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858-569-0692
GREG VOGELPOHL

WORKPLAN FOR REMEDIATION WELL INSTALLATION AND FEASIBILITY STUDIES

Former E-Z Serve Location No. 100877
525 West A Street
Hayward, California 95073
STID No. 3580

R023

Submitted to
Restructure Petroleum Marketing Services of California, Inc.
205 South Hoover Boulevard
Tampa, Florida 33609

Submitted by
ATC Associates Inc.
9620 Chesapeake Drive, Suite 203
San Diego, California 92123

ATC Work Order No. 100877-C2-2
ATC Job No. 43.25827.0024

December 21, 2001

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1.0 SITE DESCRIPTION

a) STID Number(s): 3580

b) Facility Name: Former EZ Serve Facility No. 100877

c) Facility Street Address: 525 West A Street
City: Hayward Zip: 95073
County: Alameda Phone: Not Available

APN # 432-0016-026-03

d) Describe occupancy of the facility: Former EZ Serve gas station

e) Describe current property use: Vacant

2.0 INVOLVED PARTIES

a) Eligible person:
Restructure Petroleum Marketing Services of California, Inc.
205 South Hoover Boulevard, Suite 101
Tampa, FL 33609
Phone: (813) 986-2443 Fax: (813) 986-2445

b) Responsible Party:
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Tampa, FL 33609
Phone: (813) 986-2443 Fax: (813) 986-2445

c) Property Owner:
Vinod Vansal
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Redwood City, CA 94063

d) Facility Contact:
Andrew Long, Environmental Manager
Restructure Petroleum Marketing Services of California, Inc.
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3.0 CONSULTANT INFORMATION

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4.0 SITE HISTORY, LITHOLOGY, AND AREA HYDROGEOLOGY

4.1 Site UST History

The general site location is shown in Figure 1, Vicinity Map and Figure 2, Previous Site Investigation Map – Groundwater Monitor Wells (ASA, January 1992/June 1993), illustrates the former underground storage tank (UST) system. ATC understands that the original USTs were removed on June 15, 1990. The former UST system consisted of four 10,000-gallon gasoline USTs, and three fuel dispenser islands. The 10,000-gallon USTs were located in the northwestern portion of the property. The fuel dispenser islands are located in the center of the site. Based on field observations and analytical results, the USTs were suspected to be the source of the release.

The site is currently vacant. There are no USTs or dispensers currently on-site; however, the canopy and remnant concrete islands are still present.

4.2 Previous Site Characterizations-Soil

In November 1986, Converse Environmental Consultants of California (CECC) conducted an initial phase of assessment as a result of a suspected fuel system leak. The assessment consisted on installation of three groundwater monitor wells, designated as MW1 through MW3, each with a total depth of 30 feet below ground surface (bgs). In June 1987, CECC conducted another phase of assessment, which included the installation of three additional groundwater monitor wells (MW4 through MW6). The original wells named MW2 through MW6 were destroyed during UST removal activities in June 1990. Hereafter, MW1 is designated as MW-1A.

In January 1992, Associated Soil Analysis, Inc. (ASA) performed a third phase of site investigation. During this investigation, six groundwater monitor wells, designated as MW-1 through MW-6, were installed on-site. All the wells were installed to a total depth of 30 feet bgs, and had a screened interval from approximately 15 to 30 feet bgs. The soil samples submitted for laboratory analysis indicated low to non-detect levels of fuel hydrocarbons. Monitor well locations are illustrated on Figure 2 and soil sample analytical results obtained during this assessment are summarized in Table 1, Previous Site Investigation – Groundwater Monitor Well – Soil Sample Analytical Results (ASA, January 1992/June 1993; BC, February 1995). Details of this assessment were presented in the ASA *Site Assessment Report*, dated May 2, 1992.

In June 1993, ASA performed another phase of assessment in the site vicinity. During this investigation, four groundwater monitor wells, designated as MW-7 through MW-10, were installed. MW-7 was installed approximately 85 feet north of the site in a yard of a trailer park residence. MW-8 was installed approximately 20 feet east of the intersection of West A Street and Garden Avenue. MW-9 was installed approximately 80 feet west of monitor well MW-1 at 533 West A Street. MW-10 was installed on the south side of West A Street southwest of Garden Avenue. The total depth of each well is reported to be approximately 30 feet bgs and the wells are reportedly screened from approximately 10 to 30 feet bgs. Analytical results of soil samples obtained from well boring MW-7 at an approximate depth of 15 feet bgs, and from well borings MW-9 and MW-10 at approximate depths of 10 and 15 feet bgs indicated the presence of low levels of fuel hydrocarbon constituents. Petroleum hydrocarbon constituents were not detected above laboratory detection limits in the remaining soil samples submitted for analytical testing. Monitor well locations are illustrated on Figure 2 and soil data obtained during this assessment is summarized in Table 1. Details of this assessment were presented in the ASA *Site Assessment Study for Petroleum Constituents in Soil and Groundwater*, dated July 20, 1993.

In February 1995, Brown and Caldwell (BC) performed a phase of off-site assessment near the subject facility. During this investigation, four groundwater monitor wells, designated as MW-11 through MW-14, were installed. Prior to well installation activities, seventeen hydro-punch borings were advanced within the rights-of-way of West A Avenue, Victory Drive, Garden Street, and Lupine Street in an effort to locate the best position of wells MW-11 through MW-14. As a result of the hydro-punch boring sampling activities, MW-11 was installed within the right-of-way of West A Street approximately 460 feet west of the site. MW-12 was installed within the right-of-way of Garden Street approximately 250 feet north of the site. MW-13 was installed within the right-of-way of Victory Drive approximately 300 feet south of the site. MW-14 was installed within Garden Street approximately 180 feet north of the site. Monitor well MW-11 was installed to a total depth of 25 feet bgs and was screened from approximately 5 to 25 feet bgs. Monitor wells MW-12 through MW-14 were installed to a total depth of approximately 30 feet bgs and screened from approximately 10 to 30 feet bgs. Low to non-detect levels of petroleum hydrocarbons were detected in the soil samples obtained during drilling of well borings MW-11 through MW-14. Monitor well locations are illustrated on Figure 3, Previous Site Investigation Map – Hydro-punch Locations/Groundwater Monitor Wells (BC, February 1995). Soil sample analytical data obtained during this assessment is summarized in Table 1. Details of this assessment were presented in the BC *Draft Step 5, Phase II Site Investigation Report*, dated March 1, 1995.

4.3 Previous Site Characterizations – Groundwater Investigations

In November 1986 and June 1987, CECC installed six monitor wells (MW-1A, and MW2 through MW6). With the exception of MW-1A, these wells were destroyed during UST removal activities conducted in June 1990. In February 1992, ASA installed six groundwater monitor wells (MW-1 through MW-6). In June 1993, ASA installed four groundwater monitor wells (MW-7 through MW-10). In February 1995, BC installed groundwater monitor wells MW-11 through MW-14. Monitor well construction details are presented in Table 2, Monitor Well Construction Details. The most recent groundwater gauging and sampling event was performed by Clearwater Group Inc. (Clearwater) on June 13/14, 2001. During this gauging event the depth to groundwater beneath the site ranged from 14.51 (MW-13) to 16.62 (MW-12) feet bgs. During the most recent groundwater monitor event a hydraulic gradient of approximately 0.005 vertical feet to horizontal foot (ft/ft) trending towards the southwest was calculated. Groundwater conditions are illustrated in Figure 4, Groundwater Summary Map - (Clearwater, June 13/14, 2001). Historically, elevated concentrations of petroleum hydrocarbons have been detected in groundwater samples obtained from all the wells, excluding wells MW-8, MW-12, and MW-13. Analytical results for past and current groundwater sampling events are summarized in Table 3, Historical Summary of Groundwater Data.

4.4 Site and Area Lithology

According to ASA, the subject site is located within the San Leandro cone, a low gradient alluvial fan, which originates at the mouth of Castro Valley and spreads westward onto the Bay Plain. This cone consists of alluvial sediments, which overlie marine clay, terrigenous sand and silt of inter-tidal provenances. Based on previous investigations, shallow soils consist of silty clay, clay, clayey silt, silty sand, and sand to a total depth of approximately 30 feet bgs (the maximum depth explored).

The Hayward Fault, the San Andreas Fault and the Calaveras Fault are the closest major faults in the vicinity of the site.

4.5 Area Hydrology and Hydrogeology

According to BC, the shallowest regional aquifer in the area is the Newark Aquifer, which consists of permeable water bearing alluvial sand. The Newark Aquifer consists of series of laterally discontinuous saturated lenses of coarse to fine-grained sediments 10 to 100 feet thick at depths less than 200 feet bgs. The regional hydraulic gradient is westward, from the mouth of the Castro Valley towards the San Francisco Bay. The nearest water wells in the area indicate depths to the first water table to be 6 to 21 feet bgs.

An inventory of wells within a ½ mile radius of the site was compiled by ASA. This list was compiled from available well logs and permits at the Alameda County Flood Control and Water Conservation District, Hayward Quadrangle files. Fifteen wells are located within a ½ mile radius of the site, five of which are located within approximately 1,500 feet of the site. Ten of the wells are categorized as shallow (terminating less than 100 feet bgs) with the remaining five having greater depths. Of the ten shallow wells, five are used for water supply, three for groundwater monitoring, and two for unspecified uses.

Based on the groundwater monitoring event conducted by Clearwater on June 13/14, 2001, the calculated groundwater hydraulic gradient and flow direction indicates a southwestern flow direction at a gradient of 0.005 ft/ft beneath the site.

5.0 SCOPE OF WORK

This work plan for remediation well installation and performance of feasibility studies was prepared in response to Alameda County Health Care Services Agency (ACHCSA) letters dated August 22, 2001 and October 24, 2001. In the August 22, 2001 letter, the ACHCSA requested the preparation of a risk assessment to establish clean-up levels for the subject site. In the October 24, 2001 letter, the ACHCSA requested the performance of feasibility studies to determine the most appropriate clean-up technology to be employed at the subject site. Copies of the letters are presented in Appendix A. Based on the results of the previous site characterization activities, the most recent groundwater monitoring data, and in accordance with the ACHCSA requests, ATC proposes the following:

1. Resume quarterly groundwater gauging and sampling activities.
2. Performance of a Risk-Based Corrective Action (RBCA) risk assessment to establish site-specific soil and groundwater clean-up levels for the site.
3. Install three dual-completion vapor extraction/air sparge wells (VEAS-1 through VEAS-3) on-site for the purposes of conducting pilot study activities. The two foot air sparge point will be installed to a depth of approximately 30 feet bgs, with the corresponding vapor extraction well set at approximately 15 feet bgs, and screen from approximately 5 to 15 feet bgs.
4. Install a groundwater extraction well (EX-1) on-site for the purposes of conducting a 24-hour constant rate discharge test. Well EX-1 will have an approximate total depth of 35 feet and be screened from 10 to 35 feet bgs.
5. Conduct an 8-hour vapor extraction feasibility study.
6. Conduct an 8-hour air sparge pilot study.
7. Conduct a 24-hour aquifer test.
8. Prepare a Corrective Action Plan (CAP)

The scope of work includes: preparation of a Community Health and Safety Plan, risk assessment, site reconnaissance, well drilling, organic vapor monitoring, soil sampling (for lithologic logging, analytical testing and waste characterization purposes), remediation well installation, quarterly groundwater gauging and sampling, analytical chemistry, data interpretation, pilot studies, and CAP preparation. Each part is described below.

5.1 Community Health and Safety Plan

ATC has established a Safety and Health Program (SHP) to ensure the personal health and safety of all ATC employees. The SHP defines safety practices and procedures to be instituted in all ATC work places, as applicable. The program meets, and often exceeds, the requirements promulgated by the

Occupational Safety and Health Act (OSHA). As part of the SHP, all ATC personnel are appropriately trained and under a Medical Surveillance Program in accordance with OSHA 40 CFR 1910.120.

ATC's primary mechanism to ensure employee, environmental, and public safety at the project site will be the Community Health and Safety Plan (CHASP). ATC will prepare, approve and implement a CHASP for this project. All individuals working under the purview of ATC will be required to read and sign the CHASP to acknowledge their understanding of the information contained in it. The CHASP will be site-specific and task-specific, describing hazardous conditions that may be encountered and prescribing the necessary safety protocols to protect employees from these hazards. The CHASP will be reviewed by the project management team and then reviewed/approved for field use by the Site Safety and Health Officer. The CHASP will be implemented and enforced on site by the assigned Site Safety and Health Officer. ATC will prepare a comprehensive CHASP based on the scope of work and the potential hazards described in this workplan.

At a minimum, the CHASP will identify the following: roles and responsibilities of key site personnel; hazard analysis for all chemical, physical, and physiochemical hazards anticipated; a personnel protection plan; site safety procedures for specific site operations, (e.g., drilling, etc.); a decontamination plan; and an emergency response/contingency plan. The CHASP will specify levels of protection for site personnel on a task-specific basis. As with any project of this magnitude, there are inevitable encounters with a variety of physical hazards ranging from simple housekeeping to temperature extremes. ATC will provide continual evaluation of all potentially hazardous conditions, as the project is undertaken and prescribe additional safety protocols to protect site personnel as needed.

5.2 Permitting

ATC will complete four well permit applications to drill and install remediation wells (EX-1 and VEAS-1 through VEAS-3) and submit them to the ACHCSA prior to initiation of fieldwork. In addition, encroachment permits will be updated, if necessary, for the sampling of monitor wells MW-10 through MW-14, which are located in City of Hayward right-of-ways.

5.3 Drilling and Soil Sampling

Prior to drilling the soil borings, ATC will contact Underground Service Alert (USA) and a private utility locator service to locate possible subsurface utilities in the vicinity of the proposed boring locations. Following utility clearance, drilling will be scheduled. ATC proposes to utilize a hollow-stem-auger drilling rig equipped with 10-inch diameter augers. Additional details are provided below.

ATC also proposes to install three vapor extraction/air sparge remediation wells. The proposed location of each remediation well is illustrated on Figure 5, Proposed Well (VEAS-1 through VEAS-3) Location Map. ATC proposes to drill each dual completion vapor extraction/air sparge well to approximately 30 feet bgs. Proposed remediation well construction details are illustrated on Figure 6, Proposed Remediation Well (VEAS-1 through VEAS-3) Construction Detail.

ATC also proposes to drill and install one six-inch diameter groundwater extraction well on-site (EX-1). The proposed location of EX-1 is illustrated on Figure 5. ATC proposes to drill EX-1 to an approximate total depth of 35 feet. Proposed remediation well construction details are illustrated on Figure 7, Proposed Groundwater Extraction Well (EX-1) Construction Detail.

The well borings will be drilled and sampled in general accordance with ATC's Standard Operating Procedure – Soil Borehole Drilling, Monitor Well Installation and Development, and Soil Sampling, which is included in Appendix B. Undisturbed soil samples will be collected at 5 to 10 feet intervals from the borings. These samples will be utilized for analytical testing, lithologic logging and waste characterization purposes.

