrogen peroxide has decomposed.

Waste Disposal:
Manage in accordance with applicable local, State, and Federal solid/hazardous waste regulations. Material is not a listed waste.

Other Information: Follow local, State and Federal release reporting requirements

Section 7: HANDLING AND STORAGE

Handling
Wear chemical splash goggles and full face shield, impervious clothing, gloves, and shoes. Avoid cotton, wool, and leather. Avoid excessive heat and contamination. Contamination may cause decomposition and generation of oxygen gas which could results in high pressures and possible container rupture. Never return unused material to the original container. Empty drums should be triple rinsed with water before discarding. Utensils used for handling should be made of glass, stainless steel, aluminum, or plastic. Do not allow this material to come in contact with eyes. Avoid prolonged contact with skin. Use in well ventilated areas. Do not breathe vapors. Thoroughly wash hands with soap and water after handling this material.

Storage
Store containers in well-ventilated area, out of direct sun-light, and away from combustibles. Keep away from incompatible materials and heat, sparks, and flame. Open container slowly to release pressure caused by temperature variations. Product may be packaged in phenolic-lined, steel containers, or fluorinated plastic containers. Storage temperature should not exceed 110°F (43°C) for extended periods of time. Keep container closed when not in use.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines

VeruSOLVE™	N/E	(N/E – Not Established)

Engineering Controls:
Provide ventilation to minimize the release of vapors and mist into the work environment. Spills should be minimized or confined to prevent release from work area. Remove contaminated clothing immediately and wash before reuse. Keep away from sparks and flames.

Eye/Face Protection:
Wear chemical splash-type safety glasses or goggles. Use full face mask if severe splashing is expected during use.

Skin Protection:
Wear chemically resistant clothing, gloves and boots as recommended by the manufacturer.

Respiratory Protection:
If required, use NIOSH approved respiratory protection

Protective Clothing:
Wear impervious clothing as recommended by the manufacturer. (avoid cotton, leather, and wool). Completely submerge any clothing that becomes contaminated with the product in water, before drying. Residual peroxide left to dry on a material such as fabrics, paper, leather, wool, cotton, wood, or other combustible material may cause ignition and result in a fire.

General Hygiene Considerations:
As with any chemical, wash hands thoroughly after handling. Have eyewash facilities immediately available.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Color:	Clear	**Odor:**	Citrus odor.
Physical State:	Liquid	**Boiling Point:**	212°F (100°C)
Specific Gravity:	1.0 @ 77°F (25°C)	**Vapor Pressure**:	N/A
Flash Point:	>120 °F	**Solubility in Water:**	Soluble.

Volatile Organic Compound (VOC) Content: 1-5% by volume.

Note: These specifications represent a typical sample of this product, but actual values may vary. Certificates of Analysis and Specification Sheets are available upon request.

Section 10: STABILITY AND REACTIVITY

Stability: Contamination may cause decomposition and production of oxygen gas.

Conditions to Avoid: Keep away from heat, sparks, flames, and contamination.

Incompatible Materials: Strong reducing agents, iron and other heavy metals, galvanized iron, copper alloys and caustics

Hazardous Decomposition Products: Possible hazardous decomposition products formed under fire conditions – Nature of products is unknown.

Possibility of Hazardous Reactions: Possible under extreme conditions or in presence of incompatible material.

Section 11: TOXICOLOGICAL INFORMATION

Acute Effects
May cause irritation to eyes, nose, and throat.

Chronic Effects
N/A

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: N/A

Persistence/Degradability: This product is subject to reduction or oxidation process and decomposes in to water and oxygen.

Bioaccumulation/Accumulation: N/A

Mobility in Environment: N/A

Section 13: DISPOSAL CONSIDERATIONS

Disposal:

Dispose of in accordance with applicable local , State, and Federal regulations. Material is not a listed hazardous waste.

