



Interim Action Report Volume 1

**Former Stoneway Batch Plant
1915 SE Maple Valley Highway
Renton, Washington**

Prepared For:

**Stoneway Concrete
9216 8th Avenue South
Seattle, Washington**


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- Attachment B** Results of Biorespiration Rates Tables
- Attachment C** As-built Ground Water Monitoring Well Diagrams
- Attachment D** Regional Hydrogeologic and Piezometric Data

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- Attachment E** Analytical Laboratory Reports for Heating Oil UST Samples
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1.0 INTRODUCTION

Environmental Partners, Inc. (EPI) is pleased to submit this *Revised Interim Action Report* (IA Report) for the Stoneway Concrete (Stoneway) property located at 1915 SE Maple Valley Highway in Renton, Washington (subject property). This report presents a revision to the *Interim Action Report* dated February 7, 2011. The Interim Action report was previously submitted to the Washington Department of Ecology (Ecology) under the Voluntary Cleanup Program (VCP). Stoneway received comments on the Interim Action Report in a letter dated May 9, 2011. Based upon that letter and subsequent conversations with Ecology EPI and Stoneway provided Ecology with additional technical details of the subject property and participated in a meeting. Stoneway and EPI participated in an additional meeting in which Ecology provided clarification regarding its May 9, 2011 opinion and the actions necessary to resubmit the Interim Action Report and request a No Further Action (NFA) determination. Those additional actions include:

- Providing additional information regarding local hydrogeologic conditions and the potential effects of City of Renton pumping on the natural ground water flow direction and the potential for temporal reversals in the ground water flow direction,
- Inclusion of an additional remedial option in the feasibility study and the disproportionate cost analysis.

Ecology has indicated that both of these actions are necessary to support the request for an NFA determination with a conditional point of compliance. This report has been revised to provide the requested information.

The subject property is located between the Cedar River and Maple Valley Highway, just east of Interstate 405. The general location of the subject property is indicated on Figure 1. Figure 2 presents a representation of the subject property prior to demolition of the facility buildings or the implementation of the remedial actions..

For purposes of this IA Report, the "Site", as defined by the Model Toxics Control Act and its implementing regulation (RCW 70.105D and WAC 173-340; collectively "MTCA"), is those areas where contamination has come to be located. For the subject property, there are multiple "Sites", or work areas, which are all located within the boundary of the subject property. Interim actions taken at these Sites are discussed individually within this report and in support of regulatory closure for the subject property

The subject property is enrolled in the Washington Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) and has been assigned Toxics Cleanup Site Number NW1702, and facility database Site Number 62244377. The Ecology project manager is Ms. Libby Goldstein. Copies of all supporting and historical documents regarding prior investigations and assessments of the site were supplied to Ecology with the VCP application.

This IA Report documents the remediation of soil through direct excavation and on-site treatment in bioremediation cells and off-site recycling. Impacts to ground water have been addressed through removal of the impacted source soils and natural attenuation. The work documented herein was conducted in conformance with the *Final Cleanup Action Plan* dated March 9, 2009, which was submitted to Ecology and subsequently approved on April 30, 2009.

The IA report has been prepared on behalf of Stoneway in support of the reporting requirements of MTCA. By way of this report, Stoneway is requesting a No Further Action (NFA) determination from Ecology for the subject property. Stoneway understands that the NFA determination may require the use of selected environmental covenants or conditional points of compliance for the subject property. Such a form of regulatory closure and this request for an NFA determination was previously discussed with Ecology.

1.1 Subject Property Description

The subject property is an irregularly shaped parcel about 13.5 acres in size and is situated between the Cedar River and Maple Valley Highway, just east of Interstate 405. The subject property was most recently occupied by a concrete batch plant and associated support operations and structures. Figure 2 is a representation of the site features and structures that were located on the subject property prior to demolition activities in late 2007 and early 2008. Figure 3 is a current subject property representation as it appears after completion of remediation activities. Ingress and egress to the subject property is limited to one double-gate entrance from the access road to the City of Renton Water Park.

The subject property has been occupied by a concrete batch plant since the 1960's and ceased operation prior to October 14, 2002 in conformance with City of Renton ordinances relative to its Aquifer Protection Zone and operating permits. Due to its location within the City of Renton's Aquifer Protection Zone, industrial activities that use, handle, or store hazardous substances are precluded from operating at the subject property.

Prior to the initiation of the remedial activities described herein, all of the buildings and concrete surfacing were demolished and removed from the subject property. The small temporary treatment cells for the previously documented bioremediation pilot study were dismantled for future reconfiguration. The former settling ponds located along the southern border of the property were left intact for storage and infiltration of on-site storm water run-off in accordance with the subject property's stormwater permit. The entire property is surrounded by a six-foot chain link fence. Utilities are no longer available for use at the property.

The northern portion of the subject property is currently being used for temporary storage of Gary Merlino (GM) Construction machinery, and the eastern portion of the subject property is being leased to a contracting company and used as temporary storage for construction equipment and supplies.

The subject property is located within the historical flood plain of the Cedar River. In the area of the subject property, the Cedar River Valley is relatively narrow and the property is situated between two

upland areas comprised of glacial till sediments from the most recent Vashon Glaciation. The subsurface conditions of the northern portion of the property are consistent with river flood plain deposits that include variable quantities of unconsolidated sand and gravel with occasional layers of silt ranging from a depth of 5 to 18 feet below grade. The southern portion of the property is generally underlain with various types of fill material including (but not limited to) concrete, gravel, boulders, pea gravel, and silty sands ranging from near surface to 10 feet below grade.

Ground water migration the subject property has been demonstrated to be consistently to the northwest away from the Cedar River. Section 6.1 provides additional information regarding property specific hydrogeologic conditions.

1.2 Prior Work and Current “Work Areas”

This following provides a brief overview of previous investigative activities and findings at the subject property.

The following reports prepared by EPI have been previously submitted to Ecology:

- *Remedial Investigation Report* (dated May 6, 2005);
- *Interim Remedial Action Letter Report* (dated September 17, 2007);
- *Ex Situ Soil Bioremediation Treatability Study* (dated October 30, 2007); and
- *Final Cleanup Action Plan* (dated March 9, 2009).

EPI and others have performed numerous environmental investigations at the subject property. A cumulative summary of the previous investigative work as well as EPI's investigative efforts are documented in EPI's *Remedial Investigation Report* (RI Report) dated May 5, 2006, which was previously provided to Ecology as a component of the VCP submittal. The reader is referred to the RI Report for additional detail. The prior investigative actions resulted in a thorough characterization of the environmental conditions and impacts to the soil and ground water at the subject property. The RI Report summarized the previous investigative actions and concluded that the subject property was sufficiently well characterized to plan and implement a remedial action.

An interim action (IA) was performed in 2007 to address gasoline-range petroleum hydrocarbons (GRPH) impacts to soil in the vicinity of RI boring “B-28”, which was located in the northern portion of the subject property. The IA was accomplished by direct excavation. The impacted excavated soil was stockpiled on-site for future treatment in the bioremediation cells in conjunction with the planned formaldehyde treatment. Confirmation sampling performed during the interim action confirmed that the interim actions were successful in removal of all GRPH impacted soil. The area of the GRPH soil excavation is indicated on Figure 3. The results of the interim action were documented in EPI's *Interim Remedial Action Letter Report* dated September 17, 2007, which previously submitted to Ecology.

In addition, EPI performed a soil bioremediation treatability study to determine if on-site bioremediation would be an effective technology to address soil impacted with formaldehyde and petroleum hydrocarbons. The results of the treatability study indicated that bioremediation would be an effective technology and the results of that study are presented in EPI's *Ex Situ Soil Bioremediation Treatability Study* dated October 30, 2007, which was also submitted to Ecology.

Based on the findings of the investigative actions and follow-up interim actions and treatability study, EPI prepared a cleanup action plan (CAP) to address the remaining Sites at the subject property. The determination of the contaminants of concern (COCs), site-specific cleanup levels, a conceptual model, and proposed remedial techniques are described in the CAP. The *Final Cleanup Plan* dated March 9, 2009 was submitted to Ecology and subsequently approved on April 30, 2009.

The CAP addressed impacts to soil and/or ground water at four individual "Sites", or "Work Areas", at the subject property. These included:

1. Work Area 1: Former small settling pond (southwest corner of the subject property);
2. Work Area 2: Large settling ponds (along southern property boundary).
3. Work Area 3: Shallow petroleum-impacted soil area (south-southeastern portion of the subject property);
4. Work Area 4: Formaldehyde-impacted soil and ground water area (central portion of the subject property);

During the course of implementing the IA's described herein, a previously unknown heating oil UST was discovered in the northern portion of the subject property and, a fifth Work Area was added as follows:

5. Work Area 5: Heating oil UST area (north portion of the subject property).

The locations of the Work Areas at the subject property addressed during this IA are displayed on Figure 3.

The remainder of this report documents the efforts taken to fully address soil and ground water impacts at the subject property. All actions were performed in conformance with the Ecology-approved CAP.

1.3 Contaminants of Concern

Investigative actions documented in the RI Report have resulted in a thorough characterization of the environmental conditions and impacts to the soil and ground water at the subject property. Following the interim actions to remove GRPH-impacted soil from the northern portion of the subject property, the following COCs for soil remained:

- Diesel-range petroleum hydrocarbons (DRPH);

- Oil-range petroleum hydrocarbons (ORPH); and
- Formaldehyde.

The following compounds were identified as COCs for ground water at the subject property:

- Arsenic; and
- Formaldehyde.

As previously mentioned, during implementation of the IA, one heating oil UST was discovered in the north central area of the subject property (see Section 4.5 below). Based on the reported usage of the UST as heating oil, the COCs for the newly discovered UST (*i.e.*, DRPH and ORPH) were already included for soil at the subject property.

1.4 Cleanup Levels

When establishing applicable cleanup levels for the COCs at the subject property, three potential exposure pathways were considered:

- Direct human contact with impacted soils;
- Ingestion of impacted drinking water; and
- Vapor migration of contaminants in soil and/or ground water to indoor air.

Protection of surface water was not relevant because ground water flows away from the Cedar River.

The subject property qualified for an exclusion from the Terrestrial Ecological Evaluation since no contaminants remain at the subject property at a depth shallower than 6 feet below grade (WAC 173-340-7491(1)(a) and there will be less than 1.5 acres of contiguous undeveloped land on, or within 500 feet, of any area of the site (WAC 173-340-7491(1)(c) after completion of the planned development.

The specified Method A cleanup levels and PQL in Table 1 below are protective of human health and the environment for all receptors (*e.g.*, residents and workers) for the exposure pathways identified above.

Consistent with MTCA's preference for the use of permanent solutions to the maximum extent practicable, the interim action performed at the subject property used direct excavation and on-site treatment of soils as the overarching remedial strategy.

Table 1 below shows the cleanup levels for each of the COCs as developed and presented in the CAP that was approved by Ecology.

Table 1. Summary of Cleanup Levels

Contaminant of Concern	Cleanup Levels		Basis for Use
	Soil (mg/kg)	Ground Water (µg/L)	
DRPH	2,000	N/A ^(a)	MTCA Method A
ORPH	2,000	N/A ^(a)	MTCA Method A
Formaldehyde	0.04	5.0	PQL ^(b)
Arsenic	N/A ^(c)	5	MTCA Method A

Notes:

N/A = not applicable, not a COC for ground water

(a) DRPH and ORPH not a COC for ground water

(b) Under WAC 173-340-707.

(c) Arsenic is not a COC for soil.

The use of these cleanup levels is fully compliant with the MTCA regulation. Moreover, these cleanup levels meet the strictest requirements available within the MTCA regulation and address all potentially completed exposure pathways to the maximum extent practicable. The use of these cleanup levels was approved by Ecology within the final CAP.

While pH in soil and ground water is not regulated under MTCA, high pH soils were addressed at the subject property due to their potential impact on the ground water solubility of naturally occurring arsenic. The RI did not identify any uses or releases of arsenic or arsenic-bearing wastes at the subject property. The slightly elevated concentrations of dissolved arsenic in ground water were correlated to elevated pH in ground water, which can increase the solubility of naturally occurring arsenic in soil. Removal of accessible high pH soils was determined to be appropriate as a method for addressing ground water pH and the associated arsenic impacts.

2.0 OBJECTIVES

The objectives of the IA were to:

- Protect the health and safety of both on-site workers and the public due to exposure to formaldehyde and PCS during performance of the interim actions;
- Field designate areas of formaldehyde impacted soil and PCS for proper excavation, handling and placement into remediation cells;
- Document the soil conditions at the terminal limits of all remedial excavations and collect final performance soil samples;
- Coordinate the construction of the remediation cells;
- Monitor progress of the remediation cells including respiration rates, flow rates, and collection of confirmation soil samples to document successful completion of soil treatment;
- Characterize and document impacts remaining in-place (if any);
- Assist with the removal and off-site recycling of accessible high pH soils;
- Install, develop, and sample ground water monitoring wells to monitor ground water conditions and contaminant concentrations below the site and along the property boundaries;
- Document the interim action activities and prepare this IA Report; and
- Assist Stoneway in obtaining an NFA determination or similar form of regulatory closure for the subject property.

3.0 METHODOLOGY

In consultation with Ecology, EPI identified the remedial alternative for the subject property as excavation and on-site treatment (via aerobic degradation) of petroleum- and formaldehyde-contaminated soils, excavation and off-site recycling of pH-impacted soils, and monitored natural attenuation (MNA) of ground water. This remedial approach was approved by Ecology in the Final CAP. The selected remedial alternative was determined to be highly effective, readily practicable and demonstrable, fully protective of human health and the environment, and had a very short restoration timeframe. Excavation with on-site treatment passed the threshold criteria required by MTCA [WAC 173-340-360(2)].

In order to confirm the potential effectiveness of bioremediation, EPI performed a bioremediation treatability study. EPI documented the results in the report *Ex Situ Soil Bioremediation Treatability Study Report* (TS). This study confirmed that bioremediation would be an effective method of treatment for the petroleum- and formaldehyde-impacted soils at the subject property.

Although bioremediation was selected for treatment of petroleum- and formaldehyde-impacted soils, on-site bioremediation would not be effective for treatment of high pH soils. Therefore, high pH soils were transported off-site for recycling at Stoneway's new Maple Valley concrete batch plant facility.

The methodology for this interim action is consistent with the methodology and technical approach documented in the CAP. The following section provides a description of the activities performed during the interim actions and the findings of those activities.

Stoneway reviewed its existing permits for the site and determined that no additional permits were required to perform the on-site excavation activities. A valid storm water permit was already in place and on-site storm water run-off was channeled into the existing infiltration structures. Prior to ground breaking, crushed asphalt was placed on the ground surface around the entrance gate to prevent vehicles from tracking mud onto the city street.

GM Construction personnel conducted all excavation activities. Track-mounted excavators and front-end loaders were used to excavate and move impacted soil.

4.0 REMEDIAL ACTIONS

The following sections describe the remedial actions performed at the subject property in the following order:

- 4.1 Work Area 1 – Former Small Settling Pond
- 4.2 Work Area 2 – Large Settling Ponds;
- 4.3 Work Area 3 – Shallow Petroleum Impacted Soil Area;
- 4.4 Work Area 4 – Formaldehyde-Impacted Soil Area.
- 4.5 Work Area 5 – Heating Oil UST Area;

4.1 Work Area 1 – Former Small Settling Pond

High pH soil was present in a former small settling pond that was located in the southwest corner of the site (Work Area 1 – See Figure 3). The southwestern settling pond was historically backfilled and covered with soil and gravel.

As noted above, high pH soil is associated with high pH in ground water, which in turn results in increased solubility of naturally occurring arsenic in soil. Therefore, in order to address residual arsenic in ground water, excavation of high pH soil was necessary.

The soil in the southwestern settling pond was removed using a track-mounted excavator. The settling pond sediment was gray in color, and was easily distinguishable from the surrounding soil and backfill material. The settling pond sediment appeared to be a one-foot thick layer at a depth of approximately four feet below ground surface (bgs) over an area of approximately 60 feet by 30 feet. The majority of the area was excavated to a depth of about 6 feet bgs. A portion of the excavation where a smaller concrete-lined pond was encountered was excavated to a depth of 8 feet bgs. Approximately 200 cubic yards of high pH soil was removed from the southwestern area.

The high pH soil removed was transported and recycled off-site at Stoneway's operating concrete batch plant located in Maple Valley, Washington.