All drill cuttings will be collected in Department of Transportation (DOT)-approved 55-gallon drums and will remain on-site pending proper disposition. Soil cuttings will be managed in accordance with ACHCSA guidelines. If a boring is not completed as a well (for example, if unable to advance boring to groundwater), it will be backfilled through a tremie pipe with bentonite grout from total depth to approximately 1 foot bgs, and capped with concrete to the surface. An ATC staff scientist will complete lithologic logs for each boring in general accordance with ASTM Method D 2488-90. Boring Log Notes, Method of Soil Classification, Soil Boring Graphics, and an edited boring log are included in Appendix C.

5.4 Organic Vapor Monitoring

To obtain preliminary data regarding the degree of potential petroleum hydrocarbon-impact to soil and for health and safety concerns, a representative sample will be collected at each soil sampling location and field screened for volatile organic vapors utilizing a hand held photo-ionization detector (PID) in general accordance with ATC's Standard Operating Procedure - Field Soil Vapor Monitoring, which is included in Appendix B. PID readings will be recorded in the boring logs.

5.5 Well Installation

Following completion of borings VEAS-1 through VEAS-3 the borings will be completed as a dual-completion vapor extraction/air sparge wells. The borings will be drilled to approximately 30 feet below ground surface. The vapor extraction portion of the wells will be constructed of a 4-inch PVC casing screened from 5 to 15 feet (0.010-inch slots). The air sparge well will be constructed of a blank 1-inch Schedule 80 PVC casing from the surface to 28 feet bgs, and a stainless steel air sparge tip screened from 28 to 30 feet bgs (0.010-inch slots). Figure 6 shows the proposed well construction details.

The annulus of the screened portion of the vapor extraction/air sparge wells will be backfilled with a #2/12 sand (or equivalent) filter pack from approximately 4 to 15 feet, and from 27 to 30 feet bgs, respectively. Hydrated bentonite chips (from 25 to 27 feet bgs) and bentonite grout (from 15 to 25 feet bgs) will create the necessary annular seals for the air sparge portion of the wells. Hydrated bentonite chips will be used to create a 2-foot seal above the vapor extraction portion of the wells (from 2 to 4 feet bgs). The wells will be completed from 2 feet bgs to the ground surface with a watertight, flush-mounted, traffic-rated vault slightly raised for drainage and set in concrete. All well casing and screen will be delivered to the site in factory-sealed containers.

Following completion of proposed boring EX-1 the boring will be completed as a groundwater extraction well. The proposed construction of EX-1 will consist of one blank 6-inch, Schedule 40 PVC casing from surface to 10 feet bgs, and 25 feet of slotted (0.020-inch slots) 6-inch stainless steel well screen. All well casing and screen will be delivered to the site in factory-sealed containers. The annulus of the screened portions of the monitor wells will be backfilled with a #3 Monterey sand (or equivalent) filter pack from approximately 9 to 35 feet bgs. The filter material will then be settled by surging the well with a surge block. Adding more sand prior to placement of the bentonite seal will compensate for any settlement. A 2-foot layer of bentonite pellets will be placed on top of the upper filter pack and hydrated to form an annular seal. The annular space to 2 feet bgs will be filled with bentonite grout. The well will be completed at the ground surface with a watertight, flush-mounted, traffic-rated vault set in concrete. Construction details are illustrated in Figure 8.

Following groundwater extraction well completion, EX-1 will be developed by a combination of surging and bailing groundwater from the well. It is estimated that up to 50 gallons of purge water will be generated during development of EX-1. Groundwater purged from the wells will be contained in properly labeled DOT-approved 55-gallon drums and stored on-site pending proper disposition. The groundwater monitoring wells will be installed and developed in general accordance with ATC's Standard Operating Procedure - Soil Borehole Drilling, Monitor Well Installation and Development, and Soil Sampling, which is included in Appendix B.

A California-licensed land surveyor will re-survey the location and elevation of existing wells MW-1 through MW-14 and the location and elevation of the newly installed groundwater extraction well (EX-1) to a City of Hayward benchmark. The location and elevation of measuring marks at each well head will be surveyed to the nearest 0.01 foot by the licensed surveyor in order to more accurately determine the local groundwater flow direction beneath the site relative to mean sea level. In addition, in accordance with Article 12 (Section 2729.1) of Chapter 16, Division 3, Title 23 of the California Code of Regulation (CCR), the latitude and longitude of each groundwater monitor well will be measured with a Global Positioning Device to an accuracy of one meter.

5.6 Groundwater Monitoring and Sampling

ATC proposes to gauge, and collect no-purge groundwater samples from all of the groundwater monitor wells in the network (MW-1 through MW-14) on a quarterly basis for a year. An attempt will be made to locate and uncover wells MW-8, MW-10, and MW-11 with the use of a metal detector.

Assuming that phase-separated hydrocarbons (PSH) are not present, static water levels in each well will be measured, and a representative groundwater sample will be collected from the well in general accordance with ATC's Standard Operating Procedure - Groundwater Monitor Well No-Purge Sampling, which is included in Appendix B. Quarterly groundwater monitoring reports will be prepared and submitted to the ACHCSA. The reports will summarize the quarterly groundwater elevation measurements, calculated groundwater gradient and flow direction and analytical results of the quarterly sampling.

5.7 Analytical Testing

Analyses of representative soil samples and groundwater samples will be performed by a State-certified laboratory. All drill cuttings will be collected in DOT-approved 55-gallon drums and will remain on-site pending proper disposition. Soil cuttings will be managed in accordance with the ACHCSA Regulations.

Quality Assurance and Quality Control (QA/QC) procedures, sample preservation, apparatus required, and analyses performed will be per: 1) A.A.C. R9-14-601 through -617; 2) U.S. EPA Document EPA-600, "Methods for Chemical Analysis for Water and Wastes" dated July 1982; and 3) U.S. EPA document SW-846, 3rd Edition, "Test Methods for Evaluating Solid Waste: Physical Chemical Methods", dated November 1986.

Select soil and groundwater samples will be analyzed for total petroleum hydrocarbons characterized as gasoline (TPHg), benzene, toluene, ethylbenzene, total xylenes (BTEX), methyl-tertiary-butyl ether (MTBE), tert-amyl methyl ether (TAME), tert-butyl alcohol (TBA), di-isopropyl ether (DIPE), and ethyl-tert-butyl ether (ETBE) in accordance with Environmental Protection Agency (EPA) Test Method 8260B.

In addition, select soil samples will be analyzed for total porosity, dry bulk density, water content, air-filled porosity, hydraulic conductivity, and total organic carbon (TOC) to gather site-specific information for risk assessment activities.

5.8 Vapor Extraction Pilot Test

A vapor extraction pilot test (VEPT) will be conducted to evaluate the feasibility of utilizing this technology for remediation of the hydrocarbon-impacted vadose zone soil. Additionally, the pilot test data can be used to design the appropriate soil and groundwater remediation system.

A vapor extraction pilot test will be conducted using newly installed vapor extraction wells VEAS-1 through VEAS-3. Existing groundwater monitor wells will be used as observation points. Each pilot test will be conducted in three stages, which will involve extracting soil gas from the vadose zone at three different well head applied vacuums and flow rates. Vacuum influence will be monitored at several wells to evaluate the radius of vacuum influence. During the pilot test the soil gas oxygen concentration will be monitored using a GasTech™ combustible vapor analyzer. The volatile fuel hydrocarbon (VFH) concentration will also be monitored with a flame ionization detector (FID) or photo ionization detector (PID). During each pilot test three soil gas samples will collected in Tedlar™ bags for laboratory analysis for volatile fuel hydrocarbons (VFH), BTEX and MTBE using EPA Test Method TO-14.

The VEPT will be conducted using vapor extraction pilot test equipment having a blower and associated flow rate and pressure measuring equipment. A thermal oxidizer will be utilized to treat the off-gas during the pilot test. The VEPT will be performed in general accordance with ATC's Standard Operating Procedure – Soil Vapor Extraction and Air Sparge Pilot Tests, which is included in Appendix B.

5.9 Air Sparge Pilot Test

An air sparge pilot test (ASPT) will be conducted to evaluate the feasibility of utilizing this technology for remediation of the hydrocarbon-impacted groundwater. Additionally, the pilot test data can be used to design the appropriate soil and groundwater remediation system.

An air sparge pilot test will be conducted at wells VEAS-1 through VEAS-3. Existing groundwater monitor wells will be used as observation points. The pilot test at each well will be conducted in three stages, which will involve injecting air into the saturated zone at three different flow rates (2, 5, and 10 cfm). Air sparge influence in terms of dissolved oxygen (DO) and groundwater mounding will be monitored at surrounding wells.

The ASPT will be conducted using a compressor, associated flow rate and pressure gauges, DO and water level meters. The ASPT be performed in general accordance with ATC's Standard Operating Procedure – Soil Vapor Extraction and Air Sparge Pilot Tests, which is included in Appendix B.

5.10 Constant Discharge Aquifer Test

A constant rate discharge aquifer test will be performed at the site. The aquifer test will consist of a step test, pumping test, and recovery test. Well EX-1 will be utilized as the pumping well for the test. Several surrounding wells will be utilized as observation wells. Data collected during the aquifer test will be used to evaluate aquifer hydraulic parameters such as hydraulic conductivity (K), transmissivity (T), and coefficient of storage (S). The data can be used to evaluate groundwater remediation technologies. In addition, the aquifer parameters are necessary to evaluate contaminant transport.

Prior to arriving on site, ATC will obtain the necessary permits to discharge the groundwater extracted from the pumping well into the sewer, or a water holding tank to be delivered to the site for temporary storage.

The aquifer test will be conducted using a submersible Grundfos® environmental pump which will have a check valve. A discharge hose will be connected to the pump and extend to the sewer, or a holding tank. A flow meter/totalizer will be installed to measure the flow rate and total gallons extracted during the test. A globe valve will be utilized to control the extraction flow rate. The pump will be set approximately one to two feet from the bottom of the well. A generator, or existing electrical power at the site, will be used to power the pump. Pressure transducers will be installed in the pumping well and in three observation wells. The transducers will be connected to a data logger, which will document changes in the groundwater surface elevation as the test proceeds. Traffic cones and caution tape will be used to surround the pumping well and associated test equipment. The discharge hose and all power cords will be secured to the ground using duct tape.

Prior to the start of work, a decontamination area will be established. This will be in a secured area and consist of an Alconox® solution wash, a first rinse and a second rinse. Down hole equipment will be decontaminated prior to use. Prior to equipment set-up, all wells to be monitored during the test will be opened and allowed to stabilize. The data logger will be set-up for the conditions of the test.

At least 24 hours prior to the test, a step test will be performed to determine the appropriate flow rate to be used during the aquifer test. The step test will be conducted in the well to be used for the aquifer test. Each step will consist of pumping groundwater from the designated pumping well at a constant rate until the water level stabilizes. The flow rate will be increased in each subsequent step until the maximum flow rate that can be sustained by the pumping well is determined.

Prior to starting the pump, the total gallons displayed on the flow meter/totalizer will be recorded. This will be used to determine the total number of gallons extracted during the test. The pump and data logger will be turned on simultaneously to start the pumping test. During the pumping test a constant flow rate will be extracted from the pumping well. The flow rate and data collected by the data logger will be periodically monitored during the test. The duration of the pumping test will be determined by the data collected. The test may be conducted for 8 to 16 hours. Personnel conducting the test will determine the duration of the pumping test.

Once the pumping test is completed, the pump is shut off and the recovery test begins. Prior to shutting off the pump the data logger will be configured for the recovery portion of the aquifer test. The exact time and the total gallons displayed on the flow meter/totalizer will also be recorded. The pump will be turned off and data logger stepped to collected recovery data. The duration of the recovery test will be determined by the data collected. The recovery test may be conducted for 8 to 16 hours. Personnel conducting the test will determine the duration of the recovery test.

An effluent water sample shall be collected during the pumping test. The analytical data can be used to help design a groundwater remediation system. Additional sampling may be required by conditions of a discharge permit. If water is being stored in a holding tank, appropriate samples will be collected per disposal requirements. The water will be removed to an appropriate disposal facility by a licensed transporter.

Data collected during the aquifer test will be evaluated using various graphical and numerical methods, depending on flow (steady or unsteady state) well construction (fully or partially penetrating) and aquifer type (confined, leaky, unconfined, or semi-confined). The aquifer test will be evaluated using more than one method. Analysis of the aquifer test data will be conducted utilizing computer software.

A majority of the aquifer test will be conducted using partially penetrating wells in unconfined aquifers under steady state conditions. In general, the curve-fitting method presented by Neuman (1975) or by Boulton (1954) will be used to evaluate transmissivity, storativity and vertical hydraulic conductivity under these conditions (the Boulton method assumes nonsteady state conditions). The Stretitsova's curve-fitting method presented by Kniseman and de Ridder (1990) may also be used for unconfined conditions. In addition, the steady state well equation may be applied (Todd, 1980) to evaluate the hydraulic conductivity (away from the pumping well).

If it is determined that the test was performed under confined aquifer conditions and enough time has elapsed for steady-state conditions to have been met (as defined in the literature), the Jacob distance-draw down and time-draw down methods (Cooper & Jacob, 1946) will generally be applied to evaluate storativity and transmissivity. Alternatively, the Theis curve-fitting method (Theis, 1935) may be employed if steady-state conditions were not reached. In leaky aquifers, the Hantush method (Hantush, 1956) will generally be used.

The capture zone will also be determined using the transmissivity values obtained through the evaluation and following the method initially outlined by Janvandel and Tsang (1986). The data will then be used to determine the construction and design specifications of the proposed system, based on the requirements of the system conceptual design (migration control, dewatering, plume capture).

It must be recognized that even using theoretical models for the data evaluation, some judgment will be necessary in conducting the analyses and applying the calculated parameters to the system design. Different types of aquifers may have similar draw down or response behaviors, and this must be accounted for. A complete explanation of the method used and the reasoning behind the choice of method and an analysis of the results will be presented with the data evaluation. The pump test will be performed in general accordance with ATC's Standard Operating Procedure – Constant Discharge Aquifer Test, which is included in Appendix B.

5.11 Risk Assessment

ATC will use data obtained from previous site assessment activities and from the vapor extraction, air sparge, and groundwater extraction pilot studies to prepare a RBCA risk assessment in accordance with American Society for Testing and Materials (ASTM), Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (September 1995, 1735). To evaluate risk, a Site Conceptual Model will be developed and include definition of primary, secondary, and tertiary source(s), release mechanisms, and receptor(s)/exposure route(s). The ASTM RBCA computer model will be used with site-specific data to determine risk and associated clean-up goals for the subject site.

5.12 Data Evaluation and Corrective Action Plan

Following completion of the vapor extraction, air sparge and groundwater extraction pilot studies, ATC will evaluate the information and provide a written CAP to the ACHCSA. The CAP will conform to the guidelines established in the most recent version of the ACHCSA Guidelines.

6.0 ASSUMPTIONS

- ATC will not be responsible for any unforeseen conditions (i.e., shallow groundwater conditions, hard soils, unknown utilities).
- ATC shall have unrestricted site access and will not be limited to specific working hours.