Section 14: TRANSPORT INFORMATION

US DOT Shipping Classification
Hazard Class: Not regulated
Identification No.: Not applicable
Packing Group: Not applicable
Label/Placard: Not applicable

TDG Status:
Not regulated

IMO Status:
Not regulated

IATA Status:
Not regulated

Section 15: REGULATORY INFORMATION

Global Inventories
The components of this product are included in the following inventories:
USA (TSCA)
Canada (DSL)
Australia (AICS)
Korea (KECL)
Philippines (PICCS)

Proposition 65: California Safe Drinking Water and Toxic Enforcement Act of 1986
This product is not known to contain any chemicals currently listed as carcinogens or reproductive toxins under California Proposition 65 at levels which would be subject to the proposition.

Section 16: OTHER INFORMATION

NFPA 704: National Fire Protection Association

Health – 0 (minimal hazard)	Fire – 0 (minimal hazard)	Reactivity – 0 (minimal hazard)

Legend
OSHA – United States Occupational Health and Safety Administration
IARC – International Agency for Research on Cancer
NTP – National Toxicology Program
NIOSH – National Institute for Occupational Safety and Health
EPA – United States Environmental Protection Agency

Caution: The user should conduct his/her own experiments and establish proper procedures and control before attempting use on critical parts.

The information contained herein is based on current knowledge and experience: no responsibility is accepted that the information is sufficient or correct in all cases. Users should consider these data only as a supplement to other information obtained by the user. No warranty is expressed or implied regarding the accuracy of this data, the results to be obtained from the use thereof, or that any such use will not infringe any patent. Users should make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials, the safety and health of employees and customers, and the protection of the environment. This information is furnished upon the condition the person receiving it shall determine the suitability for the particular purpose. This MSDS is to be used as a guideline for safe work practices and emergency response.

VeruSOLVE-HP™

What is VeruSOLVE-HP™?

VeruTEK® Technology's green chemistry platform provides innovative solutions to today's most challenging environmental cleanups. VeruSOLVE-HP™ is a stabilized surfactant/oxidant combination effective for surgical destruction of DNAPLs and source term wastes like MGP waste, creosote, hydrocarbons and chlorinated solvents. Clients apply VeruSOLVE-HP™ in-situ via injection, or ex-situ as a direct spray application.

Why is VeruSOLVE-HP™ better than current methods?

- VeruSOLVE-HP™ safely destroys organic contamination in place such as beneath buildings and structures.
- S-ISCO® is a less expensive process overall and is a far more complete remedy.
- Previous applications of VeruSOLVE-HP™ have demonstrated successful destruction of fuel oil and gasoline constituents to achieve closure of sites in a short duration (less than two weeks).
- Injected in close proximity to homes and high traffic areas safely and without disruption to occupancy.
- VeruSOLVE-HP™ can be used for source removal, enhanced product recovery and as an aerobic biostimulant (for plume control).
- The carbon footprint of S-ISCO® remediation with VeruSOLVE-HP™ is less than 10 percent than that of traditional remedies such as excavation/landfilling.

VeruSOLVE-HP™ application is easy.

- VeruSOLVE-HP™ is shipped ready to inject into the subsurface through geoprobe points, permanent injection wells, or monitoring wells.
- VeruSOLVE-HP™ can be delivered in 55-gallon drums, 1000 L totes, or by tanker truck.
- Ex-situ application can treat stockpiled contaminated soil at rates of 400-800 tons per day.