4.1.1 Performance Sampling

In the southwest pond area, EPI collected confirmation soil samples for field pH screening. Soil samples were placed into a plastic cup, mixed with distilled water, and screened with field pH test paper. Soils with pH levels between 6.0 and 8.0 were deemed acceptable (pursuant to Stoneway's current storm water permit). Soils with field results indicating a pH of greater than 8.0 were removed for off-site disposal. The excavating and field testing procedures were repeated until acceptable pH results for the remaining soils were obtained. The results for the soils remaining in place varied in pH levels ranging from 6.5 and 8.0. The final limits of the excavation in Area 4, sample locations, and field screening results are shown on Figure 4.

4.1.2 Restoration

At the completion of excavation activities, the excavation in Work Area 1 was backfilled with remediated soil from the bioremediation cells (see Section 5).

4.2 Work Area 2 – Large Settling Ponds

High pH soil was also present in the three large open concrete settling ponds located along the southern side of the subject property, adjacent to the Cedar River (Work Area 2 – See Figure 3). These settling ponds previously received runoff and washout material from the batch plant in addition to general storm water. The ponds are constructed of concrete and are currently open and used as a collection basin for on-site storm water runoff.

Approximately 2,200 cubic yards of high pH soil was removed from the large settling ponds. The material was very viscous and required stabilization with dry soil prior to off-property transportation. The ponds were approximately 15 to 16 feet deep and concrete lined. Excavation was deemed complete when the concrete sidewalls and bottom were exposed.

The high pH soil removed was transported and recycled off-site at Stoneway's operating concrete batch plant located in Maple Valley, Washington.

4.2.1 Performance Sampling

As previously mentioned, the walls and bottom of the southern settling ponds were lined with concrete and excavation was discontinued upon encountering the walls and bottom. Therefore, no soil performance samples were collected due to the presence of the concrete enclosure. There appears to be a minor amount of high pH material in and immediately surrounding the southern settling ponds that cannot be practicably removed. The pH-impacted soils are relatively deep and are not exposed at the surface or in direct contact with surface water or the Green River. The removal of these soils would require deep excavation adjacent to the Cedar River. The deep excavation would endanger the rip-rap shoreline protection of the Cedar River and poses the potential for slope failure, erosion, and potential silt and/or sediment release to the Cedar River and is salmon spawning habitat. Any excavation of the residual pH-impacted soils would likely require the construction of a diversion structure for a portion of the river, deep shoring or slope laybacks, and extensive hydraulic control.

4.2.2 Restoration

No site restoration was required since the large settling ponds remain open and currently are being used as storm water collection basins. The settling ponds are a component of the current site general stormwater permits and prevent surface water runoff to the Cedar River. Restoration of these areas will be completed as a component of property development and will be subject to other applicable regulations. It is anticipated that future development will require the construction of a storm water control system that complies with current State and Federal regulations.

4.3 Work Area 3 – Shallow Petroleum-Impacted Soil Area

The shallow petroleum impacted area is located in the south-southeastern portion of the subject property (Work Area 3 – See Figure 3). The COC for Work Area 3 is ORPH.

The ORPH impacted area was excavated to a depth of four feet over an approximate area of 28 feet by 45 feet. The soils were excavated until all visual staining was removed. Performance soil samples were then collected to confirm compliance with the selected cleanup levels.

Approximately 190 cubic yards of visually stained soil was stockpiled on visqueen for future placement into the bioremediation cells (described in section 5.0 below). To limit the potential for cross-contamination of PCS to clean soil, the PCS stockpile was also covered with visqueen until it was placed into a remediation cell.

During sampling and excavation activities, EPI observed the soil conditions encountered and performed ongoing field screening using a photoionization detector (PID) equipped with a 10.6 eV lamp. EPI used the field screening results in conjunction with analytical results to assess the terminal limits of the excavation.

4.3.1 Performance Sampling

EPI collected 12 final performance soil samples from the terminal sidewalls and bottom of the excavation. Soil sampling frequencies were consistent with the CAP; one sidewall sample for every 20 linear feet less than ten feet deep, and one bottom sample for every 200 square feet. Sidewall samples were collected using a decontaminated stainless steel trowel. The first few inches of soil were removed to expose the undisturbed soil. The undisturbed soil was placed into a 4-ounce glass jar provided by the laboratory, sealed, labeled, and placed into an iced cooler pending transport to the analytical laboratory.

The soil samples were submitted under chain-of-custody procedures to CCI Analytical Laboratories for analysis. The samples were analyzed for DRPH and ORPH using Northwest NWTPH-Dx methods.

4.3.2 Analytical Results

A summary of the analytical results is provided in Table 2; copies of the laboratory analytical reports are provided in Volume II, Attachment F. Soil sample locations and excavation limits are shown on Figure 5.

The analytical results for the soil samples indicated detectable DRPH concentration ranging from below laboratory detection limits (<25 mg/kg) to 180 mg/kg, which were below the MTCA Method A Soil Cleanup Level for Unrestricted Land Use for DRPH of 2,000 mg/kg.

ORPH concentrations in soil ranged from below laboratory detection limits (<50 mg/kg) to 410 mg/kg, which were all below the MTCA Method A Soil Cleanup Level for Unrestricted Land Use for ORPH of 2,000 mg/kg.

4.3.3 Restoration

After receipt of analytical results, the excavation in Work Area 3 was backfilled with remediated soil from the bioremediation cell (see Section 5).

4.4 Work Area 4 – Formaldehyde-Impacted Soil Area

The formaldehyde-impacted soil area is located in the central portion of the subject property (Work Area 4 – See Figure 3). The COC for Work Area 4 is formaldehyde.

The excavated soils in Work Area 4 consisted of typical river deposits as well as historical fill including concrete, timbers, metal debris, bricks, and other inert material. The soil materials at the subject property contain about 30 to 40 percent coarse gravel, pebbles, and cobbles in excess of 1-inch in minimum dimension. These naturally occurring rock materials are inert and did not require remediation or treatment. The presence of these materials would hinder and complicate the bioremediation process.

The excavation process was a two stage process that included 1) mechanically screening the soil to remove larger materials to reduce waste volume, and 2) blending the screened soil with microbe-stimulating compost material and wood chips to assist in the bioremediation process (see Section 5).

To perform the mechanical screening, the excavated soil was placed into a mobile multi-stage vibratory screen to remove the material larger than 1-inch in minimum dimension. The finer material 1-inch minus) exited the screen plant on a conveyer belt and was blended with compost and wood chips at a mixture of approximately 5%. The amended soil was then placed into the remediation cell and covered with plastic (remediation cell construction is described in Section 5.1). The larger screened material was temporarily stockpiled on areas that were planned for future excavation and remediation.

The initial dimensions of the excavation were based on the findings of the RI and were estimated to be 250 feet by 300 and 10 feet deep, or approximately 20,000 cubic yards. The final excavation is irregular in shape, but, in general, the dimensions were 270 feet (north-south) by 320 feet (east-west) and the total excavation area was approximately 1.4 acres. The depth of the excavation is 11 feet bgs near the center and beneath the former source area and about 9 feet bgs near the terminal limits. The southern extent of the excavation terminated at the concrete wall on the north side of the settling ponds. The terminal limits of the Work Area 4 excavation are shown on Figures 6 and 7.

Approximately 21,030 cubic yards of material was excavated and processed through the vibratory screen. Approximately 13,430 cubic yards of 1-inch minus material was produced by screening and then blended with wood chips and compost and placed into one of the seven remediation cells over a 13-month timeframe. Each cell contained about 2,000 cubic yards of material and the bioremediation

process was performed on a batch basis. Each cell required about 2 to 3 months for full treatment. Once remediated, the “clean” soils were stockpiled for later use and the remediation cell was refilled with additional contaminated material. Approximately 7,600 cubic yards of 1-inch plus oversize material was produced and placed into a separate “large rock” stockpile.

The formaldehyde cleanup level for soil at the subject property was the method detection limit. Remedial excavation was advanced outward from the former central source area until the excavation was beyond the initial assessment soil borings which contained detectable concentrations of formaldehyde. Once these limits were reached, performance soil sampling and analysis were performed to guide further excavation. If laboratory analysis of these samples demonstrated that the target cleanup level had been attained, then the lateral extent of the excavation at that location was deemed complete, and these soil samples were then considered as final performance samples. Similarly, the depth of excavation was terminated when the cleanup levels was attained in final performance soil samples from the bottom of the excavation, or when the saturated zone was reached.

Large fluctuations in the ground water table elevation were observed within the excavation during the 13 months of excavating activities. In order to maximize removal of impacted soils, most of the removal activities from the bottom of the remedial excavation were conducted when the ground water was at a low level.

As noted above, the oversized rock piles were located in areas that were subsequently excavated to address underlying impacts to soil. Initial samples collected from the large rock pile indicated that some of the residual silt and sand that had adhered to the material contained detectable concentrations of formaldehyde. These detectable concentrations ranged from 0.04 mg/kg (i.e., equal to the method detection limit) to 0.11 mg/kg. The oversized pile was then reprocessed through the vibratory screen to assist with the removal of the finer material. The finer material was then placed into one of the bioremediation cells for treatment. The remaining oversized material was then rinsed with potable water and stockpiled on plastic sheeting. The rinse water was contained and allowed to evaporate or infiltrate into the soils below the rinse area. As stated, these soils were later excavated and placed into a remediation cell for treatment. If formaldehyde was detected in any of the oversized material samples, the material was reprocessed and retested. The confirmation samples were considered a final confirmation samples when the cleanup level of 0.04 mg/kg was attained.

The sampling frequency of stockpiled rock was performed in conformance with Ecology’s Minimum Number of Samples From Stockpiled Excavated Soil (Publication #90-52, Table 5-3). Grab-type rock samples were collected and placed into stainless steel bowls. Smaller rocks were then crushed to obtain a volumetric representation of the rock pile. The crushed material was placed into pre-cleaned, laboratory-supplied 4-ounce glass containers. The glass sample containers were packaged in bubble wrap and blue ice and shipped to Exova (previously named Bodycote Testing Group) located in Santa Fe Springs, California, via overnight, next morning delivery. The samples were analyzed for formaldehyde using EPA Method 8315A.

Laboratory analytical results are provided in Volume II, Attachment G, and presented in Table 3. After laboratory non-detect was obtained, the large rock material was used as backfill in the bottom of the excavation.

On-site health and safety monitoring was maintained during the excavation process. EPI's on-site personnel monitored the work areas, excavation, and the remediation cells for VOCs periodically using a PID equipped with an 11.7 eV lamp. The PID was calibrated with 100 parts per million (ppm) isobutylene weekly. No elevated readings above normal background levels were observed throughout the excavation project.

4.4.1 Performance Sampling

For purposes of performance monitoring, soil samples were collected and analyzed to determine attainment of the target cleanup levels and to guide the lateral and vertical extent of remedial excavation. Excavation in an area was considered complete only when performance soil sample analytical results indicated that a cleanup level had been attained. If the cleanup level was not attained, the excavation was expanded, and the soils were once again sampled and analyzed. Once a final performance sample was obtained, then the sample location was determined to be representative of the terminal limits of the excavation.

For sidewalls less than 10 feet deep, one sidewall performance sample was collected for every 20 linear feet of excavation sidewall, and for sidewalls deeper than 10 feet, two soil samples were collected for every 20 linear feet of excavation. These samples were collected from different depths to characterize the vertical distribution of impacts in the sidewall.

One bottom sample was collected for every 400-square foot area of excavation bottom, except at locations where the soil was excavated to below ground water levels. It was generally possible to remove the soil in the bottom of the excavation to a depth of 11 feet bgs.

Performance samples were generally collected either by hand from the open excavation or from a backhoe bucket when the sample was from an excavation deeper than 4 feet below a adjacent unsupported sidewall grade. The top six inches of slough was removed with a decontaminated stainless steel trowel and the sample was collected from the undisturbed soil below. Samples were placed into pre-cleaned, laboratory-supplied 4-ounce glass containers. The glass sample containers were packaged in bubble wrap and blue ice and shipped to Exova (previously named Bodycote Testing Group) located in Santa Fe Springs, California, via over night, next morning delivery. All soil samples were analyzed for formaldehyde using EPA Method 8315A.

A total of 10% of the performance/final performance soil samples were collected for analysis as duplicate samples. In cases where the analytical results for the original sample and the duplicate sample differed, the higher of the two results were used.

Individual samples were given location identifiers that correlate to their grid location and depth from the top of the excavation. An x-y coordinate grid system was established across the entire excavation.

The northwest corner of the western settling pond was designated as the "0,0" point of origin, and was surveyed by the GM survey crew, and later surveyed using a global positioning system (GPS) unit. Other critical points were surveyed and flagged by the survey crew.

All location identifiers for samples within the field of excavation are preceded with a site name designation as "ST" for Stoneway, followed by a bottom or sidewall designation such as "B" for bottom or "SW" for sidewall. This is followed by the x,y location on the grid system with the first number being the "x" node or easting, and the second number being the "y" node or northing, then followed by the depth (feet) below ground surface of the sample. For example, sample ST-SW15, 350:8 designates a sample collected from the Stoneway project, and is a sidewall sample collected fifteen feet east (x) and 350 feet north (y) of the origin, at a depth of 8 feet bgs.

4.4.2 Analytical Results

All performance, final performance, and duplicate sample analytical results are presented in Table 4, and copies of the laboratory reports are provided in Volume II, Attachment H. For clarity, the locations of **all** performance samples and duplicates are presented on Figure 6, and only the locations of the **final** performance samples from the final lateral and vertical limits of the remedial excavation are presented on Figure 7.

A total of 447 performance samples (406 soil samples and 41 duplicates) were collected during the course of the remedial excavation. Of the 447 soil samples, 238 samples represented final performance soil samples.

Detectable concentrations of formaldehyde in the performance soil samples ranged from 0.04 to 0.48 mg/kg. The detectable concentration of formaldehyde in the performance samples decreased significantly as the excavation was expanded and final performance samples were obtained.

As indicated on Figure 7, analytical results for **all** of the 238 samples from the terminal lateral and vertical limits of the remedial excavation were in compliance with the 0.04 mg/kg cleanup level accepted by Ecology in the CAP.

4.4.3 Restoration

Upon receiving confirmation that the cleanup objectives had been attained, the excavation area in Work Area 4 was backfilled first with the clean rock from the screening process. The remaining volume of the remedial excavation was backfilled with treated soils from the on-site bioremediation cells (See Section 5.0). Those soils were clearly demonstrated to have attained the 0.04 mg/kg cleanup level for formaldehyde prior to their re-use as on-property fill material.

4.5 Heating Oil UST Area

One 600-gallon UST, constructed of single-walled steel, was removed from the north central portion of the subject property in Work Area 5. The UST was uncovered during the demolition of the shop

buildings. Based on visual observations, the presence of a copper tubing feeder line, and discussions with on-property personnel, it was determined that the UST previously been used to store heating oil for use in the shop heaters. The UST was empty at the time of removal. The heating oil UST excavation area is indicated on Figure 3.

GM personnel obtained a Tank Removal Permit from the City of Renton and removed the UST on September 30, 2008. The removal of the UST was monitored and approved by Mr. Craig Trettevik, Marine Chemist with Sound Testing, Inc., and by Mr. William Flora, Inspector for the City of Renton Fire Department. Mr. Eric Caddey, EPI's Washington State Certified UST Assessor, conducted the UST assessment sampling activities. Copies of the City of Renton Tank Removal Permit and the Sound Testing Certificate are provided in Attachment A. The tank was removed from the subject property by GM Construction personnel and reportedly destroyed at a metal recycling facility.

Petroleum stained soils were observed in the bottom of the excavation after removal of the UST. The staining appeared to be from leakage from small holes located in the bottom of the UST. Since large excavating machinery was available at the site and on-site soil treatment was going to be occurring, a decision was made to excavate the impacted soils and stockpile for future treatment in the on-site bioremediation cells. The impacted soils were excavated until visual observations indicated that the remaining soils were clean. The final excavation was approximately 24 by 24 feet, with a final depth of 23.5 feet below ground surface (bgs).

Approximately 300 cubic yards of visually stained soil was stockpiled on visqueen for future placement into the bioremediation cells. To limit the potential for cross-contamination of PCS to clean soil, the PCS stockpile was also covered with visqueen until it was placed into a remediation cell.

Ground water was encountered at approximately 23 feet bgs. Sloughing from the remedial excavation appeared to have impacted some of the water at the bottom of the excavation. Marine Vacuum Services was retained to extract water from the open excavation. Marine Vacuum Services removed approximately 3,000 gallons of water from the bottom of the excavation, and disposed of the water at their treatment facility. Native ground water reentered the open excavation after water extraction. A sample of the native water was collected and submitted for laboratory analysis to assess the potential for petroleum impacts to ground water.