- The project costs and schedules do not include allowance for delays or standby time due to inclement weather, facility access restrictions or other factors beyond the control of ATC.
- Nothing contained within this workplan shall be construed or interpreted as requiring ATC to assume the status of a generator, transporter, storer, treater, or disposal facility as those terms appear within the Resource Conservation Recovery Act, 42 USCA, Section 6901 et seq., as amended, or within any state statute governing the treatment, storage, and disposal of hazardous waste.
- ATC may recommend additional work or disposal activity. This workplan does not include any work that may be recommended based on the results of this project. ATC will provide a supplemental work plan for additional recommended assessment services.

7.0 WORK SCHEDULE

Following receipt of ACHCSA approval of the workplan, ATC will seek pre-approval for the implementation of the workplan from the California Underground Storage Tank Cleanup Fund. Upon receipt of pre-approval, ATC can initiate the project within 5 days. ATC anticipates that site access negotiations and well permitting should take approximately 30 days; well installation, and development fieldwork should take approximately 5 days. Pilot study fieldwork should take approximately 5 days. Groundwater gauging and sampling should take 1 day. Groundwater analytical test results should be received within 10 - 15 working days of sample delivery. Data interpretation and report preparation are expected to take 20- to 30-working days. Subsequent groundwater monitoring quarterly reports will be submitted by the 15th day of the month following the end of the quarter. The estimated project schedule does not include allowances for delays or standby time due to inclement weather, facility access problems or other factors beyond the control of ATC.

TABLE 1

PREVIOUS SITE INVESTIGATION
GROUNDWATER MONITOR WELLS
SOIL SAMPLE ANALYTICAL RESULTS (ASA, January 1992/June 1993; BC, February 1995)
FORMER EZ-SERVE FACILITY NO. 100877
ATC JOB NO. 43.25827.0024

(Results in milligrams per kilogram (mg/kg))

Sample Identification	Sample Depth (feet)	Sampling Date	Lithology	TPH EPA 8015	Benzene EPA 8020	Toluene EPA 8020	Ethylbenzene EPA 8020	Total Xylenes EPA 8020
MW-1	11.0-11.5	1/28/92	Sand	<0.5	0.12	<0.005	0.0073	0.0053
MW-1	16.0-16.5	1/28/92	Clay	19	0.98	0.013	0.17	0.35
MW-2	11.0-11.5	1/28/92	Silty Sand	<0.5	<0.005	<0.005	<0.005	<0.005
MW-2	16.0-16.5	1/28/92	Clay	5.4	<0.005	<0.005	1.1	0.057
MW-3	11.0-11.5	1/28/92	Silty Sand	5.6	0.69	<0.005	0.048	0.013
MW-3	16.0-16.5	1/28/92	Clay	6.4	1.0	<0.005	0.13	0.078
MW-4	6.0-6.5	1/28/92	Silty Sand	28	0.035	<0.024	0.4	1.6
MW-4	11.0-11.5	1/28/92	Silty Sand	5.7	0.22	0.076	0.17	0.64
MW-4	16.0-16.5	1/28/92	Clay	15	2.7	1.2	0.39	1.8
MW-5	11.0-11.5	1/28/92	Silty Sand	0.79	0.3	<0.005	0.049	0.019
MW-5	16.0-16.5	1/28/92	Clay	7.2	0.66	0.016	0.16	0.55
MW-6	11.0-11.5	1/28/92	Silty Sand	<0.5	0.0076	<0.005	<0.005	0.0052
MW-6	16.0-16.5	1/28/92	Clay	0.55	0.17	<0.005	0.016	0.021
MW-7	5	6/21/93	Clay	<0.5	<0.005	<0.005	<0.005	<0.015
MW-7	10	6/21/93	Silty Sand	<0.5	<0.005	<0.005	<0.005	<0.015
MW-7	15	6/21/93	Silty Clay	0.5	0.012	<0.005	0.038	<0.015
MW-8	5	6/22/93	Silty Clay	<0.5	<0.005	<0.005	<0.005	<0.015
MW-8	10	6/22/93	Silty Clay	<0.5	<0.005	<0.005	<0.005	<0.015
MW-8	15	6/22/93	Silty Clay	<0.5	<0.005	<0.005	<0.005	<0.015
MW-9	5	6/22/93	Silty Clay	<0.5	<0.005	<0.005	<0.005	<0.015

TABLE 1

PREVIOUS SITE INVESTIGATION

GROUNDWATER MONITOR WELLS

SOIL SAMPLE ANALYTICAL RESULTS (ASA, January 1992/June 1993; BC, February 1995)

FORMER EZ-SERVE FACILITY NO. 100877

ATC JOB NO. 43.25827.0024

(Results in milligrams per kilogram (mg/kg))

Sample *Identification*	**Sample *Depth* (feet)**	**Sampling *Date***	**Lithology**	**TPH *EPA 8015***	**Benzene *EPA 8020***	**Toluene *EPA 8020***	**Ethylbenzene *EPA 8020***	**Total Xylenes *EPA 8020***
MW-9	10	6/22/93	Silty Sand	<0.5	0.015	<0.005	<0.005	<0.015
MW-9	15	6/22/93	Clay	9	0.13	0.027	0.19	0.76
MW-10	5	6/22/93	Silty Clay	<0.5	<0.005	<0.005	<0.005	<0.015
MW-10	10	6/22/93	Sandy Silt	<0.5	0.016	<0.005	<0.005	<0.015
MW-10	15	6/22/93	Clay	0.59	0.0089	<0.005	0.051	0.015
MW-11	10	2/6/95	Silty Sand	<100	<1	<1	2	5
MW-11	15	2/6/95	Clayey Sand	100	<1	<1	2	5
MW-12	10	2/6/95	Sandy Clay	310	<1	<1	1	4
MW-12	15	2/6/95	Sandy Clay	<100	<1	<1	<1	1
MW-13	10	2/7/95	Sandy Silt	<100	<1	<1	<1	<1
MW-13	15	2/7/95	Clayey Sand	<100	<1	<1	<1	11
MW-14	10	2/7/95	Silty Sand	<100	<1	<1	<1	<1
MW-14	15	2/7/95	Silty Sand	760	1	<1	1	9

Notes:

TPH	Total petroleum hydrocarbons, analyzed by EPA method 8015
<0 5	Less than the detection limit of 0.5
mg/kg	*milligrams per kilograms (parts per million)*

TABLE 2
MONITOR WELL CONSTRUCTION DETAILS
FORMER EZ-SERVE FACILITY NO. 100877
ATC JOB NO. 43.25827.0024

Well Number	Total Depth (ft bgs)	Screened Interval (ft bgs)	Top of Casing Elevation (feet above mean sea level)	Date of Construction	Casing Diameter (inches)	Boring Diameter (inches)	Screen Slot Size (inches)
MW-1A	30	Unknown	97.59	11/86	2	Unknown	Unknown
MW-1	30	15-30	96.73	1/28/91	4	10	0.020
MW-2	30	15-30	98.06	1/28/91	4	10	0.020
MW-3	30	15-30	97.66	1/28/91	4	10	0.020
MW-4	30	15-30	97.10	1/28/91	4	10	0.020
MW-5	30	15-30	96.73	1/29/91	4	10	0.020
MW-6	30	15-30	97.09	1/29/91	4	10	0.020
MW-7	30	10-30	97.44	6/21/93	2	8	0.020
MW-8	30	10-30	97.61	6/22/93	2	8	0.020
MW-9	30	10-30	95.41	6/22/93	2	8	0.020
MW-10	30	10-30	97.11	6/22/93	2	8	0.020
MW-11	25	5-25	92.68	2/6/95	2	10	0.020
MW-12	30	10-30	99.03	2/6/95	2	10	0.020
MW-13	30	10-30	96.80	2/6/95	2	10	0.020
MW-14	30	10-30	99.01	2/6/95	2	10	0.020

Table 3
Historical Summary of Groundwater Data

Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-1	2/5/92	96.73	20.82	0.00	75.91	46,000	76,000	23,000	2,400	6,500	NA
	9/11/92	96.73	20.08	0.00	76.65	48,000	9,000	1,200	1,800	4,600	NA
	12/22/92	96.73	19.79	0.00	76.94	84,000	22,000	1,600	4,800	17,000	NA
	3/3/93	96.73	16.23	0.00	80.50	54,000	16,000	1,600	1,900	4,300	NA
	6/23/93	96.73	16.86	0.00	79.87	30,000	18,000	1,100	1,400	3,700	NA
	9/30/93	96.73	18.04	0.00	78.69	33,000	10,000	440	940	1,700	NA
	2/6/94	96.73	18.15	0.00	78.58	64,000	18,000	1,600	4,700	12,000	NA
	5/2/94	96.73	17.26	0.00	79.47	7,200	2,100	29	490	520	NA
	7/1/94	96.73	17.60	0.00	79.13	13,000	3,700	150	550	12,000	NA
	9/20/94	96.73	20.59	0.00	76.14	10,000	3,100	75	440	870	NA
	12/5/94	96.73	17.83	0.00	78.90	8,700	3,700	87	520	950	NA
	9/23/96	96.73	14.92	0.00	81.81	20,000	5,200	860	700	1,100	270
	12/4/96	96.73	15.61	0.00	81.12	17,000	3,100	64	610	1,200	280
	4/8/97	96.73	13.25	0.00	83.48	2,100	430	15	52	85	100
	6/30/97	96.73	14.68	0.00	82.05	10,000	2,100	ND	ND	320	ND
	11/25/97	96.73	15.99	0.00	80.74	16,000	2,100	23	76	240	ND
	6/1/98	96.73	9.98	0.00	86.75	19,000	6,100	430	1,100	2,300	420
	6/14/01	96.73	15.05	0.00	81.68	6,000	380	8	260	180	<25
MW-1A	6/23/93	97.59	17.80	0.21	79.79	NS	NS	NS	NS	NS	NS
	9/30/93	97.59	NM	NM	NM	NS	NS	NS	NS	NS	NS
	2/6/94	97.59	18.89	0.00	78.70	8,900	1700	42	1,000	400	NA
	5/2/94	97.59	18.35	0.09	79.24	NS	NS	NS	NS	NS	NS
	7/1/94	97.59	18.45	0.00	79.14	12,000	1100	<1	920	1,100	NA
	9/20/94	97.59	21.72	0.22	75.87	NS	NS	NS	NS	NS	NS
	12/5/94	97.59	18.87	0.07	78.72	NS	NS	NS	NS	NS	NS
	9/23/96	97.59	16.00	0.01	81.59	NS	NS	NS	NS	NS	NS

Table 3
Historical Summary of Groundwater Data
Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-1A	12/4/96	97.59	16.55	0.00	81.04	52,000	420	140	1,000	3,500	130
(Cont.)	4/8/97	97.59	14.15	sheen	83.44	NS	NS	NS	NS	NS	NS
	6/30/97	97.59	15.57	0.00	82.02	17,000	180	ND	140	1,100	ND
	11/25/97	97.59	16.91	0.00	80.68	19,000	110	37	290	910	ND
	6/1/98	97.59	10.78	0.00	86.81	18,000	200	17	230	820	91
	6/14/01	97.59	15.93	0.01	81.66	27,000	29	<5.0	620	520	<50
MW-2	2/5/92	98.06	22.35	0.00	75.71	67,000	13,000	4,700	820	1,300	NA
	9/11/92	98.06	21.67	0.00	76.39	5,700	9,000	1,400	1,200	8,400	NA
	12/22/92	98.06	21.39	0.00	76.67	31,000	9,900	350	2,000	4,100	NA
	3/3/93	98.06	17.75	0.00	80.31	17,000	5,100	1,300	720	1,900	NA
	6/23/93	98.06	18.42	0.00	79.64	60,000	23,000	1,500	4,500	17,000	NA
	9/30/93	98.06	19.63	0.00	78.43	38,000	12,000	780	1,500	6,500	NA
	2/6/94	98.06	19.61	0.00	78.45	34,000	8,900	450	2,000	5,500	NA
	5/2/94	98.06	19.84	0.00	78.22	18,000	3,800	260	1,100	3,500	NA
	7/1/94	98.06	19.18	0.00	78.88	18,000	3,700	510	870	2,600	NA
	9/20/94	98.06	22.17	0.00	75.89	19,000	4,500	300	1,200	4,000	NA
	12/5/94	98.06	19.37	0.00	78.69	22,000	4,700	340	1,400	4,500	NA
	12/4/96	98.06	17.19	0.00	80.87	31,000	3,800	140	2,000	5,100	690
	4/8/97	98.06	14.86	0.00	83.20	20,000	2,500	80	1,300	3,400	880
	6/30/97	98.06	16.28	0.00	81.78	41,000	2,700	130	1,200	4,000	890
	11/25/97	98.06	17.56	0.00	80.50	51,000	2,900	140	1,800	7,000	1,200
	6/1/98	98.06	11.58	0.00	86.48	33,000	2,700	130	1,800	5,700	610
	6/14/01	98.06	16.63	0.00	81.43	18,000	860	14	1,100	2,200	<100

Table 3
Historical Summary of Groundwater Data
Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-3	2/5/92	97.66	21.85	0.00	75.81	5,900	1,100	<1	<1	<1	NA
	9/11/92	97.66	21.13	0.00	76.53	9,400	12,000	180	550	1,100	NA
	12/22/92	97.66	20.88	0.00	76.78	12,000	2,800	190	850	1,600	NA
	3/3/93	97.66	17.29	0.00	80.37	11,000	2,200	360	570	900	NA
	6/23/93	97.66	17.88	0.00	79.78	33,000	12,000	2,700	1,300	3,500	NA
	9/30/93	97.66	19.18	0.00	78.48	4,300	1,100	160	690	670	NA
	2/6/94	97.66	19.21	0.00	78.45	20,000	4,800	430	1,500	2,900	NA
	5/2/94	97.66	18.30	0.00	79.36	4,200	680	48	310	540	NA
	7/1/94	97.66	18.63	0.00	79.03	4,600	600	63	240	470	NA
	9/20/94	97.66	21.64	0.00	76.02	8,200	2,200	130	670	930	NA
	12/5/94	97.66	19.15	0.00	78.51	4,000	640	34	290	480	NA
	9/23/96	97.66	16.11	0.00	81.55	10,000	950	20	700	780	80
	12/4/96	97.66	16.63	0.00	81.03	13,000	1,100	25	1,000	1,100	67
	4/8/97	97.66	14.25	0.00	83.41	3,800	210	5	270	280	56
	6/30/97	97.66	15.70	0.00	81.96	3,500	280	ND	32	180	ND
	11/25/97	97.66	16.99	0.00	80.67	6,800	230	ND	370	290	130
	6/1/98	97.66	NM	NM	NM	NS	NS	NS	NS	NS	NS
	6/14/01	97.66	16.63	0.00	81.03	2,100	9	<0.5	78	43	<5.0
MW-4	2/5/92	97.10	21.31	0.00	75.79	16,000	2,700	410	<1	3,400	NA
	9/11/92	97.10	20.62	0.00	76.48	43,000	7,600	1,600	1,400	4,100	NA
	12/22/92	97.10	20.37	0.00	76.73	29,000	8,800	1,200	1,500	3,700	NA
	3/3/93	97.10	16.78	0.00	80.32	17,000	5,000	1,500	680	1,700	NA
	6/23/93	97.10	17.45	0.00	79.65	5,700	3,000	120	560	790	NA
	9/30/93	97.10	18.64	0.00	78.46	2,100	7,000	2,100	970	2,600	NA
	2/6/94	97.10	18.59	0.00	78.51	24,000	7,200	1,600	990	3,200	NA
	5/2/94	97.10	17.81	0.00	79.29	10,000	2,200	440	470	1,200	NA
	7/1/94	97.10	18.13	0.00	78.97	8,200	2,000	370	350	930	NA