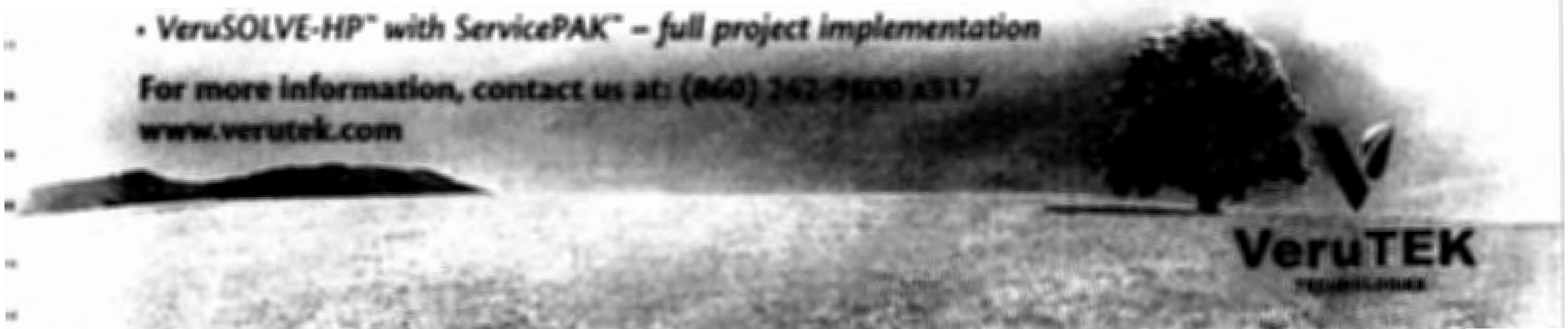
VeruSOLVE-HP™ is the preferred solution for Engineers, Injection Contractors, and the following Industries:

Real Estate
Utilities
Manufacturing
Industrial
Pharmaceutical
Municipal
Homeowners
State and Federal Government
Banks
Lawyers
Insurance Companies

VeruSOLVE-HP™ is available for direct purchase. VeruTEK® provides multiple levels of support, based on site specific needs from training to full scale implementation.

Applicators can choose from the following:

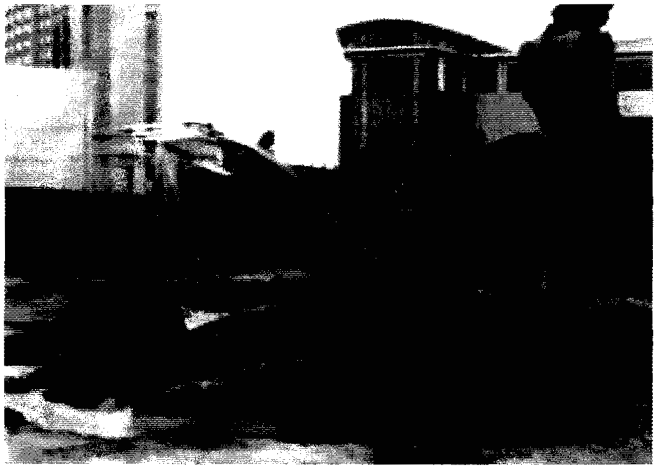
- ***VeruSOLVE-HP™ direct purchase***
- ***VeruSOLVE-HP™ with technical support***



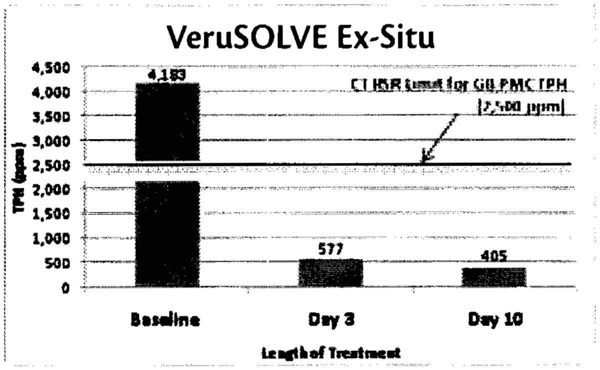
- ***VeruSOLVE-HP™ with ServicePAK™ – full project implementation***