4.5.1 Performance Sampling

EPI collected 11 final performance soil samples from the sidewalls of the excavation, one duplicate soil sample, and four confirmation soil samples from the clean stockpiled overburden soils that were removed from above the UST. Soil sampling frequencies were consistent with the CAP. Due to the depth of the excavation, sidewall samples were collected from the excavator bucket. In order to obtain an representative sample, the top several inches of soil were removed with a stainless steel trowel. The undisturbed soil was placed into a 4-ounce glass jar provided by the laboratory, sealed, labeled, and placed into an iced cooler pending delivery to the analytical laboratory.

One ground water sample was also collected from the excavation using a disposable bailer. The bailer was lowered into the ground water, withdrawn, and the water was placed into sampling containers supplied by the laboratory. Samples were placed into iced coolers pending transport to the analytical laboratory.

The soil and ground water samples were submitted under chain-of-custody procedures to CCI Analytical Laboratories in Everett, Washington for analysis. Soil and ground water samples were analyzed for DRPH and ORPH using Northwest NWTPH-Dx methods.

4.5.2 Analytical Results

Soil sample locations and excavation limits for Work Area 5 are shown on Figure 4. A summary of the analytical results is provided in Table 5; copies of the laboratory reports are provided in Volume II, Attachment E.

The analytical results for the soil samples indicated that only one sample contained a detectable DRPH concentration of 28 mg/kg, which is below the MTCA Method A Soil Cleanup Level for Unrestricted Land Use for DRPH of 2,000 mg/kg. DRPH was not detected above the detection limit of the method used in any of the remaining soil samples.

ORPH were not detected at a concentration above the laboratory detection limit of 50 mg/kg in any of the soil samples analyzed.

The analytical results for ground water indicated a DRPH concentration of 320 micrograms/Liter ($\mu\text{g/L}$), which is below the MTCA Method A Cleanup Level for Groundwater for DRPH of 500 $\mu\text{g/L}$. No ORPH were detected above the detection limit of the method used.

4.5.3 Restoration

After receipt of the analytical results, the excavation in Work Area 5 was backfilled with both the adjacent clean stockpiled soil and remediated soil from the bioremediation cell.

5.0 DESCRIPTION OF CONSTRUCTION AND OPERATION OF BIOREMEDIATION CELLS

This section describes the construction and operation of the bioremediation cells that were utilized for the on-site remediation of the PCS- and formaldehyde-impacted soils. Bioremediation was conducted in a batch fashion in two east-west trending bays constructed out of Ecology blocks. Construction details for bioremediation cells are detailed below in Section 3.4.1. The location of the remediation bays and which cells were constructed in each bay is included on Figure 3.

The PCS from on-site remedial excavations was blended with the formaldehyde-impacted soil, the biological inoculant (i.e., compost) and the additional nutrient source (i.e., wood chips). After blending, the soil was placed into one of two remediation bays constructed as detailed below and in the CAP. Each bay contained about 2,000 cubic yards of material and operated for variable time periods, determined by the progress of the biotreatment. A total of seven cells were constructed and operated within the two bays and about 13 months was required to successfully treat the approximately 13,430 cubic yards of impacted soil.

An approximate total of 13,430 cubic yards of contaminated soil with 2,190 cubic yards of amendments (i.e., 15,620 cubic yards total) was processed through seven individual on-site remediation cells. A summary of the approximate volumes of remediated soil per bioremediation cell is presented in Table 6. After confirmation analytical results indicated that soil remediation was complete, the clean soils were removed from the cells and ultimately used as on-site backfill for the remedial excavation. The start and stop dates of each of the cells and total days of operation by cell are presented below in Table 7.

Table 7
Summary of Days of Operation by Cell

Cell Number	Remediation Bay	Start Date	Stop Date	Total Days Operated
1	1	5/9/08	5/27/08	18
2	2	6/2/08	9/19/08	110
3	1	7/9/08	10/20/08	103
4	2	10/22/08	12/1/08	40
5	1	11/19/08	12/29/08	40
6	1	3/24/09	4/20/09	27
7	2	4/16/09	5/21/09	35

5.1 Bioremediation Cell Construction and Operation

The as-built diagram of the typical bioremediation cell design is presented on Figure 9. Rows of Ecology blocks reaching a height of six feet were placed to form two linear adjacent bays, each with three sides sharing a common row of blocks in the center. This configuration allowed for two cells to be

constructed side by side and operated simultaneously. The cells were 300 feet long oriented in an east-west direction starting at the far west side of the subject property. Cell #7 was 230 feet long and was the last cell constructed for the last portion of the impacted soil. Each cell was 24 feet wide and varied in height from 8 to 14 feet.

Prior to soil placement in each cell, a liner was placed within the cell to prevent contact between the contaminated soil and the clean soil below. Each soil pile in each cell was enclosed within an impermeable 10-mil plastic liner to maintain and stabilize soil moisture and temperature. The plastic liner placed over the pile was secured with sand bags to prevent stormwater from eroding or leaching the COCs. The bottom of the pile was lined with sand and sloped from the sides to the middle, and from the back to the front of the cell for leachate drainage. A six-inch, perforated, Schedule 40, PVC collection pipe was placed lengthwise along the center of each pile for draining leachate that accumulated on the bottom of the pile to a sump located adjacent to the pile. When the sump became full, a pump equipped with a float valve pumped the water back up onto the top of the piles through a series of soaker hoses. This water assisted with providing moisture and nutrients for the biological activity, and returned any impacted water back to the cell for further treatment.

Up to five rows of two-inch, 0.010-inch factory-slotted schedule 40 PVC air induction pipes were installed in each of the seven cells. Three rows of pipes were installed at a height of four feet, and depending on the total height of the pile, two additional rows of induction pipes were installed at a height of approximately eight feet. The induction pipes were connected by flush-threaded joints and had a screw-on end cap. The slotted portion of the pipes extended from within one foot of the enclosed end (west end) of the pile, and extended through the length of the pile to within three feet of the front (east end) of the pile. Prior to exiting the pile, the piping was changed to blank Schedule 40 PVC and continued out of the pile into a manifold system. The manifold system directed air flow from the five induction pipes into one main feeder pipe. This feeder pipe was connected to a six-inch water entrainment chamber that was used to remove excess water from the effluent air. The effluent air then exited the opposite end of the chamber, passed through the blower, and exited into the atmosphere through the exhaust stack equipped with an air sampling port.

A regenerative vacuum blower attached to the air induction piping was utilized to pull ambient atmospheric oxygen through each of the cells to produce and maintain the aerobic conditions that favor biological degradation. The electric blower for each cell required a three-phase electrical power source, which was supplied by an on-site electrical generator provided by and maintained by GM Construction. The blowers were rated at a 400 cubic feet per minute (CFM) air flow.

An air flow control valve was placed in each line between the manifold and the pile. An air measuring port was installed upstream from the valve in the blank PVC. Air flow was measured from this port using a hand-held thermal anemometer. The air flow in each extraction pipe was adjusted by turning the valve until approximately equal air flow was achieved in each of the induction pipes. A vacuum gauge was placed in the main extraction line to monitor total air flow. The total air flow through the main air flow pipe in the cells ranged from 8 to 11 inches of water vacuum, and air flow readings collected with the thermal anemometer ranged from 135-146 CFM.

5.2 Effluent Air Monitoring

The effluent air exiting the exhaust stack was monitored on a regular basis to insure compliance with Puget Sound Clean Air Agency (PSCAA) regulations. Two air samples were collected on the day of start-up to monitor formaldehyde loads being emitted to the atmosphere. The air samples were collected in one-liter Tedlar bags from a sampling port located in the exhaust stack. The sample bags were labeled, placed in a cooler, and transported to ALS Laboratory Group (previously named CCI Analytical Laboratories) for analysis.

The air samples were analyzed for formaldehyde using NIOSH Method 2541. No formaldehyde was detected above the method detection limit of 0.3 micrograms per cubic meter in any of the air samples collected from the seven cells. The analytical results for the air samples are summarized in Table 8. A PID was utilized to periodically monitor the effluent air from the exhaust ports. No elevated readings were detected. Based on this information, and contaminant loading calculations presented in the CAP, it was determined that the PSCAA standard of 1,000 pounds of emitted formaldehyde per year was not exceeded. Copies of the laboratory analytical reports are provided in Volume II, Attachment I.

5.3 Monitoring of Bioremediation Parameters

As part of the operation of the bioremediation cells, four sets of two probes (three sets in cells #6 and #7) were installed within each cell to monitor the respiration rates and temperatures of the cells as microorganism metabolism advanced. Three of the probes were located at an equal lateral distance along the length of the cell, and the fourth probe was placed vertically above the middle probe. Each probe set included a thermo-coupling temperature probe and one-quarter inch tubing for extracting internal air from the cell. A porous stone was attached to the end of the tubing to prevent the extraction of fine soil particles that may impede air flow and damage the measuring equipment. Due to the decrease in height of remediation cells #6 and #7, only three sets of probes were installed in these two cells. Probe locations were labeled alphabetically and continued sequentially through the end of the last cell (*i.e.*, probes in cell #1 were labeled A, B, C and D; probes in the last cell, cell #7 were labeled W, X, and Y). The approximate locations of the probes are shown on Figure 9.

The quarter-inch tubing was connected to a portable GasTech multi-meter equipped with oxygen and carbon dioxide sensors for collection of internal respiration readings. Temperature readings from the thermocouples were periodically collected throughout the lifespan of each cell, and the oxygen and carbon dioxide readings were collected during an eight-hour respiration test after the cell was allowed to operate for a minimum of two weeks.

The internal temperature in the cells increased an average of 4-5 degrees Celsius over the lifespan of the cell indicating exothermic biological processes. The temperature increase by each cell is listed in Table 9 below:

Table 9
Bioactivity Temperature Increases in Each Cell

Cell Number	Initial Date Measured/ Degrees Celsius	Final Date Measured/ Degrees Celsius	Total Increase in Temperature
1	Not measured*	Not measured*	--
2	5/23/08 13° C	9/10/08 24° C	11° C
3	7/9/08 19° C	9/25/08 22° C	3° C
4	10/22/08 13° C	11/13/08 14° C	1° C
5	Not measured*	Not measured*	--
6	4/1/09 7° C	4/21/09 11° C	4° C
7	4/16/09 8° C	5/21/09 15°	7° C

*Not Measured due to damaged probes and/or meter malfunction

The eight-hour biorespiration test was conducted on five of the bioremediation cells to monitor oxygenation of the cells and then subsequent rate of biological uptake. The blower was turned off to cease the flow of fresh air into the cell, and the temperature, percent oxygen, and percent carbon dioxide concentrations at each of the probe locations was measured on a 30-minute time interval. The tests indicated that the biorespiration rates increased with time in each of the cells measured. Probe 1 from cell #3 showed the highest respiration rate over the eight-hour period with oxygen decreasing from 20.6% to 18.6% and carbon dioxide increasing from 0.5% to 1.2%. This finding is a strong indication of active aerobic biological activity. The field readings from the biorespiration tests have been tabulated and are provided in Attachment B.

Moisture levels were visually monitored during the construction of each of the cells and during the collection of the confirmation soil samples. A field moisture meter was periodically used during cell loading to check moisture levels. The field readings indicated that the soils were consistently moist and the addition of water to support biological activity was not necessary.

5.4 Confirmation Soil Sampling

Representative confirmation soil samples were periodically collected from each of the cells to evaluate the progress of biological treatment. Soil samples were collected as described in the CAP and as depicted on Figure 10. Each sample was collected from about 2 feet below the top of the cell to 1-2 feet from the bottom of the pile. The samples were then placed into laboratory-supplied glass jars, labeled, and placed into an iced cooler pending delivery to the analytical laboratory. Samples were handled and transported under standard chain-of-custody procedures (as described in previous sections) and analyzed for formaldehyde using EPA Method 8315A, and TPH (as needed) using Methods NWTPH-Gx for GRPH, and NWTPH-Dx for DRPH and ORPH.

Samples were analyzed based on the COCs contained within the soils placed into each cell. The remediation of the soil was deemed complete when the analytical results for each of the confirmation samples indicated that the concentration of each of the COCs was below the cleanup levels listed in the CAP (see Section 3.2 of this report). The cleanup levels for GRPH, DRPH, and ORPH were achieved in the first round of soil samples collected from each pile. There were no detectable concentrations of GRPH in any of the confirmation samples analyzed for GRPH. Detectable concentrations of DRPH ranged from 33 mg/kg to 69 mg/kg, and the detectable concentrations of ORPH ranged from 50 mg/kg to 100 mg/kg. Both of the DRPH and ORPH contaminant concentration ranges were below their respective MTCA Method A Cleanup Level for Unrestricted Land Use for both DRPH and ORPH of 2,000 mg/kg.

The analytical results for formaldehyde in the first round of confirmation sampling at certain sampling locations in bioremediation cells 2 and 3 indicated that the cleanup levels for formaldehyde had not yet been attained. The detectable concentrations of formaldehyde ranged from 0.04 mg/kg to 0.73 mg/kg. The cell was operated for at least two additional weeks and then these locations were re-sampled. This sequence was repeated until every sample point of the cell met the cleanup levels.

A summary of the analytical results for the confirmation soil samples is presented in Table 10. Copies of the laboratory analytical reports are provided in Volume II, Attachment J.

6.0 GROUND WATER WELL INSTALLATION AND MONITORING

Ground water monitoring was conducted as part of the remedial activities to assess for post-remedial impacts to ground water and for point of compliance monitoring. It was anticipated that with the removal of the source material, the concentrations of the COCs previously identified in the ground water would naturally attenuate to below the clean up levels.

The ground water monitoring program consisted of installing four new monitoring wells, repairing and monitoring a previously installed but damaged monitoring well, and monitoring three existing point of compliance wells.

During the demolition of the on-site structures and excavation of the impacted soils, four of the existing ground water monitoring wells had been abandoned. These wells included EPI-MW-2, EPI-MW-3, EPI-MW-4, and MW-4. It was understood that these wells would be replaced after completion of the remedial activities as a component of ground water performance and compliance monitoring.

After review of the number and location of the replacement wells with Ecology, it was determined that four replacement wells (EPI-MW-6 through EPI-MW-9) along with the current existing perimeter wells, would suffice for obtaining sufficient ground water monitoring information. Monitoring wells EPI-MW-6 and EPI-MW-9 were installed within the former excavation to assess the post-remedial ground water quality at the former formaldehyde release area. Ground water monitoring well EPI-MW-7 was installed in the southwest corner of the excavation, near the former settling ponds, to assess the presence of formaldehyde and possible elevated pH and arsenic concentrations. Ground water monitoring well EPI-MW-8 was installed outside of the excavation to the northwest to assess downgradient ground water quality impacts outside of the formaldehyde-impacted area. Well locations are shown on Figures 3 and 11.

During the grading of the southern end of the site, west of the settling ponds, a well vault for a historical ground water monitoring well was uncovered. The vault had been damaged and the top of the casing appeared to be pinched inside the monument. Based on this location, it was determined that this well was most likely ground water monitoring well MW-41, a pre-remediation ground water monitoring well. The well casing and monument were repaired and the well was purged and redeveloped for use as an additional sampling location.

The four new ground water monitoring wells were installed using a track-mounted, limited access hollow stem auger drilling rig. The four monitor wells were constructed of 2-inch diameter, flush threaded, schedule 40 PVC casing and screens in conformance with WAC 173-160-430. Well screen assemblies consisted of 0.010-inch (10 slot), flush-threaded, machine-slotted Schedule 40 PVC screen with a threaded end cap. Due to the high fluctuations in ground water levels at the site, 12 feet of screen was installed in each well.

The sand filter pack consisted of 20-40 Colorado silica sand and was placed from the bottom of the end cap up to one-foot above the top of the screen. Hydrated bentonite chips were placed in the annular

space from the top of the sand pack to within two feet of ground surface. A 3-foot, locking metal stand-up well monument was placed over the well casing. The monument was placed in the top two feet of the annular space and filled with cement to ground surface. The top of the well casing was capped, and the monument was secured with a keyed lock. GM personnel placed three ecology blocks around the standup well vaults as added protection from vehicles and machinery. As-built construction diagrams for the new wells are provided in Attachment C.

The vertical elevations and horizontal locations were surveyed by Barghausen Consulting Engineers, Inc. Vertical elevations were collected from the top of each well monument and from the measuring point located on the top of the well casing. Survey data were referenced to the City of Renton survey datum. Water level measurements were collected on a quarterly basis and are presented in Table 11.