Table 3
Historical Summary of Groundwater Data

Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-4 (Cont.)	9/20/94	97.10	21.13	0.00	75.97	7,200	2,000	360	380	1,000	NA
	12/5/94	97.10	18.36	0.00	78.74	9,000	2,300	400	440	1,100	NA
	9/23/96	97.10	15.56	0.00	81.54	32,000	7,400	540	1,500	2,800	2,100
	12/4/96	97.10	16.11	0.00	80.99	23,000	7,800	140	1,200	1,200	1,900
	4/8/97	97.10	13.73	0.00	83.37	16,000	3,900	680	850	2,300	980
	6/30/97	97.10	15.19	0.00	81.91	63,000	7,000	430	1,400	4,400	17,000
	11/25/97	97.10	16.49	0.00	80.61	30,000	4,300	61	810	1,500	880
	6/1/98	97.10	10.42	0.00	86.68	33,000	5,700	710	1,700	2,900	720
	6/14/01	97.10	15.55	0.00	81.55	9,500	690	45	560	600	<50
MW-5	2/5/92	96.73	20.93	0.00	75.80	78,000	7,900	5,000	2,900	1,800	NA
	9/11/92	96.73	20.27	0.00	76.46	49,000	4,700	400	1,400	4,100	NA
	12/22/92	96.73	19.99	0.00	76.74	34,000	8,600	340	2,200	4,800	NA
	3/3/93	96.73	16.49	0.00	80.24	22,000	7,500	640	1,300	3,400	NA
	6/23/93	96.73	17.02	0.00	79.71	15,000	5,800	120	1,100	2,100	NA
	9/30/93	96.73	18.25	0.00	78.48	25,000	7,600	410	1,000	4,400	NA
	2/6/94	96.73	18.26	0.00	78.47	23,000	6,000	180	2,000	5,900	NA
	5/2/94	96.73	17.50	0.00	79.23	8,000	1,300	29	440	770	NA
	7/1/94	96.73	17.79	0.00	78.94	10,000	1,700	97	600	1,400	NA
	9/20/94	96.73	20.77	0.00	75.96	8,400	1,600	54	650	1,400	NA
	12/5/94	96.73	18.02	0.00	78.71	10,000	1,800	<50	620	1,400	NA
	9/23/96	96.73	15.19	0.00	81.54	9,800	1,800	11	470	510	100
	12/4/96	96.73	15.78	0.00	80.95	10,000	2,200	9	550	430	70
	4/8/97	96.73	13.39	0.00	83.34	11,000	1,300	15	450	720	180
	6/30/97	96.73	14.83	0.00	81.90	3,800	500	ND	75	84	ND
	11/25/97	96.73	16.14	0.00	80.59	8,200	1,300	14	310	220	ND
	6/1/98	96.73	10.10	0.00	86.63	3,600	290	12	52	52	81
	6/14/01	96.73	15.19	0.00	81.54	5,100	44	0.71	110	23	<5.0

Table 3
Historical Summary of Groundwater Data
Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-6	2/5/92	97.09	21.29	0.00	75.80	51,000	5,400	3,500	3,600	10,000	NA
	9/11/92	97.09	20.56	0.00	76.53	24,000	2,500	830	1,400	2,300	NA
	12/22/92	97.09	20.31	0.00	76.78	23,000	5,100	630	2,000	3,100	NA
	3/3/93	97.09	16.83	0.00	80.26	18,000	4,400	820	1,400	2,400	NA
	6/23/93	97.09	17.30	0.00	79.79	18,000	4,600	850	2,700	3,400	NA
	9/30/93	97.09	19.05	0.03	78.04	NS	NS	NS	NS	NS	NS
	2/6/94	97.09	18.55	0.00	78.54	20,000	4,600	690	2,100	2,500	NA
	5/2/94	97.09	17.74	0.00	79.35	5,300	930	54	610	240	NA
	7/1/94	97.09	18.09	0.00	79.00	10,000	1,500	160	850	690	NA
	9/20/94	97.09	21.05	0.00	76.04	11,000	2,000	140	1,200	760	NA
	12/5/94	97.09	18.33	0.00	78.76	8,600	1,300	87	980	610	NA
	9/23/96	97.09	15.50	0.00	81.59	12,000	520	55	930	350	51
	12/4/96	97.09	16.06	0.00	81.03	11,000	390	25	680	170	130
	4/8/97	97.09	13.64	0.00	83.45	17,000	700	92	1,400	900	2,700
	6/30/97	97.09	15.08	0.00	82.01	11,000	270	37	590	450	ND
	11/25/97	97.09	16.40	0.00	80.69	9,100	130	26	500	150	310
	6/1/98	97.09	10.31	0.00	86.78	14,000	190	50	680	400	160
	6/14/01	97.09	15.46	0.00	81.63	6,400	29	6.3	200	55	<20
MW-7	6/23/93	97.44	17.87	0.00	79.57	29000	4200	71	4400	5600	NA
	9/30/93	97.44	18.94	0.00	78.50	30000	3200	71	2800	3400	NA
	2/6/94	97.44	19.11	0.06	78.33	NS	NS	NS	NS	NS	NS
	5/2/94	97.44	18.11	0.00	79.33	5700	630	13	660	400	NA
	7/1/94	97.44	18.72	0.00	78.72	3100	180	99	160	520	NA
	9/20/94	97.44	21.41	0.00	76.03	6100	540	6	750	730	NA
	12/5/94	97.44	18.66	0.00	78.78	3700	280	<10	430	350	NA
	9/23/96	97.44	15.94	0.00	81.50	6,300	76	ND	420	270	15

Table 3
Historical Summary of Groundwater Data
Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-7	12/4/96	97.44	16.43	0.00	81.01	7,800	67	ND	600	350	22
(Cont.)	4/8/97	97.44	14.10	0.00	83.34	5,600	42	ND	240	96	ND
	6/30/97	97.44	15.51	0.00	81.93	5,500	ND	79	ND	44	280
	11/25/97	97.44	16.80	0.00	80.64	2,400	23	5.4	ND	54	120
	6/1/98	97.44	10.76	0.00	86.68	8,200	43	9.7	35	100	82
	6/14/01	97.44	15.84	0.00	81.60	2,900	<2.5	<2.5	54	10	<5.0
MW-8	6/23/93	97.61	17.64	0.00	79.97	350	43	9	35	67	NA
	9/30/93	97.61	18.85	0.00	78.76	2,700	190	340	170	720	NA
	2/6/94	97.61	18.91	0.00	78.70	<100	<1	1	1	2	NA
	5/2/94	97.61	18.11	0.00	79.50	<100	<1	3	<1	7	NA
	7/1/94	97.61	18.43	0.00	79.18	300	18	48	19	37	NA
	9/20/94	97.61	21.43	0.00	76.18	<100	<1	<1	<1	<1	NA
	12/5/94	97.61	18.72	0.00	78.89	<50	<0.5	<0.5	<0.5	<0.5	NA
	9/23/96	97.61	15.83	0.00	81.78	ND	ND	ND	ND	ND	ND
MW-9	6/23/93	95.41	15.94	0.00	79.47	45,000	14,000	1,200	2,800	12,000	NA
	9/30/93	95.41	17.05	0.00	78.36	86,000	22,000	1,100	3,300	15,000	NA
	2/6/94	95.41	17.07	0.00	78.34	43,000	10,000	460	2,100	7,500	NA
	5/2/94	95.41	16.24	0.00	79.17	17,000	5,400	270	1,300	4,700	NA
	7/1/94	95.41	16.59	0.00	78.82	10,000	2,100	120	450	1,300	NA
	9/20/94	95.41	19.61	0.00	75.80	7,500	2,200	97	400	1,200	NA
	12/5/94	95.41	16.85	0.00	78.56	10,000	2,700	130	530	1,600	NA
MW-10	6/23/93	97.11	17.39	0.00	79.72	35,000	980	640	3,500	12,000	NA
	9/30/93	97.11	18.58	0.00	78.53	4,000	230	12	100	680	NA
	2/6/94	97.11	18.61	0.00	78.50	2,000	69	12	220	120	NA
	5/2/94	97.11	17.83	0.00	79.28	710	16	6	85	62	NA

Table 3
Historical Summary of Groundwater Data
Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-10	7/1/94	97.11	18.17	0.00	78.94	2,000	52	43	120	210	NA
(Cont.)	9/20/94	97.11	21.15	0.00	75.96	2,800	34	16	270	560	NA
	12/5/94	97.11	18.43	0.00	78.68	2,700	30	13	260	430	NA
	9/23/96	97.11	15.59	0.00	81.52	3,800	4	2.9	220	170	397
	12/4/96	97.11	16.15	0.00	80.96	4,600	1.6	7.7	260	150	20
MW-11	2/10/95	92.68	11.80	0.00	80.88	7,000	140	22	600	1,000	NA
	9/23/96	92.68	12.29	0.00	80.39	27,000	55	81	3,000	3,500	40
	4/8/97	92.68	10.51	0.00	82.17	24,000	280	130	3,000	3,700	ND
MW-12	2/10/95	99.03	16.30	0.00	82.73	<50	<0.5	<0.5	<0.5	<0.5	NA
	9/23/96	99.03	16.67	0.00	82.36	ND	ND	1.6	ND	ND	ND
	12/4/96	99.03	17.16	0.00	81.87	ND	3.2	ND	1.9	3.4	ND
	4/8/97	99.03	14.88	0.00	84.15	ND	ND	ND	ND	ND	ND
	6/30/97	99.03	16.33	0.00	82.70	NS	NS	NS	NS	NS	NS
	11/25/97	99.03	17.61	0.00	81.42	NS	NS	NS	NS	NS	NS
	6/1/98	99.03	11.58	0.00	87.45	NS	NS	NS	NS	NS	NS
	6/14/01	99.03	16.62	0.00	82.41	ND	ND	ND	ND	ND	ND
MW-13	2/10/95	96.80	14.45	0.00	82.35	<50	<0.5	<0.5	<0.5	<0.5	NA
	9/23/96	96.80	14.60	0.00	82.20	ND	ND	0.80	1.0	ND	ND
	12/4/96	96.80	NM	NM	NM	NS	NS	NS	NS	NS	NS
	4/8/97	96.80	12.75	0.00	84.05	ND	ND	ND	ND	ND	ND
	6/30/97	96.80	14.13	0.00	82.67	NS	NS	NS	NS	NS	NS
	11/25/97	96.80	15.48	0.00	81.32	NS	NS	NS	NS	NS	NS
	6/1/98	96.80	9.58	0.00	87.22	NS	NS	NS	NS	NS	NS
	6/14/01	96.80	14.51	0.00	82.29	ND	ND	ND	ND	ND	ND

Table 3
Historical Summary of Groundwater Data

Former E-Z Serve Facility # 100877
525 West A Street
Hayward, California

Well I.D.	Sampling Date	TOC (feet)	DTW (feet)	PSH (feet)	GWE (feet)	TPHg (µg/L)	Benzene (µg/L)	Toluene (µg/L)	Ethylbenzene (µg/L)	Total Xylenes (µg/L)	MTBE (µg/L)
MW-14	2/10/95	99.01	16.28	0.00	82.73	12,000	42	8	740	2,100	NA
	9/23/96	99.01	16.67	0.00	82.34	6,400	3	ND	690	96	9.6
	12/4/96	99.01	17.06	0.00	81.95	9,500	6	ND	1,100	400	30
	4/8/97	99.01	14.77	0.00	84.24	2,900	ND	2.7	220	21	ND
	6/30/97	99.01	16.22	0.00	82.79	74	1.3	ND	0.51	0.68	ND
	11/25/97	99.01	17.52	0.00	81.49	ND	ND	ND	ND	ND	ND
	6/1/98	99.01	11.46	0.00	87.55	<50	<0.5	<0.5	<0.5	<0.5	<5
	6/14/01	99.01	16.53	0.00	82.48	470	<0.5	<0.5	2.8	1.0	<5

Notes:

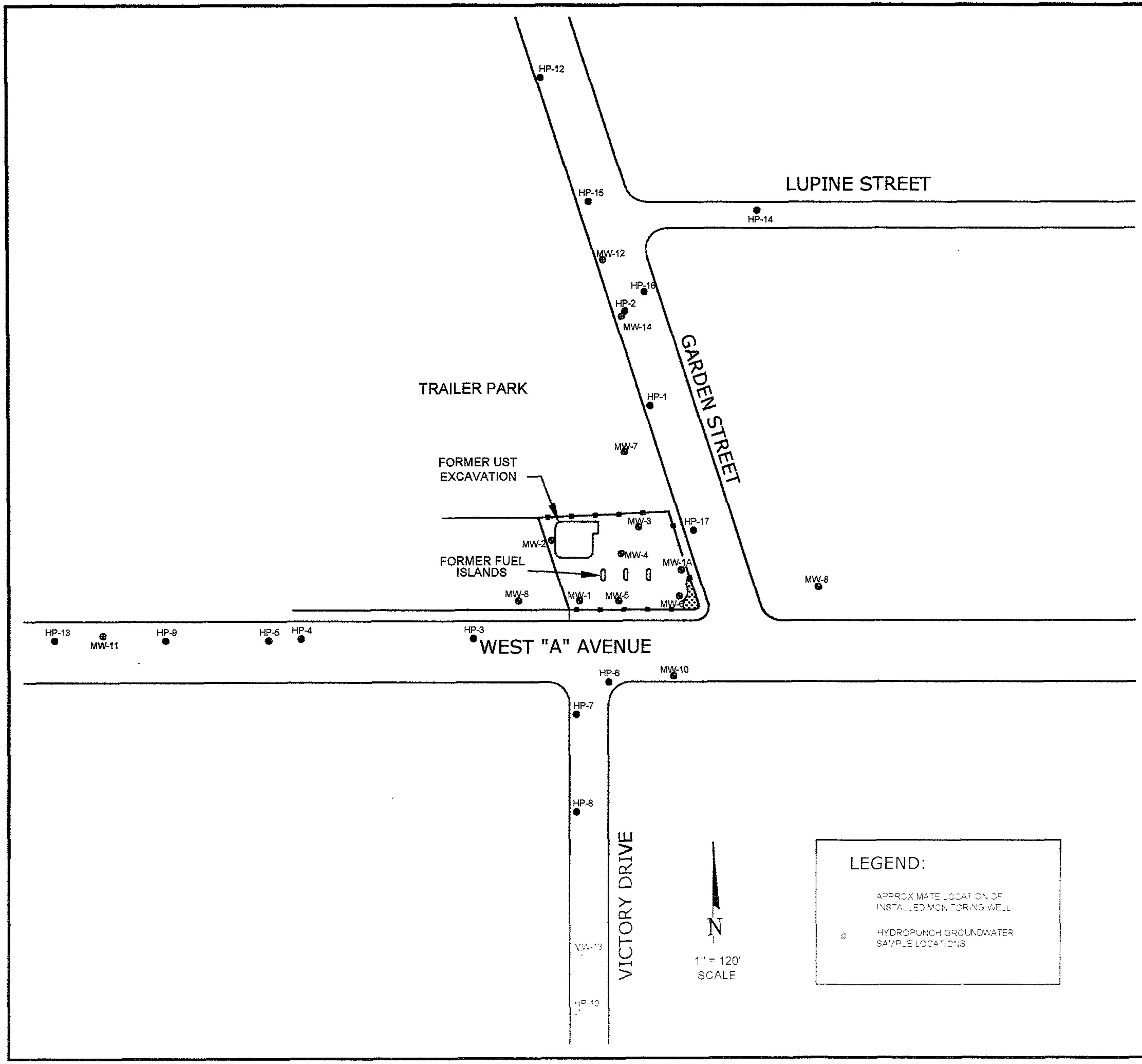
TOC	Top of casing elevation
DTW	Depth to groundwater
PSH	Phase separated hydrocarbons
GWE	Groundwater elevation (TOC-DTW)
TPHg	*Total petroleum hydrocarbons as gasoline (EPA Method 5030/8015M)*
MTBE	Methyl tert-butyl ether (EPA Method 8020 or EPA Method 8260)
µg/L	Micrograms per liter (~parts per billion)
<#.##	Non-detectable at laboratory detection limit
NM	Not measured
NS	Not sampled
NA	Not analyzed