For more information, contact us at: (860) 242-9800 x317
www.verutek.com

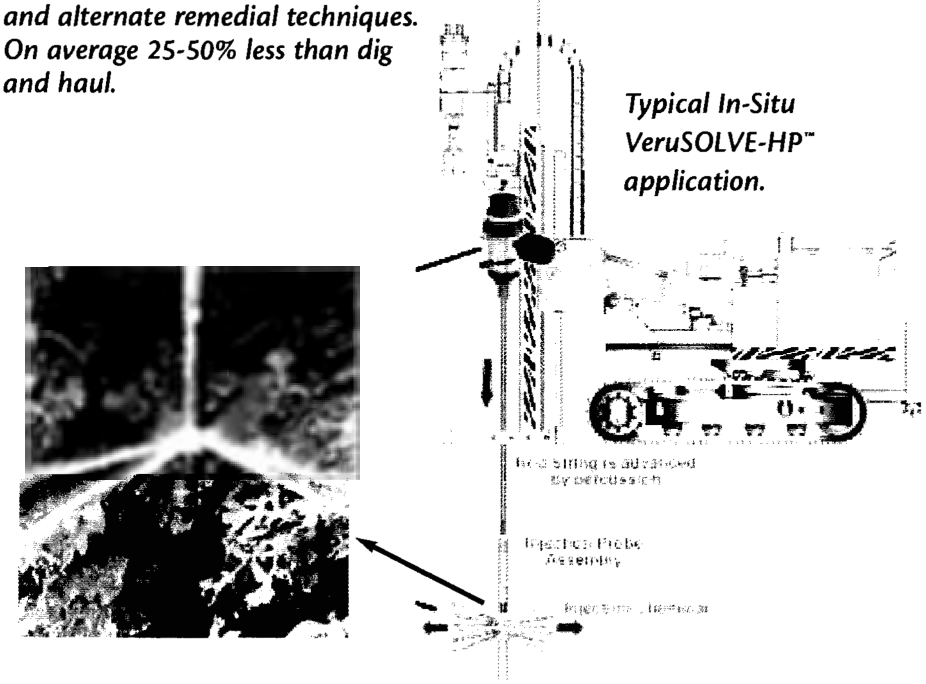
VeruSOLVE-HP™



EX-Situ VeruSOLVE-HP™ can treat up to 400-800 ton per day. More economical and sustainable option to excavation and alternate remedial techniques. On average 25-50% less than dig and haul.



VeruSOLVE-HP™ EX-Situ application successfully treats contaminant concentrations to below state standards.



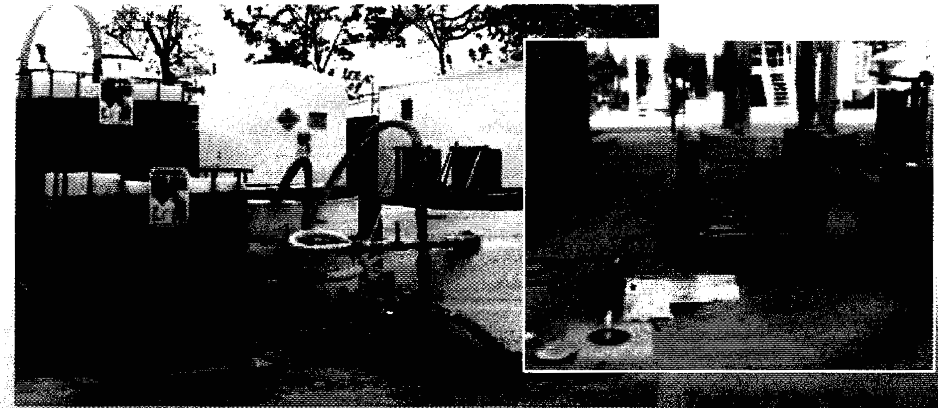
Typical In-Situ VeruSOLVE-HP™ application.

VeruSOLVE-HP™ is applicable to all size sites and available for direct purchase.

VeruTEK® provides multiple levels of support, based on site specific needs from training to full scale implementation.

Complete the Project Survey available on our website to determine the appropriate level of support.

Call or visit our website for more information.
(860) 242-9800 x317
www.verutek.com



VeruTEK
TECHNOLOGIES

VeruSOLVE-HP™
Application Guidelines

Cleaning up the Environment for the Benefit of Clients

> *"Work for something because it is good, not just because it stands a chance of success"*
> - *Vaclav Havel*

VeruTEK

VeruTEK Technologies, Inc.
65 West Dudley Town Road
Bloomfield, CT 06002
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What is VeruSOLVE-HP™?