Each of the new wells was developed by surging and over pumping to remove fines accumulated in the sand pack during well installation. The wells were developed until the water was visually clear and free of silt and fine particles. Wells were allowed to stabilize at least 72-hours prior to sampling.

Quarterly ground water sampling activities were initiated after the installation of the new ground water monitoring wells. Samples were collected from the three previously installed wells, the historic rehabilitated well, and the four newly installed wells. Ground water sampling procedures included collecting the samples with a peristaltic pump using low flow sampling techniques. Ground water parameters of pH, conductivity, and temperature were collected and recorded during well purging. At least one wetted-casing volume was evacuated and ground water parameters were allowed to stabilize to within 10% prior to sampling. Samples for formaldehyde analysis were placed into 500-ml laboratory-supplied amber jars and shipped via Fed Ex overnight for morning delivery to Exova. Samples for arsenic analysis were field-filtered and collected in a 250-ml preserved polyurethane bottle provided by the laboratory; the samples were transported under normal chain-of-custody procedures and delivered to ALS Laboratory Group for arsenic analysis.

Three existing ground water monitoring wells, EPI-MW-1, MW-1, and EPI-MW-5 were used for performance and conformational monitoring at the downgradient property boundary during and after the completion of remedial actions. These wells were sampled in the manner described above.

6.1 Piezometric Conditions and Ground Water Flow Direction

Ground water monitoring included the collection of water levels for a total of six consecutive quarters from June 2009 through September 2010. The piezometric conditions were plotted for most recent data, September 2010, and are presented on Figures 11 and 12. The direction and magnitude of the hydraulic gradient at the subject property is consistent throughout the year and is northwesterly with a magnitude of between 0.066 feet/foot and 0.075 feet/foot over the 15-month timeframe of the work presented herein. The RI Report has previously documented the temporal consistency of the local ground water gradient.

6.1.1 Historical and Ambient Ground Water Flow Conditions

During prior review of this report Ecology has expressed concern that local ground water flow conditions are strongly influenced by the existing City of Renton water supply wells northwest of the Site and that ground water conditions during period of non-pumping may differ than those currently observed. Ecology had also expressed a concern that ground water flows at the Site could reverse or change direction either in the absence of pumping from the City supply wells or during drought periods and that this condition could result in ground water migration from the Site toward the Cedar River.

To resolve these concerns Stoneway has gathered additional data regarding local piezometric and hydrogeologic conditions to confirm and document our understanding of the natural flow of ground water at the Site and whether the Cedar River is normal a gaining or losing river relative to ground water.

The entity most knowledgeable of hydrogeologic conditions in Renton area is the water resources consultants for the City of Renton, Pacific Groundwater Group (PGG). EPI has had several discussion with Mr. Peter Schwartzman; Principal Hydrogeologist for PGG regarding local hydrogeologic conditions. PGG also provide graphical representations of ground water conditions within the City of Renton which are presented in Attachment D. Our discussions with PGG, the supporting documentation and the application of hydrogeologic principles support the following statements:

- The aquifer at the Site is present in an unconfined condition within alluvial soils between generally impermeable or low-permeability uplands soils. This condition of an alluvial basin between elevated uplands is readily observable at the Site based upon the higher topographic elevations to the north and south and the narrow channel occupied by the Cedar River and the alluvial water table aquifer. Figure 23 titled "Groundwater Level Elevations in the Downtown Renton Vicinity" prepared by PGG illustrates the extent of the aquifer materials and the general ground water migration pattern at the Site.
- Immediately upstream of the Site, in an area called the "Bedrock Narrows" the alluvial aquifer *"pinches down to a very limited cross sectional area. This would force upgradient ground water into the river and once it passes through the Bedrock Narrows, the river is expected to lose water as the aquifer becomes thicker and of greater aerial extent, and can accommodate more ground water flow."* (P. Schwartzman; personal communication). As such, the river would be in a losing condition relative to the ground water in the area of the Site. This is consistent with the graphic in Attachment D from a 1989 PGG report showing the losing conditions between the river and the deltaic aquifer.
- The effect of the Bedrock Narrows is illustrated in the figure titled "Piezometric Elevations and Vertical Gradients in Selected Monitoring Wells (8/92)" prepared by PGG. This figure illustrates the narrow area of ground water flow paralleling the Cedar River Valley east and upstream of the Site and how this flow pattern extends beneath the Site. This effect is consistent with

hydrogeologic principles and will persist regardless of the pumping condition at the City of Renton production wells.

- The natural flow of ground water within the Cedar River Valley mimics the direction of surface water flow and is westerly to northwesterly in the area of the Site before entering the deltaic aquifer west of I-405. At that point natural ground water flow shifts to the southwest. This condition is expected to persist independent of ground water extraction northwest of the Site. The natural ground water flow conditions are illustrated by Figure 3-2 titled "Ground water Elevations (ft. above NGVD) January 23, 1987" prepared by CH2MHill and Figure 10 titled "Groundwater Elevation Contour Map, Lower Sand Unit, June 24, 1987" prepared by Hart Crowser. PGG has indicated that Figure 3-2 and Figure 10 were for periods of time when the City of Renton wells were not pumping and had been quiescent for a period of time.
- The Cedar River is a losing river (i.e., discharges to ground water). The relationship of the river to the local aquifer is illustrated cross-section C-C' on Figure 6 prepared by PGG. The losing condition is also illustrated on Figure 3-2 by observing river level elevations and corresponding water level elevations. This condition is expected to persist at the Site at all times based on the Bedrock Narrows. Due to the narrowing of the bedrock and the decrease in cross-section area of the aquifer ground water is forced into the riverbed. The water within the river then discharges to ground water where the cross-sectional area of the aquifer increases downstream of the narrows, in the area of the Site. This condition is expected to persist even during times of drought and very low river flows.
- The losing condition of the Cedar River is illustrated on Figure 3-2. The graphic illustrates the water level elevations in three stream gages (SG1, SG2, and SG3). Those elevations are consistently 2 or more feet higher than the adjacent piezometric elevations, which clearly indicate the losing condition within the river. Contemporaneous stream gage and water level data do not exist for a period of drought at the Site. However, based on an understanding of the local geology and hydrogeology both PGG and EPI concur that the losing condition of the Cedar River is likely to persist even in period of drought. The Cedar River's large watershed upstream of the Site, the narrow river channel upstream of the site, the permeable nature of the alluvial soils and aquifer materials, the narrowing and subsequent widening of the aquifer cross-sectional area upstream of the Site indicate that even during periods of drought and low river flows the river will remain in a losing condition to the aquifer.

The hydrogeologic conditions at the subject property are supportive of the NFA determination requested in this report. The natural flow of ground water at the subject property is northwesterly regardless of pumping at the City of Renton production wells and, due to local geologic and lithologic features the river is consistently in a losing condition relative to local ground water.

6.2 Ground Water Analytical Results

The ground water samples were analyzed for formaldehyde using EPA Method 8315A and dissolved arsenic using EPA Method 7060 or EPA Method 6020. The analytical results are included in Table 12 and are displayed on Figure 12. Copies of the analytical reports are provided in Attachment J.

Analytical results indicated that formaldehyde concentrations were below the detection limit of the method used (5 µg/L) in all of the samples collected from the wells sampled, except for a one time concentration of 6 µg/L in MW-1 in the March 2009 sampling event, and a one time concentration of 16 µg/L in MW-7 in June 2010.

Formaldehyde concentrations have been below the selected cleanup level at well MW-1 for at least four consecutive monitoring events and for a full 12-month annual cycle. The formaldehyde detection at well MW-7 is considered to be anomalous. At no time prior to, or since, the June 2010 sampling event has formaldehyde been detected at this location.

Total arsenic has been detected in two locations at concentrations exceeding the selected cleanup level. Arsenic has been detected at well EPI-MW-7 at concentrations ranging from 4.9 to 7.7 µg/L and at well EPI-MW-9 at concentrations ranging from 5.7 to 7.0 µg/L. These concentrations slightly exceed the cleanup level of 5.0 µg/L.

The presence of arsenic in these locations appears associated with elevated pH ranging from about 8 to 11.43. Elevated pH in water increases the solubility of naturally occurring arsenical compounds within the native soils. The available data for the subject property indicate that detectable arsenic in ground water is generally associated with pH between about 7.5 and 8.0 and that ground water with a normal pH range between about 6.0 and 7.5 does not contain arsenic at concentrations exceeding the 5 µg/L cleanup level. Both the presence of arsenic in ground water at concentrations exceeding the cleanup level and at elevated pH are limited to the interior of the subject property in areas downgradient of either a former settling pond or concrete batch plant operations. It is EPI's current opinion that the most likely source of the elevated pH in ground water, and resulting arsenic concentrations, is residual high pH materials in soil, primarily near the large settling ponds. As noted above, it is impracticable to remove these remaining impacts due to their depth and proximity to the Cedar River. Attempting to remove these impacts could result in surface water quality impacts from siltation and/or sedimentation and could have an adverse impact on salmon breeding habitat.

Arsenic and formaldehyde concentrations in ground water at the three wells at the downgradient subject property boundary (*i.e.*, EPI-MW-5, MW-1, and EPI-MW-1) have complied with their respective MTCA Method A or PQL standards for the prior four consecutive monitoring periods.

Based on the impracticability of attaining the Method A cleanup level in ground water throughout the entire subject property within a reasonable timeframe, EPI requests approval of a conditional point of compliance at the downgradient (*i.e.*, northwestern) property boundary as allowed under MTCA [WAC 173-340-720(8)].

7.0 EVALUATION OF ADDITIONAL REMEDIAL ACTIONS

As demonstrated above, the remedial action for soil contamination at the various work areas of the subject property have resulted in compliance with the selected cleanup levels. This is clearly demonstrated by the results of performance soil sampling during the remedial excavation and by the confirmation soil sampling conducted during operation of the bioremediation cells.

After performance of the IA's at the subject property, periodic ground water monitoring has demonstrated substantial improvement to ground water quality. Formaldehyde impacts to ground water have been greatly reduced and with the exception of a single anomalous result at one well, ground water quality has complied with the selected cleanup level throughout the subject property for the last four quarterly monitoring periods. Only minor concentrations of arsenic remain in ground water, in two monitoring wells on the interior of the property. Arsenic is not present in ground water as a contaminant that was released on-Site but rather as a result of increased solubility of naturally occurring arsenical compounds in soils, resulting from elevated pH of the ground water. The elevated pH is the result of the previous use of the Site as a concrete batch plant, and specifically, the cleaning and washing of residual concrete from equipment and trucks.

Arsenic is only present at concentrations exceeding the MTCA Method A Ground Water Cleanup Level of 5 µg/L in the interior of the Site and periodic ground water monitoring has demonstrated that those impacts do not extend beyond the property boundary. The observed arsenic concentrations range from 5.7 µg/L to 7 µg/L. As noted, arsenic concentrations in ground water comply with the MTCA Method A cleanup level at the downgradient property boundary.

The source of the high pH in ground water is likely a minor amount of high pH soils near the former settling ponds on the south side of the property. There is no MTCA cleanup level or screening level for pH in soils or ground water and current conditions at the property do not pose a threat to human health or the environment.

However, it is recognized that the elevated pH of the ground water results in the increased solubility of naturally occurring arsenic within the on-property soil matrix. In order to address the arsenic impacts to ground water it would be necessary to address the pH of the local ground water. The source of the high pH in ground water is the residual high pH soils. Therefore, the remedy for arsenic in ground water is associated with residual high pH soil materials. Addressing the residual pH-impacted soil is impracticable because those materials are not accessible to excavation and cannot be removed (see section 4.2 above).

7.1 Cleanup Alternatives

In order to address the minor arsenic impacts to ground water, EPI has performed the following evaluation of remedial alternatives (ERA). This ERA is based upon EPI's past experience, best professional judgment, and the application of scientific principles.

Based upon our understanding of the Site and the source of the pH impacts, three alternatives have been selected for evaluation. The three approaches are 1) additional targeted excavation of high pH soils, 2) in situ mixing and neutralization of high pH soils, and 3) monitored natural attenuation (MNA).

7.1.1 Alternative 1 – Additional Targeted Excavation of High pH Soils

Alternative 1 is targeted excavation of high pH soils followed by a routine ground water monitoring. Targeted excavation will result in the permanent removal of the high pH soils that are resulting in the high pH ground water and dissolution of naturally occurring arsenic. As explained in section 4.2 above, however, EPI believes it is impracticable to remove these remaining impacts due to their depth and proximity to the Cedar River. Attempting to remove these impacts could result in surface water quality impacts from siltation and/or sedimentation and could have an adverse impact on salmon breeding habitat.

Nonetheless, if Alternative 1 is performed the tasks involved include:

- A detailed and potentially extensive phase of investigation in order to fully characterize where the high pH soils are currently located;
- Permitting, including a City of Renton Grading Permit and State Environmental Protection Agency (SEPA) checklist;
- Erosion control planning and execution to protect the adjacent Green River (including the construction of a diversion structure for a portion of the river, deep shoring or slope laybacks, and extensive hydraulic control);
- Decommissioning of monitoring wells EPI-MW-7 and EPI-MW-9;
- Shoring to prevent undo damage to Green River;
- Excavation of high pH soils in the area of the former settling ponds (for purposes of this evaluation, it is assumed that approximately 3,700 cubic yards of soil will be excavated, of which, 1,000 cubic yards would be disposed of a high pH);
- Dewatering and treatment of contaminated ground water during excavation;
- Site restoration;
- Reinstallation of monitoring wells EPI-MW-7 and EPI-MW-9;
- Quarterly ground water monitoring for a period of no less than 2 years.
- Use of institutional controls and environmental covenants to address use of on-property ground water.

7.1.2 Alternative 2 – In Situ Mixing and Neutralization of High pH Soils

Alternative 2 is in situ mixing and neutralization of high pH soils followed by a routine ground water monitoring. This alternative uses a large diameter auger and injection of chemical media during mixing to neutralize the residual high pH materials. This approach would result in the chemical neutralization of the high pH soils with low pH (acidic) chemical media with a buffering solution. This methodology requires the injection of large quantities of low pH chemical to counter act both the high pH soil and the scavenging of the low pH media by other naturally occurring soil materials such as total organic carbon and other naturally occurring metals species which are readily oxidized. There is also the potential effect of inadvertent mobilization of other naturally occurring metals species through the introduction of the low pH chemicals. There is significant uncertainty with this remedial alternative associated with the degree of mixing and complete delivery of the treatment media to all of the high pH materials.

This alternative requires advancing 4-foot diameter solid flight augers on 4-foot centers throughout the expected area of high-pH soils. The borings are advanced to depths of about 20 feet and the soil within the boring is homogenized and mixed with a low pH solution with buffering compounds. This would require the advancement of about 400 borings to a depth of about 15 feet within the area to be remediated.

The mixing technology disaggregates the soil matrix and results in an increase in soil volume and surface disturbance. Due to the proximity of the activities to the Cedar River there is the potential for some surface water quality impacts during the work from siltation and/or sedimentation that could have an adverse impact on salmon breeding habitat.

Tasks associated with Alternative 2 include:

- A detailed and potentially extensive phase of investigation in order to fully characterize where the high pH soils are currently located;
- A pilot study to determine the quantities and types of media and the necessary buffering solutions. Pilot studies are also important for assessing the potential for inadvertent mobilization of other naturally occurring metals within the soil matrix.
- Permitting, including a City of Renton Grading Permit and State Environmental Protection Agency (SEPA) checklist;
- Permitting with the Ecology Underground Injection Coordinator (UIC) for placement of chemical media in the subsurface;
- Erosion control planning and execution to protect the adjacent Cedar River;
- Decommissioning of monitoring wells EPI-MW-7 and EPI-MW-9;

- Shoring to prevent undue damage to Cedar River shoreline. Shoring is required to control potential sloughing near the shoreline during boring/soil mixing;
- Advancement of about 400 soil mixing borings with a 4-foot spacing to a depth of about 15 feet below grade. This includes the injection of low pH media with buffering solutions.
- Site restoration;
- Reinstallation of monitoring wells EPI-MW-7 and EPI-MW-9;
- Quarterly ground water monitoring for a period of no less than 2 years.
- Use of institutional controls and environmental covenants to address use of on-property ground water.

7.1.3 Approach 3 – Monitored Natural Attenuation

Alternative 3 is MNA and incorporates the understanding that the volume of high pH soil and high pH material within that soil must be finite while the volume of ground water passing through those soils is infinite. Natural attenuation will inevitably result in elimination of the high pH material.