VICINITY MAP

Former EZ-Serve Location No. 100877
525 West A Street
Hayward, California

PROJECT NO. 43.25827.0024	FIGURE 1
FILE NO. h:projects/ezserve/100877/fig1	

ATC ASSOCIATES INC.
9620 Chesapeake Drive, Suite 203
San Diego, California 92123



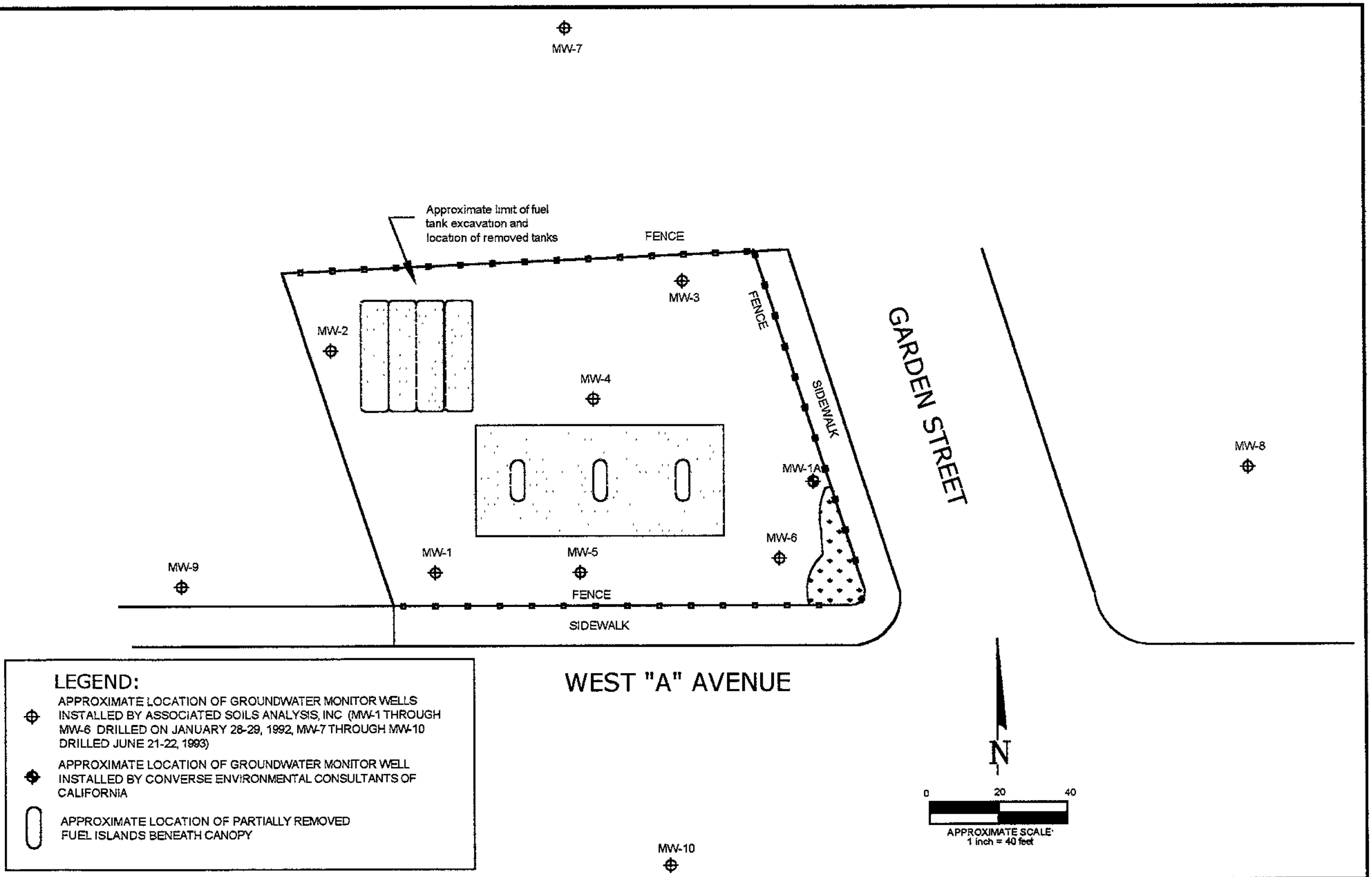
PREVIOUS SITE INVESTIGATION MAP HYDRO-PUNCH LOCATIONS/GROUNDWATER MONITOR WELLS (BC, FEBRUARY 1995)

Former EZ-Serve Location No. 100877
525 West A Street
Hayward, California

PROJECT NO. 43.25827.0024 FIGURE 3

FILE NO. h:projects/ezserve/100877/fig3

ASSOCIATES INC.
9620 Chesapeake Drive Suite 203
San Diego California 92123



LEGEND:

⌖ APPROXIMATE LOCATION OF GROUNDWATER MONITOR WELLS INSTALLED BY ASSOCIATED SOILS ANALYSIS, INC (MW-1 THROUGH MW-6 DRILLED ON JANUARY 28-29, 1992, MW-7 THROUGH MW-10 DRILLED JUNE 21-22, 1993)

◈ APPROXIMATE LOCATION OF GROUNDWATER MONITOR WELL INSTALLED BY CONVERSE ENVIRONMENTAL CONSULTANTS OF CALIFORNIA

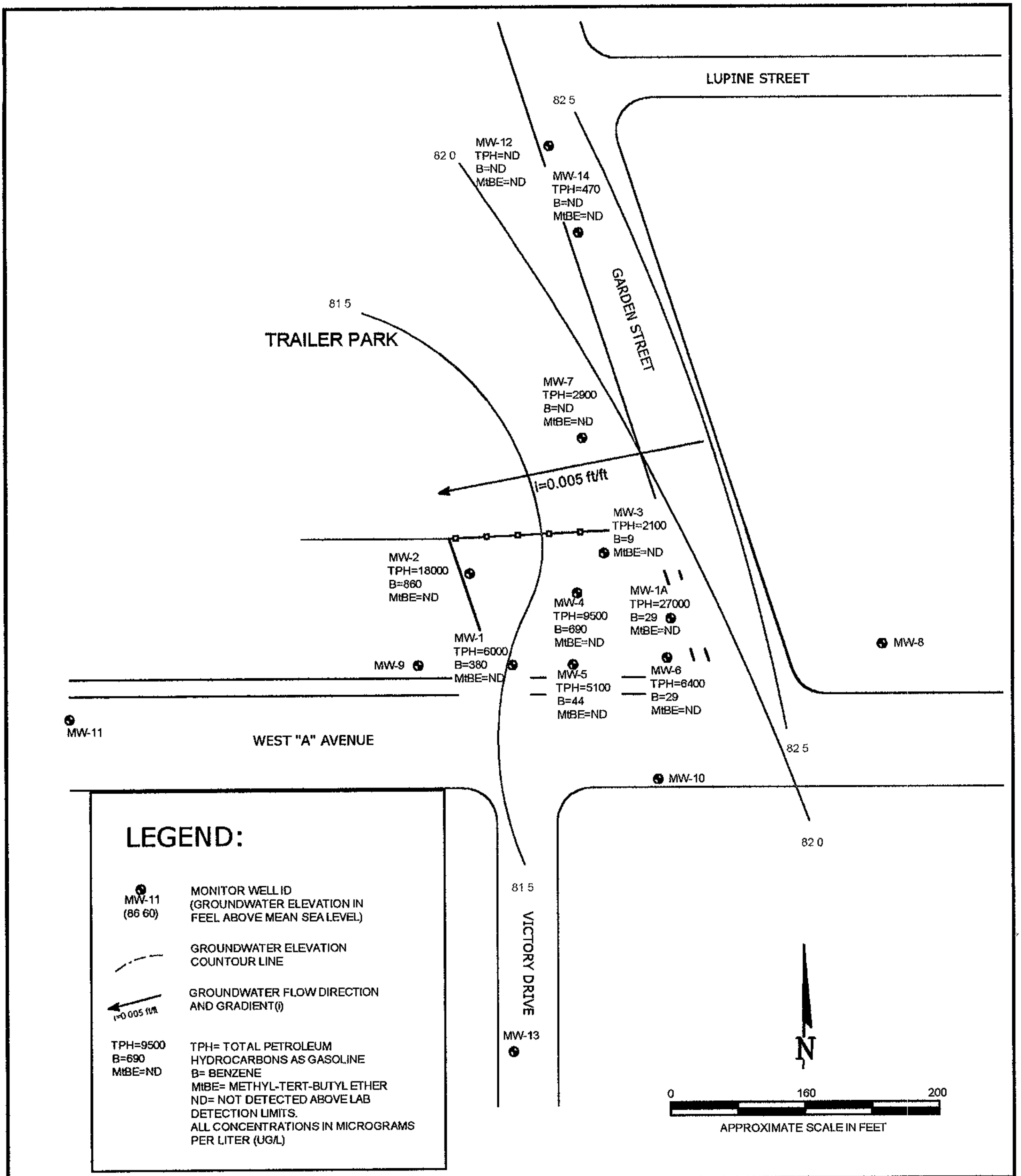
⬯ APPROXIMATE LOCATION OF PARTIALLY REMOVED FUEL ISLANDS BENEATH CANOPY

PREVIOUS SITE INVESTIGATION MAP
GROUNDWATER MONITOR WELLS
(ASA, JANUARY 1992/ JUNE 1993)

Former EZ-Serve Location No. 100877
525 West A Street
Hayward, California

PROJECT NO.	43.25827.0024	FIGURE 2
FILE NO.	h:projects/ezserve/100877/fig2	

ATC ASSOCIATES INC.
9620 Chesapeake Drive,Suite 203
San Diego, California 92123



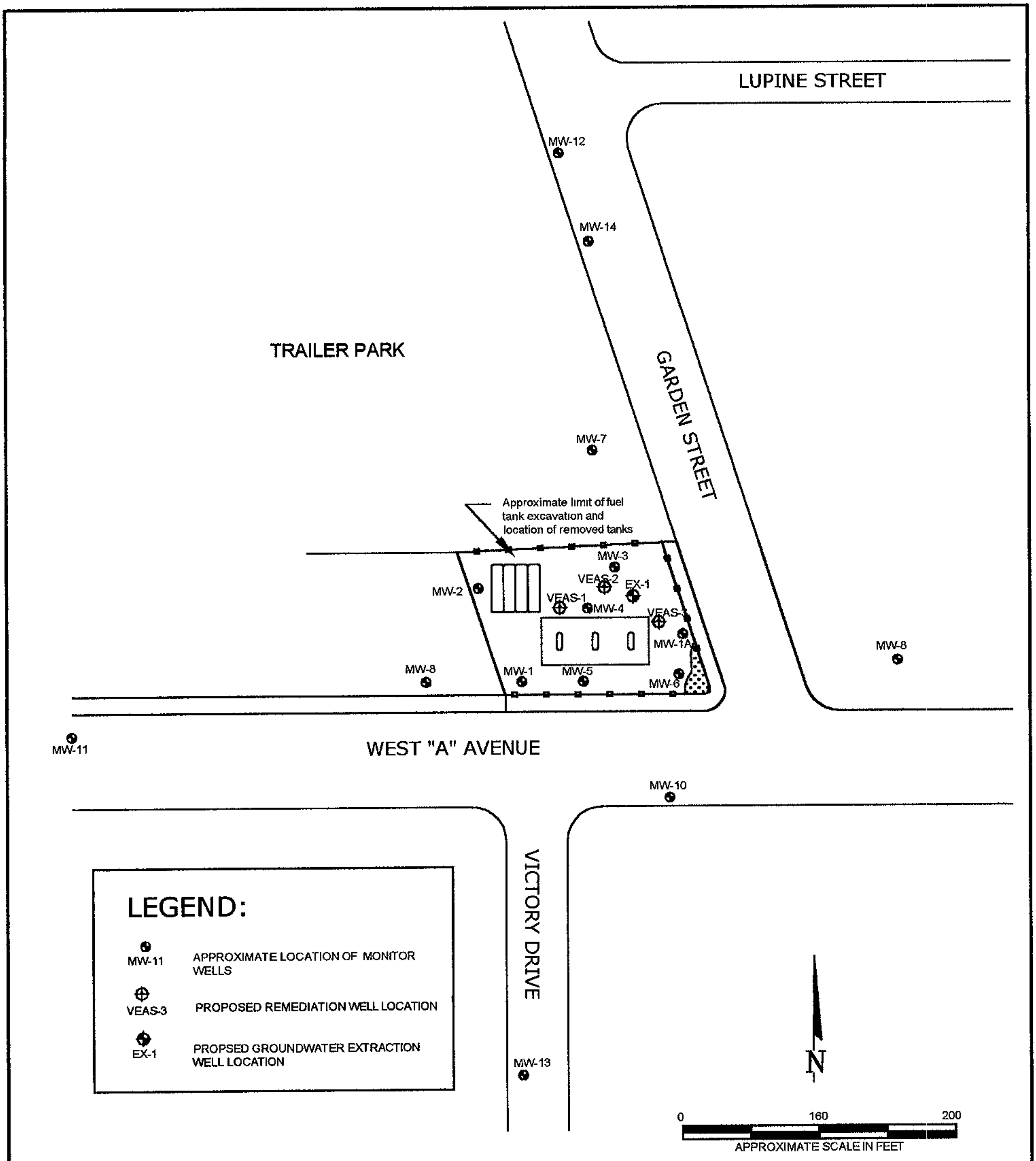
GROUNDWATER SUMMARY MAP
(CLEARWATER, JUNE 13/14, 2001)