VeruTEK's® green chemistry platform provides innovative solutions to today's most challenging environmental cleanups. VeruSOLVE-HP™ is a stabilized surfactant/oxidant combination effective for surgical destruction of DNAPLs and source term wastes like MGP, creosote, and hydrocarbons. Clients apply VeruSOLVE-HP in-situ via injection, or ex-situ as a direct spray application.

Step 1: How to Order VeruSOLVE-HP™

VeruSOLVE-HP™, is typically delivered *Ready-to-Inject*, in bulk volume tankers, totes, or drums. VeruSOVE is safe to handle and use, and not subject to regulatory reporting or DOT transportation restrictions or labeling. First step is to obtain a site survey form from VeruTEK – **info@verutek.com** or **www.verutek.com** – Complete one form for each site and return to VeruTEK. This will enable you to obtain the quantity and cost of VeruSOLVE-HP™ required for treatment at your site; custom to the type of waste, treatment area, and lithology.

Step 2: Select Your Applicator

Clients apply VeruSOLVE-HP in-situ through injection, or ex-situ as a direct spray-on application. Work with internal resources, or if applicable, identify qualified external applicators, to determine if in-situ or ex-situ application will be best suited for your site. Most any company experienced with Geoprobe® in-situ investigation and injection implementor, or remediation contractor, can successfully apply VeruSOLVE. VeruTEK has worked with numerous qualified and experienced companies across most states, and may be able to identify an applicator or consultant.

VeruSOLVE-HP is available for direct purchase. VeruTEK provides multiple levels of support based on site specific needs from training to full scale implementation.

Applicators can choose from the following:

- ***VeruSOLVE-HP™ direct purchase***
- ***VeruSOLVE-HP™ with technical support***
- ***VeruSOLVE-HP™ with ServicePAK™ full project implementation***

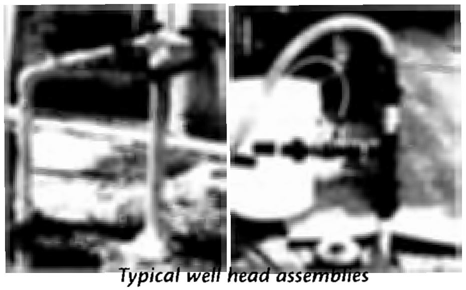
Step 3: How to Apply VeruSOLVE-HP™

Application equipment

For in-situ remediation of free phase, dissolved or DNAPL wastes, VeruSOLVE-HP™ is injected into the treatment zone through Geoprobe® rods or installed injection points using a chemically compatible pump. Both methods require an injection well head to monitor pressure and purge air from the injection line.

To treat ex-situ, a series of spray bars are assembled at the end of a power grader or pug mill. VeruSOLVE-HP is directly sprayed onto the loose contaminated material upon exit. Treated materials are piled in a controlled fashion and contaminant destruction occurs over one to several days depending on contaminant concentrations and desired cleanup levels. As with injection, a chemically compatible pump, hose, fittings and spray bars are necessary. When pumping or applying VeruSOLVE-HP™ with non-VeruTEK equipment, cross-check the wetted materials of your pumping equipment to ensure compatibility:

Compatible Materials	**Viton, HDPE, SS, PVC, Nylon, and Polycarbonate**
Incompatible Materials	**Steel, cast iron, other metal alloys**



Typical well head assemblies for delivery of VeruSOLVE-HP™

Optimizing Your In-situ application

How many injection points do I need?

Typically, it is recommended for small treatment areas to space out injection points approximately 10-15 feet apart equally throughout the treatment area.

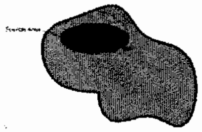
For larger areas, it is best to start in a known source area and monitor the initial injection of VeruSOLVE-HP™ to verify site specific in-situ transport properties. This will aid in determining the optimal injection point spacing, and injection operating parameters.