A ground water monitoring well network is currently present at the subject property. Quarterly ground water sampling and analysis has demonstrated that ground water quality is in compliance at the down-gradient property boundary. A minor amount of arsenic impacted ground water remains in the interior of the property. As the high pH conditions in soil attenuate, ground water conditions in the property interior will return to concentrations that are in compliance with the MTCA Ground Water Cleanup Levels. The detected concentrations of arsenic in ground water only slightly exceed the MTCA Method A Ground Water cleanup Level and do not extent beyond the property boundary.

Tasks associated with Alternative 3 include:

- Ground water monitoring for a period of no less than 10 years, with quarterly monitoring for a period of 2 years and semi-annual monitoring for the remaining 8 years.
- Use of institutional controls and environmental covenants to address use of on-property ground water.

7.2 Detailed Evaluation of Approaches

The following discussion provides a comparison of the remedial approaches using the criteria detailed in WAC 173-340-360.

7.2.1 MTCA Threshold Criteria

Each of the remedial approaches passes the minimum requirements for a cleanup action as indicated in WAC 173-340-360(2). These requirements include both the Threshold Requirements [WAC 173-340-360(2)(a)] and Other Requirements [WAC 173-340-360(2)(b)]. The threshold requirements include:

- Protection of human health and the environment; The remedial actions documented above have complied, to the maximum extent practicable, with the MTCA regulation and no accessible impacts above cleanup levels remain. The additional actions (i.e., Approaches 1 and 2) further address any residual impacts and provide for conditional points of compliance.
- Compliance with cleanup standards; Prior remedial actions have attained MTCA cleanup levels or have otherwise complied with the MTCA regulation. The additional remedial actions will further address those environmental impacts that cannot be addressed through direct excavation. The MTCA regulation is the regulatory standard that has been, and will be, applied to those past and proposed future actions.
- Compliance with applicable state and federal laws; The use of MTCA cleanup levels and conditional points of compliance and applicable deed restriction and/or institutional controls is fully compliant with applicable laws.
- Provide for compliance monitoring; The prior remedial actions have included performance and compliance monitoring to demonstrate attainment of cleanup levels at the limits of excavation and within the treatment cells. The proposed remedial approaches include provisions for periodic ground water quality monitoring to confirm compliance with cleanup levels and continued compliance with the MTCA standard at the conditional point of compliance.

Other requirements include:

- Use of permanent solutions to the maximum extent practicable; The initial remedial actions have included on-site treatment and destruction of contaminants. The additional remedial approaches presented herein result in either off-site disposal of contaminants or a return to natural soil and ground water conditions, and
- Consideration of public concerns; The remedial actions proposed for the site are being conducted with the oversight of Ecology through the VCP and all documents submitted to Ecology are in the public domain. All required public notifications have been, and will continue be made in compliance with applicable regulations.

7.2.2 Disproportionate Cost Analysis

Each of the proposed alternatives presents a permanent solution to the observed conditions. As indicated in WAC 173-340-360(d) it is not necessary to perform a disproportionate cost analysis (DCA)

if a permanent solution is selected. However, for the purposes of this document a DCA has been performed in general accordance with WAC 173-340-360(3)(e) in order to select between Alternatives 1, 2 and 3. The following criteria as defined in WAC 173-340-360(3)(f) have been used in this evaluation:

- Protectiveness
- Permanence
- Cost
- Effectiveness over the long term
- Management of short-term risks
- Technical and administrative implementability
- Consideration of public concerns

7.2.2.1 Protectiveness

Regardless of the cleanup approach selected, ground water quality at the Site will be in compliance with all applicable laws and regulations at the completion of cleanup activities. As the success of the additional targeted excavation approach cannot be guaranteed, institutional controls may be required in order to implement each of the remedial approaches. Consequently, each approach results in an environmental cleanup that is protective and at the completion of remedial activities, they are considered the same. Alternative 1 has the potential to provide a more immediate improvement to local ground water quality but may not bring the Site into ultimate compliance with regulations more quickly than the other alternatives.

Since the arsenic impacts in shallow ground water at the property do not extend beyond the subject property boundary and on-property ground water is not used as a potable source there are not potential impacts to human health or the environment during remedial action implementation. Routine ground water monitoring has demonstrated that ground water migration is consistently to the northwest (*i.e.*, away from the Cedar River) throughout the year and there are, therefore, not potential impacts to surface water during the remedial action implementation.

Alternative 1 is ranked higher than Alternatives 2 and 3 for protectiveness. Alternatives 2 and 3 are ranked equally.

7.2.2.2 Permanence

Permanence measures the degree to which an approach permanently reduces the toxicity, mobility, or volume of hazardous substances. At the completion of remedial activities, Alternatives 1 and 3 will result in a solution that is equally permanent; consequently, both approaches are thought to be nearly equal in terms of permanence.

Alternative 1 and 3 are equally ranked for permanence.

The permanence of Alternative 2 is less certain. Substantial uncertainty exists regarding how much

environmental scavenging of the injected media will take place. Excessive scavenging could result in incomplete treatment and only a temporary improvement in ground water quality. Similarly, the degree of mixing is also uncertain. In complete mixing could result in only temporary improvements in ground water quality.

Alternative 2 is ranked less permanent than Alternatives 1 and 3.

7.2.2.3 Cost

The cost of Alternative 1 ranges from about \$800,000 to \$1,200,000, which includes two years of follow-up ground water monitoring. The cost of Alternative 2 ranges from \$400,000 to \$750,000. The cost of implementing Alternative 3 for the next 10 years is estimated at approximately \$40,000 to \$60,000.

Alternative 3 is ranked higher than Alternatives 1 and 2 for cost and Alternative 2 is ranked higher than Alternative 1.

7.2.2.4 Effectiveness over the long term

Alternatives 1 and 3 are effective at addressing the cause of impacts to ground water and preventing migration of the contaminants over the long-term, and are thus considered the same.

Alternative 1 and Alternative 3 are equally ranked for long-term effectiveness.

The long-term effectiveness of Alternative 2 is less certain and it is ranked below Alternatives 1 and 3.

7.2.2.5 Management of short-term risks

Due to the presence of the Cedar River adjacent to the southern property boundary, there are significant risks and challenges associated with Alternatives 1 and 2. These risks include shoring and shoreline support, impacts to the shoreline environment, potential impacts to surface water quality, and potential risks to workers during implementation. Therefore, short-term risks are substantially increased with the implementation of Alternatives 1 and 2 in comparison to Alternative 3. Since ground water is in compliance at the downgradient property boundary and the on-site ground water is not used as a drinking source, there are no short-term risks associated with MNA.

Alternative 3 is ranked higher than Alternatives 1 and 2 for management of short-term risks.

7.2.2.6 Technical and Administrative Implementability

For Alternative 1, extensive engineering and shoring requirements would need to be implemented in order to undertake this action. In addition, an extensive permit process is required in order to proceed with this approach.

Alternative 2 would require additional pilot testing and evaluation before implementation. The soil types at the Site are not conducive to mixing. Soils at the Site are known to contain a high percentage of cobbles, which will make mixing by auger boring difficult. The precise delivery of chemical media through In situ mixing and chemical delivery is, regardless of the Site, technically challenging and uncertain.

Since the monitoring well network is currently in place, Alternative 3 does not pose any technical or administrative challenges for implementation.

Alternative 3 is ranked higher than Alternatives 1 and 2 for technical and administrative implementability. Alternative 1 is ranked higher than Alternative 2.

7.2.2.7 Consideration of public concerns

It is likely that implementation of Alternative 1 is likely to trigger significant public concern regarding excavation immediately adjacent to the Cedar River shoreline.

Alternative 2 may trigger similar concerns regarding delivery of a chemical to shallow soils adjacent to the river.

It is assumed that implementation of Alternative 3 would not trigger a similar level of concern. Any public concerns related to Alternative 3 would likely be in regard to potential threats to the City of Renton water supply wells to the northwest. Such concerns would be addressed through the current and future ground water monitoring data and the empirical demonstration that neither the pH nor the arsenic impacts extend beyond the downgradient property boundary.

Alternative 3 is ranked higher than Alternatives 1 and 2. Alternatives 1 and 2 are equally ranked for consideration of public concerns.

7.2.3 Restoration Time Frame

Restoration time frame (RTF) is evaluated using the following factors described in WAC 173-340-360(4)(b)(i through ix):

- Potential risks posed by the site to human health and the environment
- Practicability of achieving a shorter RTF
- Current use of the site
- Potential future use of the site
- Availability of alternative water supplies

- Likely effectiveness and reliability of institutional controls
- Ability to monitor and control migration of hazardous substances from the site
- Toxicity of hazardous substances at the site
- Natural processes that reduce concentrations of hazardous substances at the site.

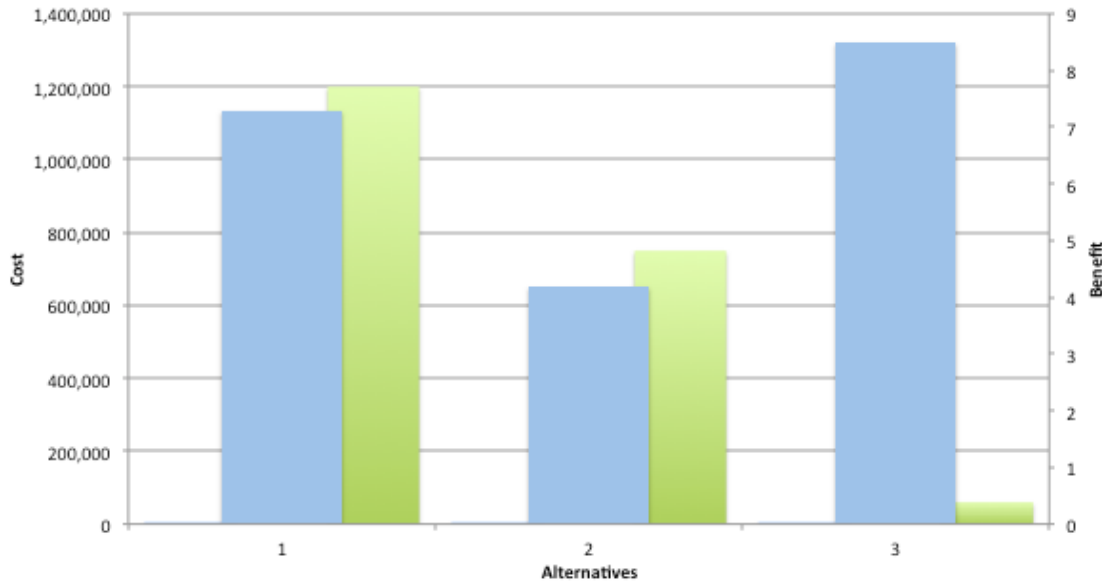
With regard to RTF, Alternatives 1, 2, and 3 are ranked equally based on a general evaluation of the factors listed above. Alternatives 1 and 2 have a marginally higher possibility of attaining a shorter RTF than Alternative 3 but there can be no guarantee. Also, as demonstrated above, Alternative 1 and 2 pose higher risks to the human health and the environment during implementation.

Each of the alternatives utilize institutional controls to the same extent and none of the alternatives has a material effect on the future use of the property.

7.3 Findings and Cleanup Approach Selection

Based on the DCA, Alternative 3 is selected. This alternative includes an on-property conditional point of compliance and compliance monitoring and the use of an environmental covenant to address on-property ground water during the period of remedial action implementation. This approach uses permanent solutions to the maximum extent practicable. Alternatives 1 and 2 have a slightly higher potential for a marginally shorter RTF but this is outweighed by the risks posted by Alternatives 1 and 2 in comparison to Alternative 3. Alternatives 1 and 2 also have substantial risk and uncertainties associated with short-term risk, implementability, and public concerns. As demonstrated on Chart 1, the incremental cost of Alternatives 1 and 2 are also substantial and disproportionate to those of Alternative 3.

Chart 1
Chart Comparing Estimated Cost Relative to Site Benefit



Notes:

- (a) Cost displayed in dollars
- (b) Benefit display unitless

Disproportionate Cost Analysis
Numerical Summary and Calculations^(c)

Factor	Weighting ^(c)	Alternative 1		Alternative 2		Alternative 3	
		Rank ^(d)	Value	Rank ^(d)	Value	Rank ^(d)	Value
Protectiveness	0.3	10	3	5	1.5	5	1.5
Permanence	0.2	10	2	5	1	10	2
Long-Term Effectiveness	0.2	10	2	5	1	10	2
Short- Term Risk	0.1	1	0.1	1	0.1	10	1
Implementability	0.1	1	0.1	1	0.1	10	1
Public Concerns	0.1	1	0.1	5	0.5	10	1
Sum	1	7.3		4.2		8.5	

- (c) Ecology proscribed weighting factors
- (d) Subjective ranking based on two alternatives as discussed above. Highest rank is 10 and lesser rank is 50% of higher rank (i.e., 5)

8.0 CONCLUSIONS

The following conclusions are supported by the actions and findings of the IA's performed at the subject property:

- The petroleum impacts of the heating oil UST and the shallow petroleum stained areas have been fully remediated; the MTCA Method A Soil Cleanup Levels for Unrestricted Land Use (WAC 173-340-740) for DRPH and ORPH have been attained.
- The formaldehyde impacts identified in soil on the subject property have been remediated and the cleanup levels accepted by Ecology in the approved CAP have been attained throughout the subject property.
- The bioremediation methods used to treat petroleum- and formaldehyde-impacted soils excavated from designated work areas were successful in attaining the selected cleanup levels. The treated soil was placed back in the excavated work areas.
- The local hydraulic gradient is northwesterly. This northwesterly ground water flow direction is the natural direction of ground water migration and exists even when the City of Renton production wells are not pumping. The direction of ground water migration is dictated by local geology and hydrogeology and does not change direction when the City of Renton wells are not operating. Due to the local geologic features the northwesterly gradient persists even in drought conditions.
- The local aquifer is recharged by the Cedar River and the river is consistently in a losing condition. This losing condition is documented in the literature and is determined by the local geology and hydrogeology. Because of the local geologic and hydrogeologic conditions, this losing condition is expected to persist even during periods of drought. There is no local hydrogeologic mechanism that would allow the Cedar River to be in a gaining condition relative to ground water.
- Accessible high-pH-impacted soil was removed from the subject property and recycled at an off-site facility. It is generally impracticable to remove any additional pH-impacted soil from the subject property due to the depth of those impacts and their proximity to the Cedar River. Additional removal would require deep excavation with shoring and/or sidewall slopes. It would also require a diversion structure in the river to prevent shoreline or bank failure and a subsequent release of silt or other sediment into the river, should a bank failure occur. These requirements result in a disproportionately high cost relative to the relatively minor environmental benefit derived to remove pH-impacted soils, which in and of themselves are not regulated by MTCA.
- The formaldehyde impacts previously identified in the ground water have decreased to concentrations that are in compliance with the cleanup goals listed in the Ecology-approved CAP.

- Arsenic concentrations in ground water are in compliance with the Method A cleanup level at the down-gradient boundary as measured at the compliance monitoring wells (EPI-MW-5, MW-1, and EPI-MW-1). Minor concentrations of arsenic above the cleanup level remain in ground water in the interior portion of the subject property. The source of the arsenic impacts to ground water is elevated pH, which result in dissolution of naturally occurring arsenic. Once outside of the area of elevated pH, the dissolved arsenic reprecipitates before reaching the downgradient property boundary. The source of the high pH in ground water is likely a minor amount of high pH soils near the former settling ponds on the south side of the property. All of the accessible high pH material in the southern portion of the property has been removed. Based on all of the currently available data it is EPI's opinion that as pH attenuates through natural flushing by ground water that the concentrations of dissolved arsenic in ground water will also decrease below cleanup levels throughout the entire plume. It is not possible to currently predict the timeframe for pH attenuation. Such a timeframe can be established through periodic ground water quality monitoring as proposed herein.
- Based on the impracticability of attaining the Method A cleanup level for arsenic in ground water throughout the entire subject property within a reasonable timeframe, EPI requests approval of a conditional point of compliance at the downgradient (*i.e.*, northwestern) property boundary as allowed by the MTCA regulation [WAC 173-340-720(8)].
- A limited ERA and a DCA were performed in order to select an appropriate remedial alternative to address these ground water impacts. MNA has been selected as the appropriate remedial alternative for the remaining arsenic impacts to ground water. This remedial alternative is permanent, protective, and provides a reasonable restoration timeframe.

It is EPI's opinion that the IA performed at the subject property complies with the substantive requirements of the MTCA regulation. By submittal of this document Stoneway and EPI respectfully request that Ecology provide a No Further Action determination for the property. Stoneway and EPI understand that such a determination may require recording an environmental covenant to prohibit withdrawal of ground water from the subject property until such time as MNA results in attainment of cleanup levels in ground water throughout the subject property.