Former EZ-Serve Location No. 100877
525 West A Street
Hayward, California

PROJECT NO. 43.25827.0024 **FIGURE 4**

FILE NO. h:projects/ezserve/100877/fig4

ATC
ASSOCIATES INC.
9620 Chesapeake Drive, Suite 203
San Diego, California 92123

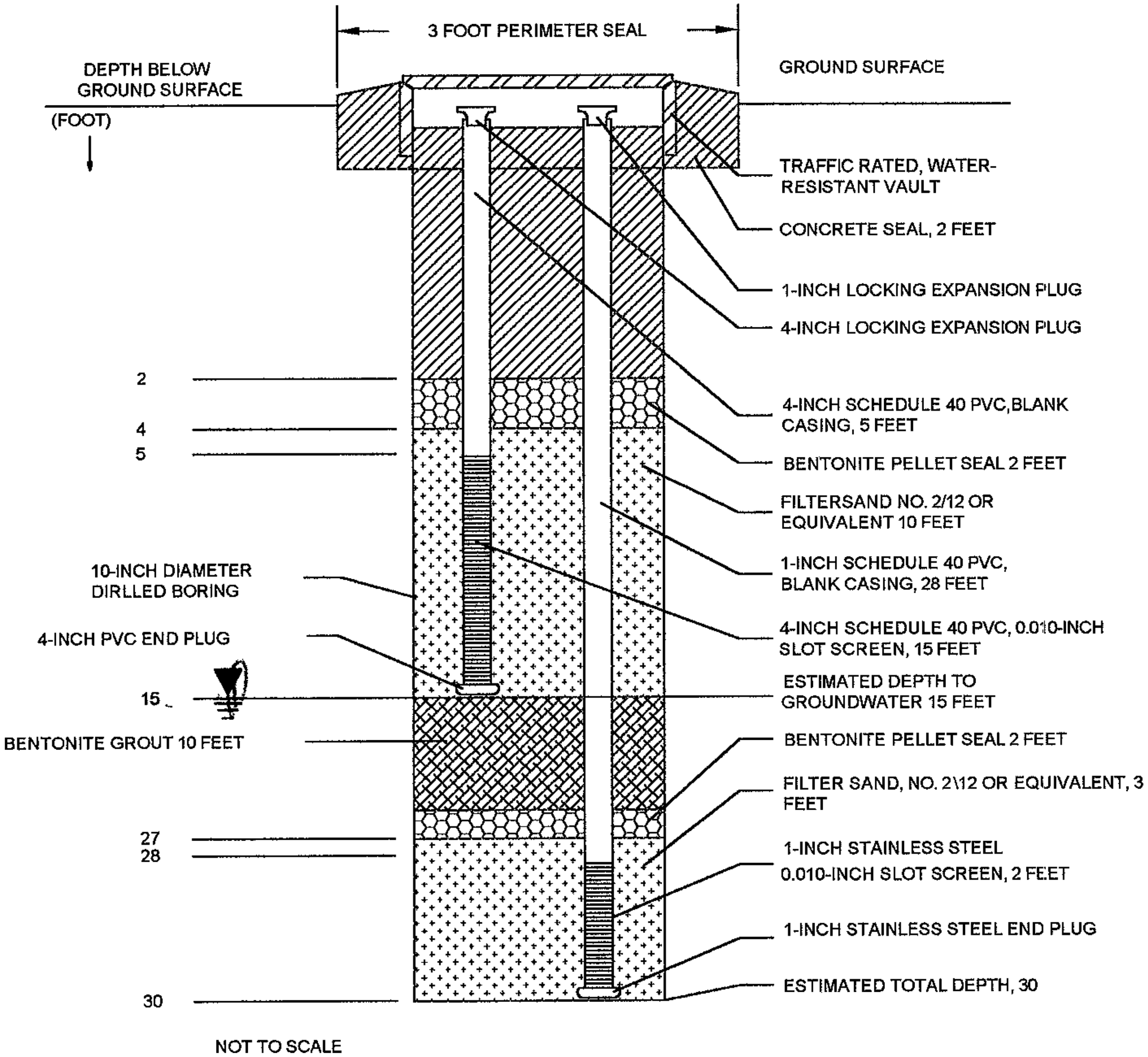


PROPOSED WELL
(EX-1 AND VEAS -1 THROUGH VEAS -3)
LOCATION MAP

Former EZ-Serve Location No.100877
525 West A Street
Hayward California

PROJECT NO.	43.25827.0030	FIGURE 5
FILE NO.	h:projects/ezserve/100877/fig5	

ATC ASSOCIATES INC.
9620 Chesapeake Drive, Suite 203
San Diego, California 92123

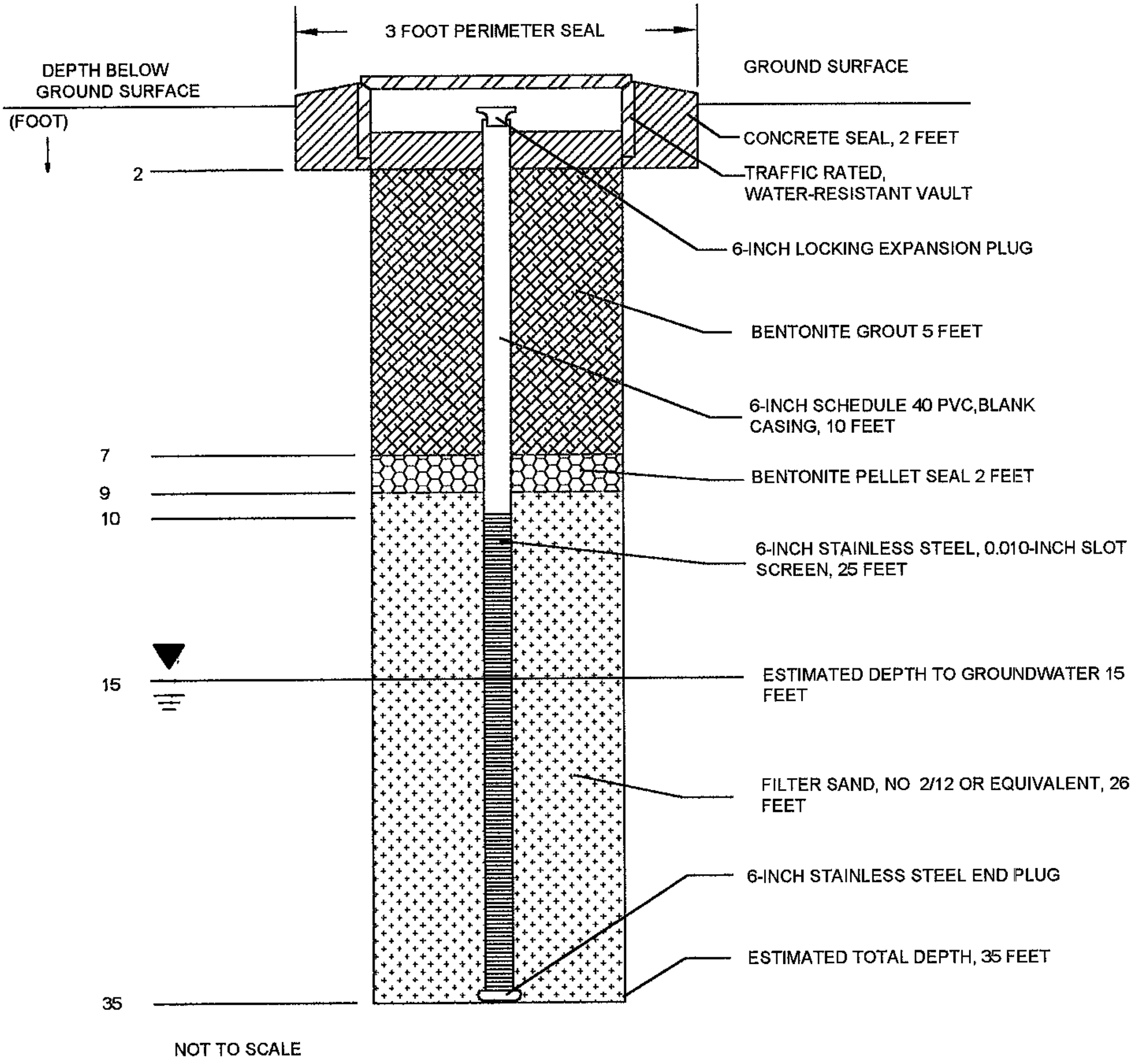


PROPOSED REMEDIATION WELL (VEAS-1 THROUGH VEAS-3) CONSTRUCTION DETAIL

Former EZ-Serve Location No. 100877
525 West A Street
Hayward, California

PROJECT NO.	43.25827.0024	FIGURE 6
FILE NO.	h:projects/ezserve/100877/fig6	

ATC ASSOCIATES INC.
9620 Chesapeake Drive,Suite 203
San Diego, California 92123



PROPOSED REMEDIATION WELL
(EX-1)
CONSTRUCTION DETAIL
Former EZ-Serve Location No. 100877
525 West A Street
Hayward, California

PROJECT NO. 43.25827.0024

FIGURE 7

FILE NO. h:projects/ezserve/100877/fig7

ATC
ASSOCIATES INC.
9620 Chesapeake Drive,Suite 203
San Diego, California 92123

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

100877

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

STID 3580

August 22, 2001

Mr. Andrew Long
Restructure Petroleum Marketing Services, RPMS
205 South Hoover Blvd. Suite 101
Tampa Florida 33609

Wayne, I'll forward it for receipt 9-11-01

RE: Former EZ Serve Site at 525 West A Street, Hayward, CA

Dear Mr. Long:

This office is in receipt of "Second Quarter 2001 Groundwater Sampling Event" dated August 20, 2001 regarding the above referenced site by Ms. Heidi M. Bauer of Clearwater Group Inc., your consultant.

Per this report MW-2, MW-4, MW-1 and MW-1A wells are the most contaminated wells at the site during this investigation. The highest TPH was noted at MW-1A well at 27,000ppb followed by MW-2 at 18,000ppb. The highest Benzene concentrations were noted at 860ppb within MW-2 and 690ppb in MW-4 well. MTBE was not detected within any of the wells during this analysis.

As you are aware, I have previously discussed this site with Ms. Bauer, who informed me regarding a risk assessment, which had been conferred with Madhulla Logan, formerly of our office. According to Ms. Bauer, Ms. Logan had requested some addendum to the previously submitted risk assessment dated May 9th, 1995 by Brown and Caldwell Consultants. The risk assessment was to be performed in order to establish clean up level for the above referenced site. Therefor, you may submit the risk assessment along with results of the previously approved workplan regarding the above referenced site.

Please begin implementation of the submitted workplan as well as the risk assessment proposal as discussed previously.

Please give me advance notice regarding your sampling schedule, so that I could be present during the sampling event.

I will be looking forward to receive the result of the submitted workplan along with the risk assessment calculations.

Should you have any questions, please call me at (510) 567-6876.

Sincerely,

Amir K. Gholami, REHS
Hazardous Materials Specialist

C: Ms. Heidi Bauer, Clear water Group Inc., 520 third Street 3104
Oakland
Mr. Hugh Murphy, City of Hayward Hazardous Material Office, 777 B Street, Hayward, CA
94541
Files

ALAMEDA COUNTY
HEALTH CARE SERVICES
AGENCY
DAVID J. KEARS, Agency Director

ENVIRONMENTAL HEALTH SERVICES
ENVIRONMENTAL PROTECTION
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577
(510) 567-6700
FAX (510) 337-9335

STID 3580

October 24, 2001

Mr. Andrew Long
Restructure Petroleum Marketing Services, RPMS
205 South Hoover Blvd Suite 101
Tampa Florida 33609

RE: Former EZ Serve Site at 525 West A Street, Hayward, CA

Dear Mr. Long:

I am in receipt of faxed copy of "Project Status" document dated October 23, 2001 submitted by Mr. Greg Vogelpohl of ATC Associates Inc. regarding the above referenced site. I understand that Ms. Bauer of Clearwater Group Inc. is no longer involved at the above referenced site.

According to my earlier discussion with Mr. Vogelpohl conversation and per previous report MW-2, MW-4, MW-1 and MW-1A wells are the most contaminated wells at the site during this investigation. The highest TPH was noted at MW-1A well at 27,000ppb followed by MW-2 at 18,000ppb. The highest Benzene concentrations were noted at 860ppb within MW-2 and 690ppb in MW-4 well. MTBE was not detected within any of the wells during this analysis.

Per this report and my discussion with Mr. Vogelpohl of ATC associate, performance of pilot studies have been recommended to determine the most appropriate remediation alternative including installment of vapor extraction/air sparge wells and groundwater extraction wells. Furthermore 8-hour vapor extraction pilot test, 8-hour air sparge test, and 24-hour constant rate discharge aquifer tests will be performed and incorporated in an Interim Remedial Action, IRA, plan.

In the past I had asked that a risk assessment be performed in order to establish clean up level and to submit the risk assessment along with results of the previously approved workplan regarding the above referenced site. The risk assessment had been requested since Madhulla Logan, formerly of our office, had requested such addendum to the previously submitted risk assessment dated May 9th, 1995 by Brown and Caldwell Consultants. However, per my discussion with Mr. Vogelpohl of ATC Associates Inc. you do not need to prepare this risk assessment at this time but rather when the concentrations of the constituents in the plume have reduced significantly in the near future.

Additionally, I understand that all the generated waste on the site will be properly handled in accordance to this office and Alameda County fire Department guidelines. This includes proper handling of the previously generated waste, three 55-gallon drums, at the above referenced site.

Please inform me in advance regarding your fieldwork schedule, so that a representative of this office could be present during the field work events.

If you have any questions, please do not hesitate to call me at (510) 567-6876.

Sincerely,

Amir K. Gholami, REHS
Hazardous Materials Specialist

C: Ms. Heidi Bauer, Clear water Group Inc., 520 third Street 3104
Oakland
Mr. Hugh Murphy, City of Hayward Hazardous Material Office, 777 B Street, Hayward, CA 94541
Files

STANDARD OPERATING PROCEDURE

SOIL BOREHOLE DRILLING, REMEDIATION WELL INSTALLATION, AND SOIL SAMPLING

Drilling and Soil Sampling

Permits, Site Safety Plan. Utility Clearance

ATC Associates Inc. (ATC) obtains all the required permits, unless otherwise contractually directed. ATC prepares a site specific Site Safety Plan detailing site hazards, site safety and control, decontamination procedures, and emergency response procedures to be employed throughout the defined phase of work. At least 48 hours prior to drilling. Underground Service Alert (USA) or an equivalent agency is notified of the planned work. ATC attempts to locate all underground and aboveground utilities by site inspection (in conjunction with its' subcontractors and knowledgeable site managers, if available), and review of site as-built drawings. ATC may employ a private, professional utility locator to refine the site utility inspection.

Drilling Equipment

All soil borings are drilled using a truck-mounted hollow-stem auger drill rig, unless site conditions warrant a different drilling method. Subsurface conditions permitting, the first five feet of each boring is advanced using a hand-auger or post-hole digger. All drilling equipment is inspected daily and maintained in safe working condition by the operator. All down-hole drilling equipment is steam cleaned prior to arriving on site. Working components of the drill rig near the borehole, as well as augers and drill rods are thoroughly steam cleaned between each boring location. All ATC drilling and sampling methods are consistent with ASTM Method D-1452-80 and local, stale and federal regulations.