How do I construct the injection wells? Can I use existing wells?

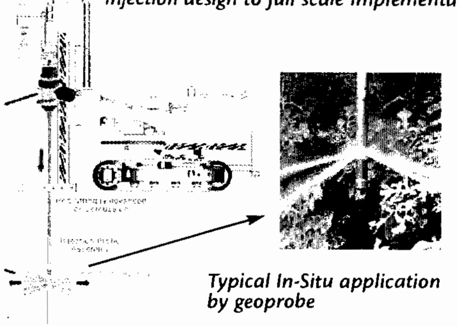
Injection wells are generally constructed of the same material as a standard monitoring well. Injections can also be performed through existing monitoring wells or through direct push Geoprobe rods.

How many injection treatments?

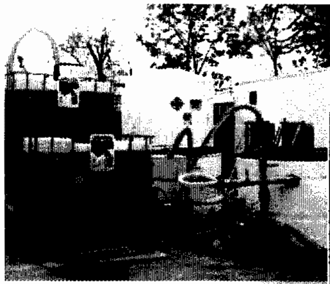
Since VeruSOLVE-HP can successfully destroy DNAPL and free phase wastes, typically no repeat treatments are required for adequately characterized sites. Detailed monitoring of the injections is important to optimize the radius of influence of treatment laterally and at depth, as well as the progress of contaminant destruction. In many cases, areas of the site may have less waste than anticipated, or contaminant destruction occurs more rapidly - allowing injection points to be turned off ahead of schedule.



VeruSOLVE-HP is available for direct purchase. Quantities are based on client provided information including area of concern and contaminant concentrations. VeruTEK provides multiple levels of support, based on site specific needs from training and injection design to full scale implementation.



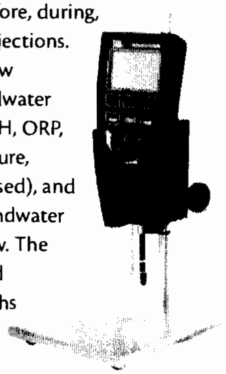
Typical In-Situ application by geoprobe



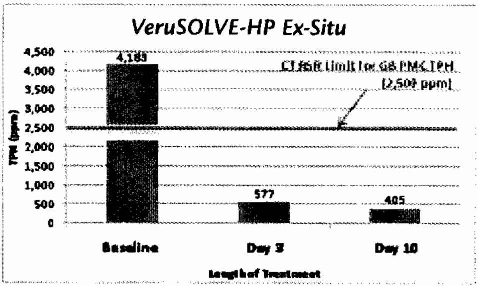
Typical Site set up.

Monitoring?

Monitoring is conducted before, during, and after VeruSOLVE-HP™ injections. Using laboratory and low flow sampling equipment, groundwater quality parameters such as pH, ORP, conductivity, head, temperature, persulfate concentration (if used), and IFT are measured from groundwater and the injection system flow. The monitoring is also conducted periodically for several months following injections.



Typical Monitoring Equipment IFT Meter

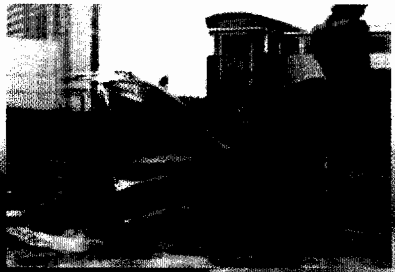


VeruSOLVE-HP™ Ex-Situ application successfully treats contaminant concen[illegible]

For more information please call:
(860) 242-9800

Optimizing your Ex-situ application

Ex-situ can be an extremely quick and economical solution for on-site treatment, and is often used to treat fuel spills and hydrocarbons in soils. The key is to increase contact of the contaminant with VeruSOLVE-HP™, and this can reliably be done by minimizing the soil particle size (increasing exposed surface area) in a pug mill or power grader. Tumbler bars or screens may also be added to aid in mixing as the wetted soil leaves the equipment.



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