9.0 LIMITATIONS

This document has been prepared solely for the use of Stoneway Concrete, Inc. This document may not be relied upon by any other party without the express written consent of Stoneway Concrete Inc. and EPI.

To the extent that these services documented herein have required judgment, there can be no assurance that fully definitive or desired results were obtained, or if any results were obtained, that they were supportive of any given course of action. To the extent that this Interim Remedial Action Report may include or require the application of judgment to scientific principles or best professional judgment, certain results of this work may be based on subjective interpretation. WE MAKE NO WARRANTIES, EXPRESS OR IMPLIED INCLUDING WITHOUT LIMITATION, WARRANTIES AS TO MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. The information provided under this report is not to be construed as legal advice.

Tables

Table 2
Work Area 3: Shallow Petroleum-Impacted Area
Summary of Analytical Results for
Final Performance Soil Samples in mg/kg

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Diesel Range Petroleum Hydrocarbons ^(a)	Oil Range Petroleum Hydrocarbons ^(a)
ST-SW405,16:2	81	140
ST-SW425,12:2	<25	<50
ST-SW445,8:2	<25	<50
ST-SW455,20:2	<25	<50
ST-SW450,40:2	40	68
ST-SW430,38:2	78	180
ST-SW410,42:2	150	410
ST-SW408,18:2	180	180
ST-B420,22:4	<25	<50
ST-SW420,32:4	<25	<50
ST-DS-TPH-1	<25	<50
ST-B440,21:4	<25	<50
ST-B440,36:4	<25	<50
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses	2,000	2,000

Notes:

(a) Analyzed by ALS Laboratory Group using Northwest NWTPH-Dx Extended Methods

Bold – Indicates detected concentration greater than compound-specific laboratory detection limits, but less than MTCA Method A Soil Cleanup Levels for Unrestricted Land Use

ST-DS-TPH-1 is duplicate sample of ST-SW420,32:4

Table 3
Work Area 4: Formaldehyde-Impacted Area
Summary of Analytical Results for
Confirmation Samples Collected from the Large Rock Stockpile

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Formaldehyde ^(a) (mg/kg)	Final Confirmation Sample
Rock Pile #1	0.11	
Rock Pile #2	0.10	
Crushed Rock – Middle 1	0.10	
Crushed Rock Middle 2	0.06	
Crushed Rock North	0.06	
Crushed Rock South	<0.04	X
Large Rock #1	<0.04	X
Large Rock #2	<0.04	X
Large Rock #3	<0.04	X
Large Rock #4	<0.04	X
Large Rock #5	<0.04	X
Large Rock #6	<0.04	X
Large Rock #7	0.05	
Large Rock #8	0.05	
Large Rock #9	<0.04	X
Large Rock #10	<0.04	X
Large Rock #11	<0.04	X
Large Rock #12	<0.04	X
Large Rock #13	<0.04	X
Large Rock #14	<0.04	X
Large Rock #15	<0.04	X
Large Rock #16	<0.04	X
Large Rock #17	<0.04	X
Large Rock #18	<0.04	X
Large Rock #19	<0.04	X
Large Rock #20	<0.04	X
Large Rock #21	<0.04	X
Large Rock #22	<0.04	X
Large Rock #23	<0.04	X
Large Rock #24	<0.04	X
Large Rock #25	<0.04	X
Large Rock #26	<0.04	X
Large Rock #27	<0.04	X
Large Rock #28	<0.04	X
Large Rock #29	<0.04	X
Site-Specific Cleanup Level	0.04	--

Notes:

(a) – Analysis performed by Exova using EPA Method 8315A

Bold and shaded – Indicates detected concentration greater than site-specific cleanup levels
mg/kg – milligrams/kilogram

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde^(a) (mg/kg)
St-B1:10.5	5	B		0.04
St-B2:10.5	5	B		0.09
St-SW 2:8	8	SW		0.05
St-SW 5:4	4	SW		0.18
St-SW 9:4	4	SW		0.15
St-SW 10:4	4	SW		0.1
St-SW 11:8	8	SW	X	<0.04
St-SW 12:4	4	SW		<0.04
St-SW 13:8	8	SW	X	<0.04
St-SW 14:4	4	SW		0.14
St-SW 15:8	8	SW	X	<0.04
St-SW 16:4	4	SW		0.06
St-SW 17:8	8	SW		0.05
St-DS-1	8	Dup of St-SW17:8		0.07
St-SW 18:4	4	SW		0.05
St-SW 19:8	8	SW	X	<0.04
St-SW 20:8	8	SW		0.1
St-SW 21:4	4	SW		<0.04
St-SW 22:8	8	SW	X	<0.04
St-SW 23:4	4	SW		<0.04
St-SW24:8	8	SW	X	<0.04
St-DS-2	8	Dup of St-SW24:8		0.12
St-B150, 70:10.5	10.5	B		0.11
St-B160, 55:10.5	10.5	B		0.04
St-B170,70:10.5	10.5	B		0.08
St-SW244, 101:4	4	SW	X	<0.04
St-SW246, 111:8	8	SW		0.29
St-SW250, 121:4	4	SW		0.05
St-B130, 90:10.5	10.5	B		0.06
St-DS-4	10.5	Dup of St-B130, 90:10.5		0.07
St-B150, 90:10.5	10.5	B		0.04
St-B190,90:10.5	10.5	B	X	<0.04
St-B210, 90:10.5	10.5	B		0.06
St-B190, 70:10.5	10.5	B		0.06
St-B210, 70:10.5	10.5	B		0.04
St-B215, 55:10.5	10.5	B		0.04
St-SW180, 45:4	4	SW		0.14
St-SW190, 45:8	8	SW		0.29
St-SW200, 45:4	4	SW		0.07
St-SW210, 45:8	8	SW		0.06
St-SW220, 48:4	4	SW		0.08
St-SW226, 56:8	8	SW	X	<0.04
St-SW229, 66:4	4	SW	X	<0.04
St-SW232, 74:8	8	SW		0.18
St-SW235, 83:4	4	SW		0.05
St-SW240, 92:8	8	SW		0.04
St-DS-3	8	Dup of St-SW240, 92:8		0.19

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde ^(a) (mg/kg)
St-B78, 80:10.5	10.5	B		0.12
St-B110, 70:10.5	10.5	B		0.09
St-B115, 55:10.5	10.5	B		0.22
St-SW254,131:8	8	SW		0.34
St-SW258,141:4	4	SW		0.31
St-B230,90:10.5	10.5	B		0.15
St-B170,110:10.5	10.5	B		0.18
St-DS-5	10.5	Dup of St-B170,110:10.5		0.29
St-B190,110:10.5	10.5	B		0.15
St-B210,110:10.5	10.5	B		0.08
St-B230,110:10.5	10.5	B		0.15
St-B130, 190:10.5	10.5	B		0.14
St-B130, 210:10.5	10.5	B		0.08
St-B130, 230:10.5	10.5	B		0.22
St-B150, 230:10.5	10.5	B		0.13
ST-B290,160:10.5	10.5	B	X	<0.04
ST-B270,160:10.5	10.5	B	X	<0.04
ST-B250,160:10.5	10.5	B	X	<0.04
ST-B300,150:10.5	10.5	B	X	<0.04
ST-B220,80:10.5	10.5	B	X	<0.04
ST-DS-7	10.5	Dup of ST-B220,80:10.5		<0.04
ST-B180,60:10.5	10.5	B	X	<0.04
ST-B230,160:10.5	10.5	B	X	<0.04
ST-B210,150:10.5	10.5	B	X	<0.04
ST-SW260,147:8	8	SW	X	<0.04
ST-SW270,147:4	4	SW		0.08
ST-SW280,147:8	8	SW	X	<0.04
ST-DS-6	8	Dup of ST-SW280,147:8		<0.04
ST-SW290,147:4	4	SW		0.07
ST-SW300,147:8	8	SW	X	<0.04
ST-SW310,147:4	4	SW		0.06
ST-SW315,150:8	8	SW	X	<0.04
ST-SW316,160:4	4	SW		0.10
ST-SW312,170:8	8	SW	X	<0.04
ST-B110,90:10.5	10.5	B		0.05
ST-B110,110:10.5	10.5	B		0.05
ST-B130,110:10.5	10.5	B	X	<0.04
ST-B150,110:10.5	10.5	B	X	<0.04
ST-B130,130:10.5	10.5	B	X	<0.04
ST-B150,130:10.5	10.5	B	X	<0.04
ST-B170,130:10.5	10.5	B	X	<0.04
ST-B170,150:10.5	10.5	B	X	<0.04
ST-DS-8	10.5	Dup of ST-B170,150:10.5		<0.04
ST-B190,150:10.5	10.5	B	X	<0.04
ST-B90, 90:9.5	9.5	B	X	<0.04
ST-B90, 110:9.5	9.5	B	X	<0.04
ST-B110,130:9.5	9.5	B		0.04

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde^(a) (mg/kg)
ST-B80, 48:9	9	B		0.04
ST-SW65, 45:5	5	SW		<0.04
ST-B70, 50:9	9	B	X	<0.04
ST-SW65, 65:5	5	SW		0.08
ST-SW65, 100:5	5	SW		0.04
ST-SW65, 120:5	5	SW	X	<0.04
ST-B90, 130:9.5	9.5	B	X	<0.04
ST-B70, 110:9.5	9.5	B	X	<0.04
ST-B75, 125:9.5	9.5	B	X	<0.04
ST-DS-10	9.5	Dup of ST-B75, 125:9.5		<0.04
ST-SW160, 45:5	5	SW		<0.04
ST-B155, 48:9	9	B	X	<0.04
ST-SW135, 45:5	5	SW		<0.04
ST-B125, 48:9	9	B	X	<0.04
ST-SW112, 45:5	5	SW		0.04
ST-DS-9	5	Dup of ST-SW112, 45:5		<0.04
ST-SW89, 45:5	5	SW	X	<0.04
ST-SW242, 73:8	8	SW	X	<0.04
ST-SW170, 38:8	8	SW		0.05
ST-DS-11	8	Dup of ST-SW170, 38:8		<0.04
ST-SW180, 38:4	4	SW		0.06
ST-SW190, 38:8	8	SW		0.05
ST-SW200, 38:4	4	SW		<0.04
ST-SW210, 38:8	8	SW		0.07
ST-SW220, 38:4	4	SW		0.04
ST-SW226, 42:4	4	SW		<0.04
ST-DS-12	4	Dup of ST-SW226, 42:4		<0.04
ST-SW325, 193:4	4	SW	X	<0.04
ST-SW325, 170:4	4	SW		0.17
ST-SW325, 140:4	4	SW		0.12
ST-SW310, 125:4	4	SW		0.10
ST-SW269, 135:8	8	SW		0.08
ST-SW269, 135:4	4	SW		0.11
ST-SW270, 110:4	4	SW		0.06
ST-SW270, 110:8	8	SW		0.20
ST-SW270, 90:4	4	SW		0.15
ST-SW270, 90:8	8	SW		0.09
ST-SW252, 92:8	8	SW		0.10
ST-SW250, 82:4	4	SW		0.09
ST-SW120, 40:5	5	SW		0.09
ST-SW110, 40:5	5	SW		0.16
ST-B78, 48:10	10	B		0.1
ST-SW76, 45:5	5	SW		0.04
ST-B80, 60:9.5	5	B		0.13
ST-SW60, 60:5	5	SW		0.11
ST-SW63, 70:5	5	SW		0.05
ST-SW60, 100:5	5	SW	X	<0.04

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde ^(a) (mg/kg)
ST-B70, 100:9.5	9.5	B		0.2
DS-14	9.5	Dup of ST-B70, 100:9.5		0.06
ST-B190, 50:10.5	10.5	B		0.14
ST-B210, 40:9	9	B		0.18
ST-B190, 40:9	9	B		0.12
ST-SW230, 40:5	5	SW		0.1
ST-SW220, 30:5	5	SW		0.07
ST-SW200, 30:5	5	SW		0.24
ST-SW180, 30:5	5	SW		0.23
ST-B170, 40:9	9	B		0.48
ST-SW160, 30:5	5	SW		0.09
DS-13	5	Dup of ST-SW160, 30:5		0.14
ST-SW65, 180:5	5	SW	X	<0.04
ST-SW65,160:5	5	SW	X	<0.04
ST-SW65,140:5	5	SW	X	<0.04
ST-SW40, 60:5	5	SW		0.06
ST-SW40, 30:5	5	SW		0.08
ST-SW80, 20:5	5	SW	X	<0.04
ST-SW110, 10:5	5	SW		0.04
ST-SW160, 10:5	5	SW		0.04
ST-SW190, 10:5	5	SW	X	<0.04
ST-SW220, 10:5	5	SW	X	<0.04
ST-DS-15	5	Dup of ST-SW220, 10:5		<0.04
ST-SW250, 10:5*	5	SW	X	<0.04
ST-SW250, 30:5	5	SW	X	<0.04
ST-SW270, 60:5	5	SW	X	<0.04
ST-SW290, 90:5	5	SW	X	<0.04
ST-SW320, 110:5	5	SW		0.16
ST-SW340, 130:5*	5	SW		0.14
ST-SW320, 90:5	5	SW	X	<0.04
ST-SW360, 130:5	5	SW		0.09
ST-SW380, 110:5	5	SW		0.08
ST-SW360, 105:5	5	SW		0.11
ST-SW350, 90:5	5	SW		0.18
ST-B110, 90:11	11	B	X	<0.04
ST-DS-16	11	Dup of ST-B110, 90:11		<0.04
ST-B170, 70:11	11	B	X	<0.04
ST-B190, 110:11	11	B	X	<0.04
ST-B230, 130:11	11	B	X	<0.04
ST-B80, 150:9.5	9.5	B	X	<0.04
ST-B110, 150: 10.5	10.5	B	X	<0.04
ST-B130, 150:10.5	10.5	B		0.04
ST-B150, 150:10.5	10.5	B		0.04
ST-B70, 170:9.5	9.5	B	X	<0.04
ST-B90, 170:9.5	9.5	B	X	<0.04
ST-B110, 170:10.5	10.5	B		0.08
ST-B130, 170:10.5	10.5	B		0.10

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde ^(a) (mg/kg)
ST-B150, 170:10.5	10.5	B	X	<0.04
ST-B170, 170:10.5	10.5	B	X	<0.04
ST-DS-17	10.5	Dup of ST-B170, 170:10.5		<0.04
ST-B190, 170:10.5	10.5	B	X	<0.04
ST-B210, 170:10.5	10.5	B	X	<0.04
ST-B210, 190:10.5	10.5	B	X	<0.04
ST-B230, 180:10.5	10.5	B	X	<0.04
ST-B250, 180:10.5	10.5	B	X	<0.04
ST-B270, 180:10.5	10.5	B	X	<0.04
ST-B290, 180:10.5	10.5	B	X	<0.04
ST-DS-18	10.5	Dup of ST-B290, 180:10.5		0.05
ST-B310, 180:9.5	9.5	B	X	<0.04
ST-B270, 200:10.5	10.5	B	X	<0.04
ST-B270, 220:9.5	9.5	B	X	<0.04
ST-B290, 220:9.5	9.5	B	X	<0.04
ST-B290, 200:10.5	10.5	B	X	<0.04
ST-DS-19	10.5	Dup of ST-B290, 200:10.5		<0.04
ST-B170, 90:10.5	10.5	B		0.04
ST-B130, 90:11	11	B	X	<0.8
ST-DS-21	11	Dup of ST-B130, 90:11		<0.8
ST-B150, 90:11	11	B	X	<0.8
ST-B90, 70:11	11	B	X	<0.8
ST-B110, 70:11	11	B	X	<0.8
ST-B130, 70:11	11	B	X	<0.8
ST-B150, 70:11	11	B	X	<0.8
ST-B110, 50:11	11	B	X	<0.8
ST-B130, 50:11	11	B	X	<0.8
ST-B130, 30:11	11	B	X	<0.8
ST-B130, 10:10.5	10.5	B	X	<0.8
ST-B150, 30:10.5	10.5	B	X	<0.8
ST-DS-22	10.5	Dup of ST-B150, 30:10.5		<0.8
ST-B150, 10:10.5	10.5	B	X	<0.8
ST-B170, 10:10.5	10.5	B	X	<0.8
ST-B170, 30:10.5	10.5	B	X	<0.8
ST-B170, 50:11	11	B	X	<0.8
ST-B190, 55:11	11	B	X	<0.8
ST-B190, 30:10.5	10.5	B	X	<0.8
ST-B190, 10:10.5	10.5	B	X	<0.04
ST-B210, 30:10.5	10.5	B	X	<0.8
ST-DS-23	10.5	Dup of ST-B210, 30:10.5		<0.8
ST-B190, 70:11	11	B	X	<0.04
ST-B210, 70:11	11	B	X	<0.04
ST-B210, 50:11	11	B	X	<0.04
ST-B110, 130:11	11	B	X	<0.04
ST-B110, 110:11	11	B	X	<0.04
ST-B230, 150:11	11	B	X	<0.04
ST-B190, 130:11	11	B	X	<0.8