Soil Sampling and Lithologic Description

Whenever possible and approved by the appropriate regulatory agency, the first ATC boring to be drilled at a site is continuously cored to obtain a complete lithologic description. Otherwise, soil samples are typically collected every 5 feet to the total depth explored, using brass tubes fitted in a California-modified split-spoon sampler. If copper or zinc contamination is the subject of the investigation, stainless steel liners are used instead of brass. Additional soil samples may be collected based upon significant changes in lithology or in areas of obvious soil contamination. During soil sample collection, the split spoon sampler is driven 18 to 24 inches past the lead auger by a 140-pound hammer falling a minimum of 30 inches. The number of blows necessary to drive the sampler and the amount of soil recovered is recorded on the Field Exploratory Soil Boring Log. The soil sampler and liners are cleaned with an Alconox® solution and rinsed with tap water prior to each sampling event. New liners are used whenever a soil sample may be retained for laboratory analysis.

Soil samples selected for laboratory analysis are sealed on both ends with Teflon® tape and plastic end caps. The samples are labeled, documented on a chain-of-custody form and placed in a cooler for transport to a state-certified analytical laboratory. Soil contained in remaining liners is removed for lithologic descriptions (according to the Unified Soil Classification System). Additional soil is screened for organic vapors by placing approximately 30 grams of soil in a sealed plastic bag or a glass jar sealed with aluminum foil. The bag or jar is left undisturbed for approximately 15 minutes, in the sun if possible. The headspace in the bag is accessed in a manner to minimize entry of outside air, and is tested for total organic vapor using a calibrated photo ionization detector (PID). The results of the field screening are noted with the lithologic descriptions on the Field Exploratory Soil Boring Log.

On encountering an impermeable (clayey) layer three feet or more in thickness below a saturated permeable layer, where the impermeable layer is considered to be a possible confining layer for an underlying aquifer, drilling is halted until a decision to proceed is obtained from the project manager. This process minimizes the chance of introducing contamination to an underlying, clean aquifer.

Soil Waste Management

Soil cuttings are stockpiled on and covered with plastic sheeting to control runoff, or contained in 55-gallon D.O.T.-approved drums on site. Waste soil is sampled to chemically profile it for disposable, and hauled by a licensed waste hauler to an appropriate landfill or certified treatment facility. All waste stored on site is properly labeled at the time of production.

Soil Boring Abandonment

Soil borings which are not to be converted into monitor wells are sealed to the ground surface using neat cement, sand-cement slurry, or hydrated bentonite pellets or chips in accordance with federal, state and local regulations. Native soil may be used to fill the top two to three feet for cosmetic purposes, as permitted.

Remediation Well Installation

Well Casing, Screen and Filter Pack Construction

All well construction is performed in accordance with Department of Water Resources "California Well Standards" and all requirements of local oversight agencies. Soil borings to be converted into single-cased monitor wells are a minimum of eight inches in diameter for 2-inch diameter wells, and a minimum of ten inches in diameter for 4-inch diameter wells. Monitor wells are constructed with schedule 40, threaded; polyvinyl chloride (PVC) casing unless site geochemistry or contamination necessitates an alternative regulatory agency approved material. The wells are constructed with factory-slotted screen and threaded end caps.

The screened interval is placed such that it extends approximately ten feet into the water bearing zone, and at least five feet above the expected maximum water level. The screened interval may extend less than five feet above the maximum water level, only to prevent intersection of the screened interval with the top of the confining layer of a confined aquifer, or where the water table is too shallow to allow this construction. A graded sand filter pack is placed in the annular space across the screened interval and extended approximately one to two feet above the screen, as site conditions permit, so as to prevent extension of the sand pack into an overlying water-bearing unit. The well screen slot size is the maximum size capable of retaining 90% of the filter pack. Typically, 0.010-inch screen is used where the formation is predominantly clay and/or silt or poorly graded fine sand. 0.020-inch screen is used where the formation is predominantly well-graded or medium to coarse sand and/or gravel.

The filter pack grade (mean grain size) is selected according to native sediment type as follows: a) for poorly graded fine sand or silt/clay - 4 times the 70% retained grain size of the formation b) for medium to coarse sand, gravel or well graded sediments - 6 times the 70% retained grain size. Since results of particle size analysis are not always available, ATC often selects screen size and filter pack on the basis of general site stratigraphy, and specifically the finest significantly thick layer of sediment to be screened. Commonly selected grades are Lone Star® 3, 2/12 or 2/16 (or equivalent) with 0.020-inch slotted screen and Lone Star® 1/20 with 0.010-inch slotted screen.

Well Seal and Completion

A minimum two-foot seal of bentonite is placed above the sand pack. The bentonite seal is hydrated by either formation water or potable water. Neat cement or a cement/bentonite grout mixture seals the remaining annular space to the surface. If bentonite is used in the grout mixture, it does not exceed 5% by weight. The grout is placed using a tremie pipe, if the top of the bentonite is more than 20 feet below grade, or if water is present in the boring above the bentonite seal. A watertight locking cap and protective traffic-rated vault box is installed on top of each well. Well construction details are presented on the Field Exploratory Soil Boring Log. Following completion of a well, ATC completes and submits, or ensures that the driller has sufficient information to complete and submit, the state-required Well Completion Report or equivalent document.

STANDARD OPERATING PROCEDURE

FIELD SOIL VAPOR MONITORING

A representative soil sample will be collected from each sample interval and placed in a Ziplock® plastic bag. The bag will be sealed and the soil dissaggregated. At least ten minutes will be allowed for the soil to be heated by direct sunlight and for any VOCs in the soil to accumulate in the headspace of the bag. Volatile gases will then be monitored by inserting the probe of a Photovac 2020 photoionization detector (PID). The PID is equipped with a 10.6 eV lamp which is capable of detecting VOCs at concentrations of 0.1 parts per million (ppm). The PID will be calibrated on-site using 100-ppmV isobutylene-in-air span gas (equivalent to benzene) prior to drilling operations. PID readings will be recorded in the boring logs.

STANDARD OPERATING PROCEDURE
GROUNDWATER MONITOR WELL PURGING AND SAMPLING

Prior to purging the well, the static water level will be measured using an electronic interface probe to evaluate the presence of any phase-separated hydrocarbons. The measurement will be obtained from a reference point on the north side of the top of the well casing. Fluid measurements will be recorded to the nearest 0.01-foot. Depth to groundwater will be measured from all site wells on the same day. The total depth of the well will also be recorded. If phase separated hydrocarbons are noted, a measurement of the apparent thickness will be obtained and the well will not be sampled. To prevent cross-contamination, all monitoring equipment that is in contact with groundwater will be washed with Alconox® detergent and rinsed with distilled water prior to use in each well.

After the static groundwater level and total depth of the well has been determined, the volume of water in the well will be calculated. Based on this data, if free floating hydrocarbons are not present, a minimum of three well volumes of water will be purged from the well using a 2-inch Grundfos® submersible pump or a PVC bailer. Periodic measurements (at approximate 5-gallon intervals) of temperature, pH, and specific electrical conductivity will be collected during purging. When three successive stabilized readings are obtained, the well will be sampled. If the well is low yielding and is pumped or bailed dry, the well will be allowed to recover at least 80% of the static groundwater level. If the well does not recover 80% within a 24-hour time frame, a sample will be collected and recovery noted on the Groundwater Sampling Log.

Groundwater purged from the well will be stored on-site in 55-gallon drums pending proper disposition. To prevent cross-contamination, equipment will be washed with Alconox® detergent and rinsed with distilled water prior to use in the well.

Groundwater samples will be collected from the well using a disposable polyethylene bailer. Each sample will be collected in laboratory-preserved 1-liter glass bottles and in 40-milliliter volatile organic analysis (VOA) vials. Each vial will be filled completely with sample and preservatives to eliminate headspace and create a positive meniscus. The vial will be capped with convex Teflon® septa. Each vial will be observed to ensure that no air bubbles are present within the vial. Samples will be marked for identification, placed on ice, and transported to a State-certified laboratory for analysis. Chain-of-custody records will be maintained and accompany all samples to the analytical laboratory.

STANDARD OPERATING PROCEDURE
AIR SPARGE, SOIL VAPOR EXTRACTION, AND COMBINED AIR SPARGE/SOIL VAPOR EXTRACTION PILOT TEST

Vapor Extraction Pilot Test

Before performing the vapor extraction pilot test (VEPT), any necessary air permits shall be obtained and the test will be performed in accordance with any requirements stated in the permit. Ambient pressure readings will be measured at the observation wells prior to the start of the test. The pilot test will be conducted by applying a vacuum to a well with a blower to extract soil-gas. The test will be conducted at three steps of increasing applied vacuum. The final step of the test will be conducted at the maximum applied vacuum of the blower. A step will be considered complete when vacuum influence measured in observation wells stabilized for two consecutive readings.

The following measurements will be made during each step of the test:

- The vacuum applied to the well will be measured with a vacuum gauge. The applied vacuum will be controlled and adjusted with dilution valve.
- The concentration of hydrocarbon volatiles and oxygen in the soil-gas extracted from the well will be monitored during each step of the test using a flame ionization detector (FID) or a photo ionization detector (PID), and Gastech® meter.
- The vacuum influence in observation wells will be measured in inches of water (vacuum) with Magnehelic® gauges.
- The soil-gas extraction flow rate at the extraction well will be measured during each step of the test, once the vacuum has stabilized, using a thermal anemometer, or pitot tube and Magnehelic® gauges.

A soil-gas sample will be collected at the maximum applied vacuum in a Tedlar™ bag for laboratory analysis. The samples will be analyzed for volatile fuel hydrocarbons (VFH) using Modified EPA Method 8015B and for BTEX using EPA Method 8021B at a California DHS-certified lab. The extracted soil-gas will be treated with an internal combustion engine, or thermal oxidizer. The appropriate air quality control permit will be procured for the internal combustion engine, or thermal oxidizer.

Air Sparge Pilot Test

The air sparge test will be performed by injecting atmospheric air into the saturated zone through an air sparge well and monitoring the influence at observations wells. Ambient groundwater level and DO readings will be measured at the observation wells prior to the start of the test. The test will be performed at three different flow rates, 2, 5, and 10 acfm. The test will be conducted at three steps of increasing flow rate. A step will be considered complete when the groundwater level and DO measured in observation wells stabilized for two consecutive readings, or at the discretion of personnel conducting the test. The vapor extraction system will be operated during the air sparge pilot test. The vapor extraction system will be operated at a constant flow rate to capture hydrocarbon vapors produce by air sparge. Personnel conducting the test will determine the extraction flow rate.

The air sparge test will be conducted using a compressor, associated flow rate and pressure gauges, DO and water level meters. All above ground air pressurized piping will be metal or hose suitable to the application. Prior to beginning the test the following measurements will be made at the surrounding observation wells:

- The groundwater level will be measured to the nearest 0.01 foot with a Solinst® electronic interface probe, or equivalent in the observation wells.
- The down hole groundwater DO concentration in the observation wells.

The test will be conducted at 2, 5, and 10 acfm. During each step, the following parameters will be measured:

- The groundwater level will be measured to the nearest 0.01 foot with a Solinst® electronic interface probe, or equivalent in the observation wells.
- The down hole groundwater DO concentration in the observation wells.
- Applied well head pressure using an appropriate pressure gauge, and flow rate using a thermal anemometer, or pitot tube and Magnehelic® gauges.

The following vapor extraction measurements will be made during each step of the air sparge test:

- The vacuum applied to the well will be measured with a vacuum gauge. The applied vacuum will be controlled and adjusted with dilution valve.
- The concentration of hydrocarbon volatiles and oxygen in the soil-gas extracted from the well will be monitored during the test using a flame ionization detector (FID) or a photo ionization detector (PID), and Gastech® meter.
- The soil-gas extraction flow rate at the extraction well will be controlled during the test using a thermal anemometer, or pitot tube and Magnehelic® gauges.

A soil-gas sample will be collected during the maximum injection flow rate during the air sparge pilot test in a Tedlar™ bag for laboratory analysis. The sample will be analyzed for volatile fuel hydrocarbons (VFH) using Modified EPA Method 8015B and for BTEX using EPA Method 8021B at a California DHS-certified lab. The extracted soil-gas will be treated with an internal combustion engine, or thermal oxidizer. The appropriate air quality control permit will be procured for the internal combustion engine, or thermal oxidizer.

STANDARD OPERATING PROCEDURE
CONSTANT DISCHARGE AQUIFER TEST

Purpose and Scope

Aquifer testing is generally required in order to accurately calculate aquifer hydraulic parameters such as hydraulic conductivity (K), transmissivity (T), and coefficient of storage (S). The data can be used to evaluate groundwater remediation technologies. In addition, the aquifer parameters are necessary to evaluate contaminant transport. The aquifer test will consist of a step test, pumping test, and recovery test.

Equipment Set-Up and Site Control

Prior to arriving on site, the necessary permits to discharge the groundwater extracted from the pumping well into the sewer, or a water holding tank to be delivered to the site for temporary storage.

The aquifer test will be conducted using a submersible Grundfos® environmental pump which will have a check valve. A discharge hose will be connected to the pump and extend to the sewer (if permitted), or a holding tank. A flow meter/totalizer will be installed to measure the flow rate and total gallons extracted during the test. A globe valve will be utilized to control the extraction flow rate. The pump will be set approximately one to two feet from the bottom of the well. A generator, or existing electrical power at the site, will be used to power the pump. Pressure transducers will be installed in the pumping well and in three observation wells. The transducers will be connected to a data logger. Traffic cones and caution tape will be used to surround the pumping well and associated test equipment. The discharge hose and all power cords will be secured to the ground using duct tape.

Field Procedures

Prior to the start of work, a decontamination area will be established. This will be in a secured area and consist of an Alconox® solution wash, a first rinse and a second rinse. Down hole equipment will be decontaminated prior to use. Prior to equipment set-up, all wells to be monitored during the test will be opened and allowed to stabilize. The data logger will be set-up for the conditions of the test.

At least 24 hours prior to the test, a step test will be performed to determine the appropriate flow rate to be used during the aquifer test. The step test will be conducted in the well to be used for the aquifer test. Each step will consist of pumping groundwater from the well at a constant rate until the water level stabilizes from water table disruption caused by equipment installations. The flow rate will be increased in each subsequent step until the maximum flow rate that can be sustained by the well is determined.

Prior to starting the pump, the total gallons displayed on the flow meter/totalizer will be recorded. This will be used to determine the total number of gallons extracted during the test. The pump and data logger will be turned on simultaneously to start the pumping test. During the pumping test a constant flow rate will be extracted from the pumping well. The flow rate and data collected by the data logger will be periodically monitored during the test. The duration of the pumping test will be determined by the data collected. The test may be conducted for 8 to 16 hours. Personnel conducting the test will determine the duration of the pumping test.