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde^(a) (mg/kg)
ST-B210, 130:11	11	B	X	<0.8
ST-B245, 130:11	11	B	X	<0.8
ST-B170, 110:11	11	B	X	<0.8
ST-B210, 110:11	11	B	X	<0.8
ST-B230, 110:11	11	B	X	<0.8
ST-B210, 90:11	11	B	X	<0.8
ST-DS-20	11	Dup of ST-B210, 90:11		<0.8
ST-B230, 90:11	11	B	X	<0.8
ST-SW320, 180:5	5	SW		0.05
ST-SW318, 192:5	5	SW	X	<0.04
ST-SW312, 210:5	5	SW	X	<0.04
ST-SW304, 230:5	5	SW		0.04
ST-SW290, 250:5	5	SW		0.08
ST-SW270, 245:5	5	SW		0.06
ST-SW250, 242:5	5	SW	X	<0.04
ST-SW230, 242:4	4	SW		0.05
ST-SW220, 241:8	8	SW		0.09
ST-SW210, 240:4	4	SW		0.11
ST-DS-24	4	Dup of ST-SW210, 240:4		0.11
ST-SW200, 240:8	8	SW		0.09
ST-SW190, 239:4	4	SW		0.06
ST-SW290, 240:9.5	9.5	SW		0.14
ST-B230, 200:10.5	10.5	B		0.17
ST-B230, 220:10.5	10.5	B		0.07
ST-SW180, 237:8	8	SW		0.05
ST-SW170, 235:4	4	SW		<0.04
ST-SW160, 230:8	8	SW		0.04
ST-SW150, 228:4	4	SW		0.05
ST-SW140, 222:8	8	SW		0.05
ST-SW130, 218:4	4	SW		0.04
ST-B250, 200:10.5	10.5	B		0.07
ST-B250, 220: 9.5	9.5	B		0.09
ST-DS-25	9.5	Dup of ST-B250, 220: 9.5		0.10
ST-B270, 230:9.5	9.5	B		0.06
ST-B210, 200:10.5	10.5	B		0.07
ST-B210, 220:10.5	10.5	B		0.16
ST-B190, 200:10.5	10.5	B		0.09
ST-B190, 220:10.5	10.5	B		0.08
ST-B 190, 190:10.5	10.5	B		0.06
ST-B170, 200:10.5	10.5	B		0.04
ST-DS-26	10.5	Dup of ST-B170, 200:10.5		0.06
ST-B170, 220:10.5	10.5	B		0.13
ST-B170, 180:10.5	10.5	B		0.05
ST-B150, 190:10.5	10.5	B		0.04
ST-B150, 210:10.5	10.5	B		0.08
ST-SW 110, 223:8	8	SW	X	<0.04
ST-SW 90, 216:4	4	SW	X	<0.04

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde ^(a) (mg/kg)
ST-SW 75, 208:8	8	SW	X	<0.04
ST-SW 65, 195:4	4	SW	X	<0.04
ST-DS-28	4	Dup of ST-SW 65, 195:4		<0.04
ST-SW 45, 10:5	5	SW	X	<0.04
ST-SW 30, 10:5	5	SW	X	<0.04
ST-SW 30, 30:5	5	SW	X	<0.04
ST-SW 30, 50:5	5	SW	X	<0.04
ST-SW 30, 70:5	5	SW	X	<0.04
ST-SW 45, 70:5	5	SW	X	<0.04
ST-DS-29	5	Dup of ST-SW 45, 70:5		<0.04
ST-SW 290, 260:4	4	SW	X	<0.04
ST-SW 270, 260:8	8	SW	X	<0.04
ST-SW 250, 255:4	4	SW	X	<0.04
ST-DS-27	4	Dup of ST-SW 250, 255:4		<0.04
ST-SW 230, 252:8	8	SW	X	<0.04
ST-SW 210, 250:4	4	SW	X	<0.04
ST-SW 190, 248:8	8	SW	X	<0.04
ST-SW 170, 245:4	4	SW	X	<0.04
ST-SW 150, 240:8	8	SW	X	<0.04
ST-SW 130, 232:4	4	SW	X	<0.04
ST-B250, 200:11	11	B		0.05
ST-B230, 200:11	11	B		0.06
ST-B210, 200:11	11	B	X	<0.04
ST-B190, 200:11	11	B		0.07
ST-B250, 220:11	11	B	X	<0.04
ST-DS-30	11	Dup of ST-B250, 220:11		<0.04
ST-B270, 230:10.5	10.5	B	X	<0.04
ST-B280, 240:9.5	9.5	B	X	<0.04
ST-B270, 250:9.5	9.5	B	X	<0.04
ST-B250, 240:9.5	9.5	B	X	<0.04
ST-B230, 240:9.5	9.5	B	X	<0.04
ST-B210, 240:9.5	9.5	B	X	<0.04
ST-B190, 240:9.5	9.5	B	X	<0.04
ST-B190, 230:10.5	10.5	B	X	<0.04
ST-B170, 240:9.5	9.5	B	X	<0.04
ST-DS-31	9.5	Dup of ST-B170, 240:9.5		<0.04
ST-B230, 220:11	11	B	X	<0.04
ST-B150, 230:9.5	9.5	B	X	<0.04
ST-B130, 220:9.5	9.5	B	X	<0.04
ST-B120, 210:9.5	9.5	B	X	<0.04
ST-B100, 210:9.5	9.5	B	X	<0.04
ST-B90, 200:9.5	9.5	B	X	<0.04
ST-DS-32	9.5	Dup of ST-B90, 200:9.5		<0.04
ST-B190, 190:11	11	B	X	<0.04
ST-B170, 200:11	11	B	X	<0.04
ST-B170, 180:11	11	B	X	<0.04
ST-B150, 210:11	11	B	X	<0.04

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde ^(a) (mg/kg)
ST-B310, 160:9	9	B	X	<0.04
ST-B310, 200:9	9	B	X	<0.04
ST-B100, 190:10	10	B		0.04
ST-B80, 190:9.5	9.5	B	X	<0.04
ST-B130, 200:11	11	B	X	<0.04
ST-B130, 150:11	11	B	X	<0.04
ST-DS-33	11	Dup of ST-B130,150:11		<0.04
ST-B130, 170:11	11	B	X	<0.04
ST-B110, 170:11	11	B	X	<0.04
ST-B50, 50:9	9	B	X	<0.04
ST-B50, 30:9	9	B		0.05
ST-SW60, 10:5	5	SW		0.04
ST-SW100, 20:5	5	SW	X	<0.04
ST-SW100, 8:5	5	SW	X	<0.04
ST-B90, 30:9	9	B	X	<0.04
ST-B70, 30:9	9	B	X	<0.04
ST-B110, 30:9.5	9.5	B	X	<0.04
ST-DS-34	9.5	Dup of ST-B110, 30:9.5		<0.04
ST-B90, 50:11	11	B	X	<0.04
ST-B110, 50:11	11	B	X	<0.04
ST-B80, 60:10	10	B	X	<0.04
ST-B235, 40:9.5	9.5	B	X	<0.04
ST-SW240, 40:5	5	SW	X	<0.04
ST-SW230, 30:5	5	SW	X	<0.04
ST-SW235, 50:5	5	SW	X	<0.04
ST-SW230, 10:5	5	SW	X	<0.04
ST-B190, 10:9.5	9.5	B	X	<0.04
ST-SW210, 0:5	5	SW	X	<0.04
ST-B50, 30:9.5	5	B		0.07
ST-SW190, 0:3	3	SW	X	<0.04
ST-SW170, 0:5	5	SW	X	<0.04
ST-SW150, 3:5	5	SW	X	<0.04
ST-DS-35	5	Dup of ST-SW150, 3:5		<0.04
ST-SW130, 3:5	5	SW		0.05
ST-SW110, 3:5	5	SW	X	<0.04
ST-SW65, 13:5	5	SW	X	<0.04
ST-SW64, 3:5	5	SW	X	<0.04
ST-B60, 10:9	9	B		0.14
ST-SW68, 80:5	5	SW		0.04
ST-SW50, 80:5	5	SW	X	<0.04
ST-B60, 75:9	9	B		0.08
ST-DS-36	9	Dup of ST-B60, 75:9		0.07
ST-B310, 90:6	6	B	X	<0.04
ST-B310, 110:7	7	B	X	<0.04
ST-B310, 130:8	8	B		0.05
ST-B290, 130:8	8	B	X	<0.04
ST-B290, 110:8	8	B	X	<0.04

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde^(a) (mg/kg)
ST-B290, 90:8	8	B	X	<0.04
ST-SW290, 86:4	4	SW	X	<0.04
ST-SW310, 88:4	4	SW	X	<0.04
ST-SW283, 84:4	4	SW	X	<0.04
ST-B260, 80:10	10	B	X	<0.04
ST-B270, 90:10	10	B	X	<0.04
ST-B250, 90:10.5	10.5	B	X	<0.04
ST-SW250, 70:4	4	SW	X	<0.04
ST-SW260, 70:8	8	SW	X	<0.04
ST-SW270, 70:4	4	SW	X	<0.04
ST-SW275, 75:8	8	SW	X	<0.04
ST-SW340, 90:4	4	SW		0.11
ST-SW350, 80:4	4	SW		0.14
ST-SW368, 87:4	4	SW		0.07
ST-B280, 120:10.5	10.5	B	X	<0.04
ST-B250, 110:10.5	10.5	B	X	<0.04
ST-B260, 120:10.5	10.5	B	X	<0.04
ST-B240, 80:10.5	10.5	B	X	<0.04
ST-B280, 150:10.5	10.5	B	X	<0.04
ST-B270, 130:10.5	10.5	B	X	<0.04
ST-B270, 110:10.5	10.5	B	X	<0.04
ST-B330, 93:6	6	B	X	<0.04
ST-B350, 90:6	6	B		0.07
ST-B350, 110:6	6	B	X	<0.04
ST-B330, 110:6	6	B	X	<0.04
ST-B370, 110:6	6	B	X	<0.04
ST-B330, 130:7	7	B	X	<0.04
ST-B368, 128:6	6	B		0.04
ST-DS-37	6	Dup of ST-B368, 128:6		0.05
ST-B350, 130:6	6	B		0.17
ST-B350, 150:6	6	B		0.14
ST-B330, 150:7	7	B		0.10
ST-B330, 170:6	6	B		0.06
ST-SW380, 100:3	3	SW	X	<0.04
ST-SW385, 110:3	3	SW		0.09
ST-SW372, 128:3	3	SW		0.11
ST-SW360, 140:3	3	SW		0.11
ST-SW352, 150:3	3	SW		0.15
ST-SW340, 164:3	3	SW		0.17
ST-SW330, 178:3	3	SW	X	<0.04
ST-DS-38	3	Dup of ST-SW330, 178:3		<0.04
ST-B300, 250:9.5	9.5	B	X	<0.04
ST-B300, 230:9.5	9.5	B	X	<0.04
ST-SW310, 260:8	8	SW	X	<0.04
ST-SW313, 240:4	4	SW	X	<0.04
ST-SW60, 90:5	5	SW	X	<0.04
ST-SW392, 97:4	4	SW	X	<0.04

Table 4
Work Area 4: Formaldehyde-Impacted Area
Summary of Formaldehyde Analysis for
Excavation Soil Performance Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Depth (Feet)	Sidewall (SW) or Bottom (B)	Final Performance Sample	Formaldehyde ^(a) (mg/kg)
ST-SW392, 112:4	4	SW	X	<0.04
ST-SW386, 125:4	4	SW	X	<0.04
ST-SW374, 140:4	4	SW	X	<0.04
ST-SW360, 157:4	4	SW	X	<0.04
ST-SW350, 170:4	4	SW	X	<0.04
ST-SW340, 180:4	4	SW	X	<0.04
ST-SW375, 84:4	4	SW	X	<0.04
ST-SW360, 70:4	4	SW	X	<0.04
ST-B310, 130:9.5	9.5	B	X	<0.04
ST-DS-39	9.5	Dup of ST-B310,130:9.5		<0.04
ST-SW340, 70:4	4	SW	X	<0.04
ST-SW335, 80:4	4	SW	X	<0.04
ST-B350, 80:7	7	B	X	<0.04
ST-B350, 90:7	7	B	X	<0.04
ST-B370, 130:7	7	B	X	<0.04
ST-B385, 110:7	7	B	X	<0.04
ST-B350, 130:7	7	B	X	<0.04
ST-B350, 150:7	7	B	X	<0.04
ST-B330, 150:8	8	B	X	<0.04
ST-B340, 170:7	7	B	X	<0.04
ST-DS-40	7	Dup of ST-B340, 170:7		0.36
ST-SW312, 222:4	4	SW	X	<0.04
ST-DS-41	4	Dup of ST-SW312,222:4		<0.04
ST-B340, 170:9	9	B	X	<0.04
Site-Specific Cleanup Levels				0.04

Notes:

(a) - Analyzed by Exova using EPA Method 8315A

mg/kg - milligrams/kilogram

Bold and shaded - Indicates detected concentration greater than site-specific cleanup level

Table 5
Work Area 5: Heating Oil UST Area
Summary of Analytical Data for
Final Performance Soil Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Soil		Ground Water	
	Diesel Range Petroleum Hydrocarbons ^(a) (mg/kg)	Oil Range Petroleum Hydrocarbons ^(a) (mg/kg)	Diesel Range Petroleum Hydrocarbons ^(a) (µg/L)	Oil Range Petroleum Hydrocarbons ^(a) (µg/L)
UST-1:2	<25	<50	NA	NA
UST-2:12	<25	<50	NA	NA
UST-3:12	28	<50	NA	NA
UST-4:22	<25	<50	NA	NA
UST-5-12	<25	<50	NA	NA
UST-6:22	<25	<50	NA	NA
UST-7:12	<25	<50	NA	NA
UST-8:22	<25	<50	NA	NA
UST-9:12	<25	<50	NA	NA
UST10:22	<25	<50	NA	NA
UST-11:12	<25	<50	NA	NA
UST-DUP	<25	<50	NA	NA
Stock-1	<25	<50	NA	NA
Stock-2	<25	<50	NA	NA
Stock-3	<25	<50	NA	NA
Stock-4	<25	<50	NA	NA
UST-Water	NA	NA	320	<250
MTCA Method A Cleanup Levels^(b)	2,000	2,000	500	500

Notes:

(a) – Analyzed by ALS Laboratory Group using Northwest NWTPH-Dx methods

(b) – MTCA Method A Soil Cleanup Levels for Unrestricted Land Use, or MTCA Method A Cleanup

Levels for Ground Water

Bold – Indicates detected concentration greater than the compound-specific laboratory detection limits,

but less than MTCA Method A Cleanup Levels

mg/kg – milligrams/kilogram

µg/L – micrograms/Liter

NA – Not Analyzed

UST-DUP – Duplicate sample of UST-11:12

**Table 6
Summary of Approximate Total Volume of
Remediated Soils Per Bioremediation Cell**

**Former Stoneway Batch Plant
Renton, Washington**

Cell #	Approximate Volume of Formaldehyde Impacted Soil	Approximate Volume of PCS Impacted Soil	Approximate Volume of Compost and Wood Chips Added	Approximate Volume of Amended Soil Treated in Each Cell
1	1,820	600 ⁽¹⁾	80	2,500
2	1,820	600 ⁽¹⁾	80	2,500
3	2,600	0	100	2,700
4	2,350	250 ⁽²⁾	100	2,700
5	1,900	240 ⁽³⁾	60	2,200
6	2,050	0	50	2,100
7	890	0	30	920
Totals	13,430	1,690	500	15,620

Notes:

- (1) Petroleum Contaminated Soil (PCS) from GRPH impacted soil located adjacent to soil boring B-28
- (2) PCS from ORPH impacted soil located in heating oil UST excavation
- (3) PCS from ORPH impacted soil located in the heating oil UST excavation and the shallow petroleum area adjacent to soil boring B-14