Once the pumping test is completed, the pump is shut off and the recover test begins. Prior to shutting of the pump the data logger will be configured for the recovery portion of the aquifer test. The exact time and the total gallons displayed on the flow meter/totalizer will also be recorded. The pump will be turned off and data logger stepped to collected recovery data. The duration of the recovery test will be determined by the data collected. The recovery test may be conducted for 8 to 16 hours. Personnel conducting the test will determine the duration of the recovery test.

An effluent water sample shall be collected during the pumping test. The analytical data can be used to design a groundwater remediation system. Additional sampling may be required by conditions of a discharge permit. If water is being stored in a holding tank, appropriate samples will be collected per disposal requirements. The water will be removed to an appropriate disposal facility by a licensed transporter.

Data Evaluation

Data collected during the aquifer test will be evaluated using various graphical and numerical methods, depending on flow (steady or unsteady state) well construction (fully or partially penetrating) and aquifer type (confined, leaky, unconfined, or semi-confined). The aquifer test will be evaluated using more than one method. Analysis of the aquifer test data will be conducted utilizing computer software.

A majority of the aquifer will be conducted using partially penetrating wells in unconfined aquifers under steady state conditions. In general, the curve-fitting method presented by Neuman (1975) or by Boulton (1954) will be used to evaluate transmissivity, storativity and vertical hydraulic conductivity under these conditions (the Boulton method assumes nonsteady state conditions). The Stretitsova's curve-fitting method presented by Kruseman and de Ridder (1990) may also be used for unconfined conditions. In addition, the steady state well equation may be applied (Todd, 1980) to evaluate the hydraulic conductivity (away from the pumping well).

If it is determined that the test was performed under confined aquifer conditions and enough time has elapsed for steady-state conditions to have been met (as defined in the literature), the Jacob distance-draw down and time-draw down methods (Cooper & Jacob, 1946) will generally be applied to evaluate storativity and transmissivity. Alternatively, the Theis curve-fitting method (Theis, 1935) may be employed if steady-state conditions were not reached. In suspected leaky aquifers, the Hantush method (Hantush, 1956) will generally be used.

The capture zone will also be determined using the transmissivity values obtained through the evaluation and following the method initially outlined by Janvandel and Tsang (1986). The data will then be used to determine the construction and design specifications of the proposed system, based on the requirements of the system conceptual design (migration control, dewatering, plume capture).

It must be recognized that even using theoretical models for the data evaluation, some judgment will be necessary in conducting the analyses and applying the calculated parameters to the system design. Different types of aquifers may have similar draw down or response behaviors, and this must be accounted for. A complete explanation of the method used and the reasoning behind the choice of method and an analysis of the results will be presented with the data evaluation.

References

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Hantush, M.S. (1956). Analysis of data from pumping tests in leaky aquifers. *J. Geophys. Res.* Vol. 64, p. 1043-1052.

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International Institute for Land Reclamation and Improvement, Wageningen, The Netherlands.

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Theis, C.V. (1935). The relation between the lowering of the piezometric surface and rate and duration of discharge of a well using groundwater storage. *Trans. Amer. Geophys. Union,* Vol. 2, p. 519-524.

Todd, D.K. (1980). Groundwater Hydrology, 2nd edition, John Wiley & Sons Pubs., 535 pp.

BORING LOG NOTES

The number shown on the Boring Logs refers to the approximate location of the same number indicated on the "Site Plan" as positioned in the field by measurements from property lines and/or existing features.

"TYPE/SIZE BORING" refers to the exploratory equipment used in the boring wherein
HSA = hollow-stem auger

"N" in "Blows/Foot" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a 2.0-inch outside diameter (1.375-inch inside diameter) split-spoon sampler a distance of 1 foot, Standard Penetration Test (ASTM Standard D1586-84). Refusal to penetration is defined as more than 100 blows per foot.

"R" in "Blows/Foot" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a 3.0-inch outside diameter (2.42-inch inside diameter) ring sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per 6 inches of advance.

"C" in "Blows/Foot" refers to the number of blows of a 140-pound weight, dropped 30 inches, required to advance a California Modified Split-barrel sampler a distance of 1 foot. Refusal to penetration is considered more than 50 blows per 6 inches of advance.

"Sample Type" refers to the form of sample recovery, in which

N = Split-Spoon sample

R = Ring sample

G = Grab Sample

C = California Modified Split-Barrel sample

"Dry Density, pcf" refers to the laboratory-determined dry density in pounds per cubic foot.

"Water Content, %" refers to the laboratory-determined moisture content in percent (ASTM Standard D 2216-90).

"Unified Soil Class" refers to the soil type as defined by the United Soil Classification System (ASTM Standard D 2488-90). The soils were classified visually in the field and, where appropriate, classifications were modified by visual examination of samples in the laboratory and/or by appropriate tests.

"OVM " or **"PID "** refers to organic vapor meter (typically flame ionization detector) readings or photoionization detector readings, respectively, both in parts per million by volume (ppmV)

These notes and boring logs are intended for use in conjunction with the purposes of our services defined in the text. Boring log data should not be construed as part of the construction plans nor as defining construction conditions.

Boring logs depict our interpretations of subsurface conditions at the specific locations and on the date(s) noted. Variations in subsurface conditions and soil characteristics may occur between borings. Groundwater levels may fluctuate due to seasonal variations and other factors.

In general, terms and symbols on the boring logs conform with "Standard Terminology Relating to Soil, Rock, and Contained Fluids" (ASTM Standard D 653-90)

▼ Groundwater first encountered at depth indicated

▽ 3-15-96 Static groundwater level and date measured

Boring Log Notes	Plate: C-1
ATC Associates Inc.	

COARSE-GRAINED SOILS
LESS THAN 50% FINES*

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
GW	WELL-GRADED GRAVELS OR GRAVEL-SAND MIXTURES, LESS THAN 5% FINES	GRAVELS More than half of coarse fraction is larger than No 4 sieve size
GP	POORLY-GRADED GRAVELS OR GRAVEL-SAND MIXTURES LESS THAN 5% FINES	
GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES, MORE THAN 15% FINES	
GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES, MORE THAN 15% FINES	
SW	WELL-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	SANDS More than half of coarse fraction is smaller than No. 4 sieve size
SP	POORLY-GRADED SANDS OR GRAVELLY SANDS, LESS THAN 5% FINES	
SM	SILTY SANDS, SAND-SILT MIXTURES, MORE THAN 15% FINES	
SC	CLAYEY SANDS, SAND-CLAY MIXTURES, MORE THAN 15% FINES	

NOTE: Coarse-grained soils receive dual symbols if they contain 5 to 15% fines (e.g. SW-SM, GP-GC, etc) (ASTM Standard D 2488-90)

FINE-GRAINED SOILS
MORE THAN 50% FINES

GROUP SYMBOLS	DESCRIPTION	MAJOR DIVISIONS
ML	INORGANIC SILTS, VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS	SILTS AND CLAYS Liquid limits less than 50
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY; CAN BE GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS	
OL	ORGANIC SILTS OR ORGANIC SILT-CLAY MIXTURES OF LOW PLASTICITY	
MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDS OR SILTS, ELASTIC SILTS	SILTS AND CLAYS Liquid limit more than 50
CH	INORGANIC CLAYS OF HIGH PLASTICITY; CAN BE GRAVELLY CLAYS, SANDY CLAYS, FAT CLAYS	
OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY	
PT	PEAT, MUCK, AND OTHER HIGHLY ORGANIC SOILS	HIGHLY ORGANIC SOILS

NOTE. Fine-grained soils may receive dual classification based upon plasticity characteristics

SOIL SIZES

COMPONENT	SIZE RANGE
BOULDERS	12 in.
COBBLES	3 in. to 12 in.
GRAVEL	No. 4 to 3 in.
Coarse	3/4 in. to 3 in.
Fine	No. 4 to 3/4 in.
SAND	No. 200 to No. 4
Coarse	No. 10 to No. 4
Medium	No. 40 to No. 10
Fine	No. 200 to No.40
*Fines (Silt or Clay)	No. 200

NOTE Only sizes smaller than 3 inches are used to classify soils

CONSISTENCY

CLAYS & SILTS	BLOWS/FOOT*
VERY SOFT	0-2
SOFT	2-4
FIRM	4-8
STIFF	8-15
VERY STIFF	16-32
HARD	Over 32

RELATIVE DENSITY

SANDS & GRAVELS	BLOWS/FOOT*
VERY LOOSE	0-4
LOOSE	4-10
MEDIUM DENSE	10-30
DENSE	30-50
VERY DENSE	Over 50

*Number of blows of 140 pound hammer falling 30 inches to drive a 2 inch O D. (1 3/8-inch ID) split-spoon sampler (ASTM Standard D 1586-84)

PLASTICITY OF FINE-GRAINED SOILS

TERMS	DEFINITIONS
Non-Plastic	1/8-inch (3-mm) thread can not be rolled
Low	Thread can be rolled once with difficulty
Medium	Thread can be rolled once or twice
High	Thread easy to roll and reknead repeatedly

MOISTURE CONDITION

DRY	No moisture present, dry to touch
SLIGHTLY DAMP	No discernable moisture
DAMP	Sufficient moisture present to darken the appearance but not adhere to the hand
MOIST	Adheres to and moistens the hand
VERY MOIST	Wets the hand but can not be squeezed out
WET	Visible free water is present

DILATANCY

DILATANCY	CRITERIA
None	No visible change
Slow	Water appears slowly on surface during shaking; disappears slowly upon squeezing
Rapid	Water appears quickly during shaking; disappears quickly upon squeezing

Method of Soil Classification | Plate: C-2

ATC Associates Inc.

PROJECT: 34.76000.0001
LOCATION: Example

EXAMPLE BORING LOG

Page 1 OF 2

BORING DATE: **DATUM:** GROUND SURFACE **DIP:** Vertical **LOGGED:**

MW-6

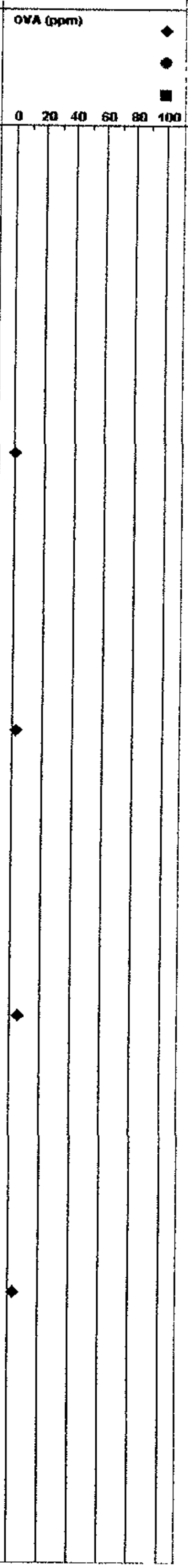
4" PVC

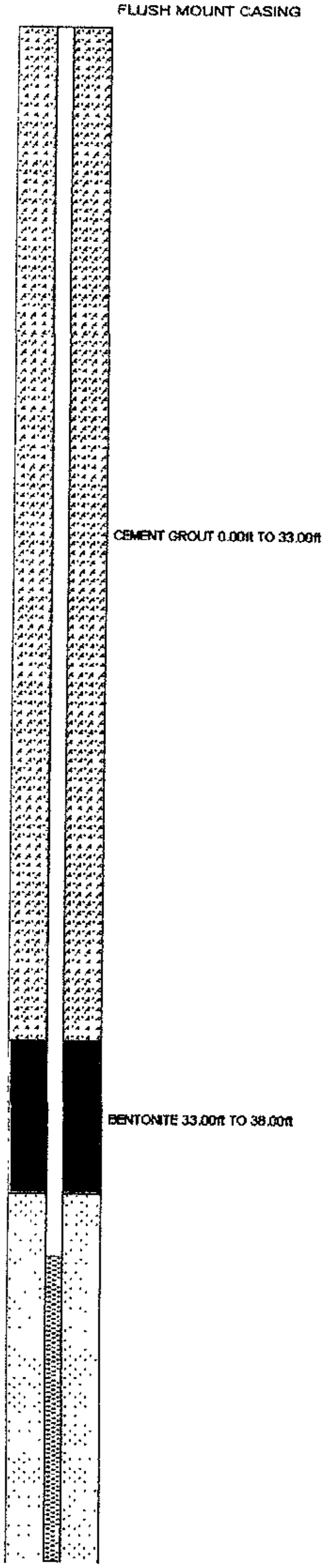
BORING METHOD: BKB1 8" OD HSA

DEPTH SCALE FEET	SOIL PROFILE DESCRIPTION	DEPTH B.G.S. (ft)
0	GROUND SURFACE	0 5
0.5–25	Sandy clay (USCS: SC) 30% clay, 0% to 10% fine gravel, 60% to 70% fine to medium grained sand. Pink (5YR7/3) Very dense. Weak to moderate cementation Dry to slightly moist. No odor or staining.	25
25–46	Sandy lean clay (USCS' CL) 10% to 30% fine sand, 70% to 90% clay. Red (2.5YR4/6). Hard. Slightly moist. No odor or staining.	46
46–	Clayey sand (USCS: SC). 15% clay, 10% fine to coarse grained gravel, 75% fine to coarse sand. Reddish brown (2.5YR4/3). Very dense. No cementation. Moist to wet. No odor. Yellowish, rusty staining.	

Samples ID	Soil Type	Blows/Foot	Odor/Stain
10	SC	75	N/N
20	SC	90+	N/N
30	CL	35	N/N
40	CL	50	N/N

Concentration





Continued on next page

DRAWN: ATC Associates **CHECKED:** gs

GROUNDWATER SAMPLING LOG

Project:	**Job No.:**
Well No.:	**Date:**
WL Measurement Method:	**By:**
Casing Type:	**Casing Size:**
MP Elevation:	**MP Description: Mark at top of casing**
Depth to Water (feet):	**Depth to Well Bottom (feet):**
Feet of Water in Well:	**Well Volume (gallons):**
Power:	**Lift Type:**
Discharge Measurement Method:	**Flow Rate (GPM):**
Pump Start Time:	**Pump End Time:**
Total Amount Purged (gallons):	**Well Volumes Purged:**

TIME	AMOUNT (gallons)	CONDUC. (mhos/cm)	pH (S.U.)	TEMP. (°F)	REMARKS

EXPLANATION:

AMSL	-	above mean sea level
GPM	-	gallons per minute
S.U.	-	standard units

ATC ASSOCIATES INC.

Chain of Custody

report to

phone

fax

company

project

address

project #

sampler

Turnaround Time

ASAP ☐ 48 hr ☐
12 hr ☐ 72 hr ☐
24 hr ☐ std ☐

LAB: use only	SAMPLE DESCRIPTION	Date Sampled	Time	Matrix	Preserve	ANALYSIS REQUESTED								# of containers	Remarks

Billing Info: **PO#:**

☐ **Quote**

Third Party:

established ☐ *name*

new ☐ *name/address/phone*

Sample integrity upon receipt:

Samples received intact ☐
Samples received cold ☐
Custody seals ☐
Correct container types ☐

comments:

Relinquished by:

Signature
Print
Company
Date Time

Received by:

Signature
Print
Company
Date Time

Relinquished by:

Signature
Print
Company
Date Time

Received by:

Signature
Print
Company
Date Time