Table 8
Summary of Formaldehyde Analysis for
Effluent Air Samples

Former Stoneway Batch Plant
Renton, Washington

Sample ID	Formaldehyde^(a) (milligrams/cubic meter)
Exhaust #1	<0.3
Exhaust #2	<0.3
Cell #2-Exhaust 1	<0.3
Cell #2-Exhaust 2	<0.3
Cell #3-Exhaust 1	<0.3
Cell #3-Exhaust 2	<0.3
Cell #4-Exhaust 1	<0.3
Cell #4-Exhaust 2	<0.3
Cell #5-Exhaust 1	<0.3
Cell #5-Exhaust 2	<0.3
Cell #6-Exhaust 2	<0.3
Cell #6-Exhaust 2	<0.3
Cell #7-Exhaust 2	<0.3
Cell #7-Exhaust 2	<0.3

Notes:

(a) - Analysis performed by ALS Laboratory Group using NIOSH Method 2541

Table 10
Summary of Bioremediation Cell Confirmation Soil Samples
(in mg/kg)

Former Stoneway Batch Plant
Renton, Washington

Sample ID	GRPH ^(a)	DRPH ^(b)	ORPH ^(c)	Formaldehyde ^(d)	Final Confirmation Sample
BIOREMEDIATION CELL #1					
Location #1					
Cell #1-C1	<3	<25	58	<0.04	X
Location #2					
Cell #1-C2	<3	<25	100	<0.04	X
Location #3					
Cell #1-C3	<3	<25	78	<0.04	X
Location #4					
Cell #1-C4	<3	<25	<50	<0.04	X
Location #5					
Cell #1-C5	<3	<25	57	<0.04	X
BIOREMEDIATION CELL #2					
Location #1					
Cell #2-C1	<3	<25	50	0.04	
Cell #2-C6	NA	NA	NA	0.73	
Cell #2-C10	NA	NA	NA	<0.04	X
Location #2					
Cell #2-C2	<3	<25	<50	<0.04	X
Location #3					
Cell #2-C3	<3	<25	<50	0.04	
Cell #2-C7	NA	NA	NA	0.04	
Cell #2-C11	NA	NA	NA	0.05	
Cell #2-C14	NA	NA	NA	<0.04	X
Location #4					
Cell #2-C4	<3	<25	110	0.05	
Cell #2-C8	NA	NA	NA	0.05	
Cell #2-C12	NA	NA	NA	0.04	
Cell #2-C15	NA	NA	NA	0.05	
Cell #2-C16	NA	NA	NA	<0.04	X
Location #5					
Cell #2-C5	<3	<25	61	0.04	
Cell #2-C9	NA	NA	NA	0.05	
Cell #2-C13	NA	NA	NA	<0.04	X
BIOREMEDIATION CELL #3					
Location #1					
Cell #3-C1	NA	NA	NA	<0.04	X
Location #2					
Cell #3-C2	NA	NA	NA	0.04	
Cell #3-C6	NA	NA	NA	<0.04	X
Location #3					
Cell #3-C3	NA	NA	NA	0.05	
Cell #3-C7	NA	NA	NA	0.05	
Cell #3-C10	NA	NA	NA	<0.04	X
Location #4					
Cell #3-C4	NA	NA	NA	0.06	
Cell #3-C8	NA	NA	NA	0.04	
Cell #3-C11	NA	NA	NA	<0.04	X
Location #5					
Cell #3-C5	NA	NA	NA	0.06	
Cell #3-C9	NA	NA	NA	0.04	
Cell #3-C12	NA	NA	NA	<0.04	X

**Table 10
Summary of Bioremediation Cell Confirmation Soil Samples
(in mg/kg)**

**Former Stoneway Batch Plant
Renton, Washington**

Sample ID	GRPH ^(a)	DRPH ^(b)	ORPH ^(c)	Formaldehyde ^(d)	Final Confirmation Sample
BIOREMEDIATION CELL #4					
Location #1					
Cell #4-C1	NA	46	<50	<0.04	X
Location #2					
Cell #4-C2	NA	40	66	<0.04	X
Location #3					
Cell #4-C3	NA	33	42	<0.04	X
Location #4					
Cell #4-C4	NA	36	72	<0.04	X
Location #5					
Cell #4-C5	NA	69	83	<0.04	X
BIOREMEDIATION CELL #5					
Location #1					
Cell #5-C1	NA	<25	78	<0.04	X
Location #2					
Cell #5-C2	NA	<25	87	<0.04	X
Location #3					
Cell #5-C3	NA	<25	96	<0.04	X
Location #4					
Cell #5-C4	NA	<25	170	<0.04	X
Location #5					
Cell #5-C5	NA	<25	210	<0.04	X
REMIEDIATION CELL #6					
Location #1					
Cell #6-C1	NA	NA	NA	<0.04	X
Location #2					
Cell #6-C2	NA	NA	NA	<0.04	X
Location #3					
Cell #6-C3	NA	NA	NA	<0.04	X
Location #4					
Cell #6-C4	NA	NA	NA	<0.04	X
Location #5					
Cell #6-C5	NA	NA	NA	<0.04	X
REMIEDIATION CELL #7					
Location #1					
Cell #7-C1	NA	NA	NA	<0.04	X
Location #2					
Cell #7-C2	NA	NA	NA	<0.04	X
Location #3					
Cell #7-C3	NA	NA	NA	<0.04	X
Location #4					
Cell #7-C4	NA	NA	NA	<0.04	X
Location #5					
Cell #7-C5	NA	NA	NA	<0.04	X
Site-Specific Cleanup Levels	100	2,000	2,000	0.04	--

Notes:

- a) Gasoline-range petroleum hydrocarbons (GRPH) using Northwest NWTPH-Gx Methods
- b) Diesel-range petroleum hydrocarbons (DRPH) using Northwest NWTPH-Dx Methods
- c) Oil-range petroleum hydrocarbons (ORPH) using Northwest NWTPH-Dx extended Methods
- d) Analyzed by Exova using EPA Method 8315A

NA - Not Analyzed

Bold - Indicates detected concentration greater than compound-specific laboratory detection limits, but less than Site-Specific Cleanup Levels

Bold and Shaded - Indicates detected concentration greater than site-specific cleanup levels.

**Table 11
Summary of Depth to Ground Water Levels and Elevations**

**Former Stoneway Batch Plant
Renton, Washington**

Well	Date	Depth to Water	Elevation(Feet MSL) of Top of Casing*	Calculated Ground Water Elevation (Feet MSL)
MW-1	6/8/09	18.63	47.93	29.3
	9/29/09	19.62	47.93	28.31
	12/14/09	19.1	47.93	28.83
	3/3/10	18.58	47.93	29.35
	6/1/10	17.58	47.93	30.35
	8/10/10	20.78	47.93	27.15
	9/14/10	19.57	47.93	28.36
EPI-MW-1	6/8/09	22.58	52.09	29.51
	9/29/09	23.48	52.09	28.61
	12/14/09	22.95	52.09	29.14
	3/3/10	22.53	52.09	29.56
	6/1/10	21.59	52.09	30.5
	8/10/10	24.45	52.09	27.64
	9/14/10	23.39	52.09	28.7
EPI-MW-5	6/8/09	13.68	43.65	29.97
	9/29/09	15.75	43.65	27.9
	12/14/09	14.2	43.65	29.45
	3/3/10	13.8	43.65	29.85
	6/1/10	12.68	43.65	30.97
	8/10/10	15.56	43.65	28.09
	9/14/10	14.72	43.65	28.93
EPI-MW-6	6/8/09	14.29	46.18	31.89
	9/29/09	15.23	46.18	30.95
	12/14/09	14.77	46.18	31.41
	3/3/10	14.48	46.18	31.7
	6/1/10	13.25	46.18	32.93
	8/10/10	15.59	46.18	30.59
	9/14/10	15.13	46.18	31.05
EPI-MW-7	6/8/09	12.11	44.05	31.94
	9/29/09	13.03	44.05	31.02
	12/14/09	12.69	44.05	31.36
	3/3/10	12.25	44.05	31.8
	6/1/10	11.1	44.05	32.95
	8/10/10	13.44	44.05	30.61
	9/14/10	13.06	44.05	30.99
EPI-MW-8	6/8/09	15.35	45.82	30.47
	9/29/09	16.7	45.82	29.12
	12/14/09	15.81	45.82	30.01
	3/3/10	15.45	45.82	30.37
	6/1/10	14.4	45.82	31.42
	8/10/10	17	45.82	28.82
	9/14/10	16.22	45.82	29.6
EPI-MW-9	6/8/09	16.84	48.25	31.41
	9/29/09	17.95	48.25	30.3
	12/14/09	17.39	48.25	30.86
	3/3/10	17.08	48.25	31.17
	6/1/10	15.94	48.25	32.31
	8/10/10	18.31	48.25	29.94
	9/14/10	17.76	48.25	30.49
MW-41	6/8/09	10.61	41.41	30.8
	9/29/09	12.4	41.41	29.01
	12/14/09	11.16	41.41	30.25
	3/3/10	10.8	41.41	30.61
	6/1/10	9.64	41.41	31.77
	8/10/10	12.24	41.41	29.17
	9/14/10	11.6	41.41	29.81

Note: Wells Surveyed by Barghausen Consulting Engineers, Inc., on 8/10/10, referenced to City of Renton survey datum.

Table 12
Summary of Ground Water Analytical Results in µg/L
Former Stoneway Batch Plant
Renton, WA

Well Identification No. and Date Sampled	Formaldehyde ^(a)	Arsenic ^(b)	pH ^(c)
EPI-MW-1			
3/18/09	<5	<5	7.28
6/08/09	<5	<5	6.96
9/29/09	<5	1.7	7.24
12/14/09	<5	1.6	7.42
3/03/10	<5	2.4	7.86
6/01/10	<5	<1.8	7.66
9/14/10	<5	2.1	7.14
MW-1			
3/18/09	<5	<5	7.29
6/08/09	<5	<5	7.13
9/29/09	6	<1	7.06
12/14/09	<5	1.1	7.74
3/03/10	<5	<1.8	8.04
6/01/10	<5	<1.8	7.48
9/14/10	<5	<1.8	7.09
EPI-MW-5			
3/18/09	<5	<5	6.46
6/08/09	<5	<5	6.31
9/29/09	<5	<1	6.47
12/14/09	<5	<1	6.34
3/03/10	<5	<1	7.72
6/01/10	<5	<1.8	6.63
9/14/10	<5	<1.8	6.75
EPI-MW-6			
3/18/09	NS	NS	NS
6/08/09	<5	<5	8.18
9/29/09	<5	3.8	8.30
12/14/09	<5	3.9	8.22
3/03/10	<5	3.9	8.16
6/01/10	<5	2.8	8.19
9/14/10	<5	4.4	7.96
EPI-MW-7			
3/18/09	NS	NS	NS
6/08/09	<5	7	10.82
9/29/09	<5	5.8	11.43
12/14/09	<5	7.7	10.34
3/03/10	<5	5.7	8.58
6/01/10	16	4.9	11.41
9/14/10	<5	7.3	9.35
EPI-MW-8			
3/18/09	NS	NS	NS
6/08/09	<5	<5	8.15
9/29/09	5	3.9	8.36
12/14/09	<5	4.2	8.58
3/03/10	<5	4.7	8.25
6/01/10	<5	3.1	8.93
9/14/10	<5	4.7	7.98
EPI-MW-9			
3/18/09	NS	NS	NS
6/08/09	<5	7	7.98
9/29/09	<5	5.7	7.95
12/14/09	<5	5.8	8.26
3/03/10	<5	6.6	8.00
6/01/10	5	6.4	8.58
9/14/10	<5	6.6	8.12
MW-41			
3/18/09	NS	NS	NS
6/08/09	<5	<5	5.87
9/29/09	<5	<1	6.65
12/14/09	<5	<1	6.58
3/03/10	<5	<1.8	7.77
6/01/10	<5	<1.8	6.65
9/14/10	<5	<1.8	7.11
Cleanup Action Plan PQLs^(d)	5	5	None Established

Notes:

(a) – Analyzed by Exova (formerly Bodycote Testing Group, Inc.) using EPA Method 8315A.

(b) – Analyzed by ALS Laboratory Group (formerly CCI Analytical Laboratories) using EPA Method 7060, using EPA 6020 on 9/29/09 and thereafter.

(c) – Measured in the field during sampling event.

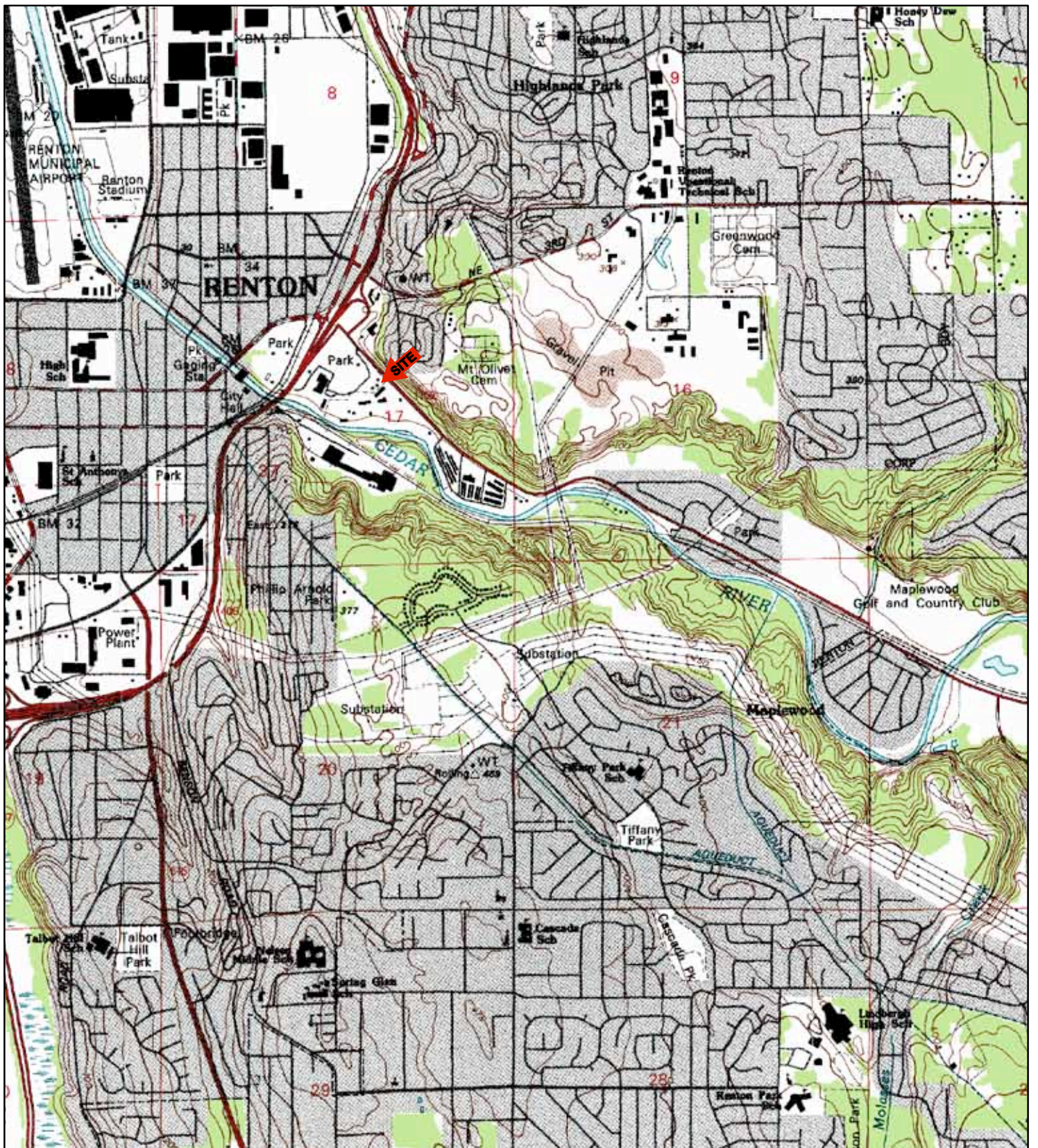
(d) – PQLs used as cleanup levels based upon WAC 173-340-707.

µg/L – Micrograms/Liter

NS – Not Sampled

Bold and Shaded - indicates concentration above Cleanup Action PQLs

Figures



KEY:



SOURCE: USGS 7.5 MINUTE QUADRANGLE
(TOPOGRAPHIC)

RENTON, WA
1949

REVISED 1994

SCALE = 1:24,000



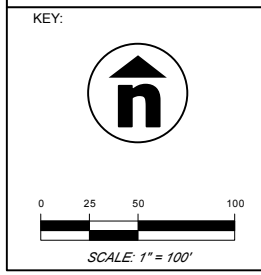
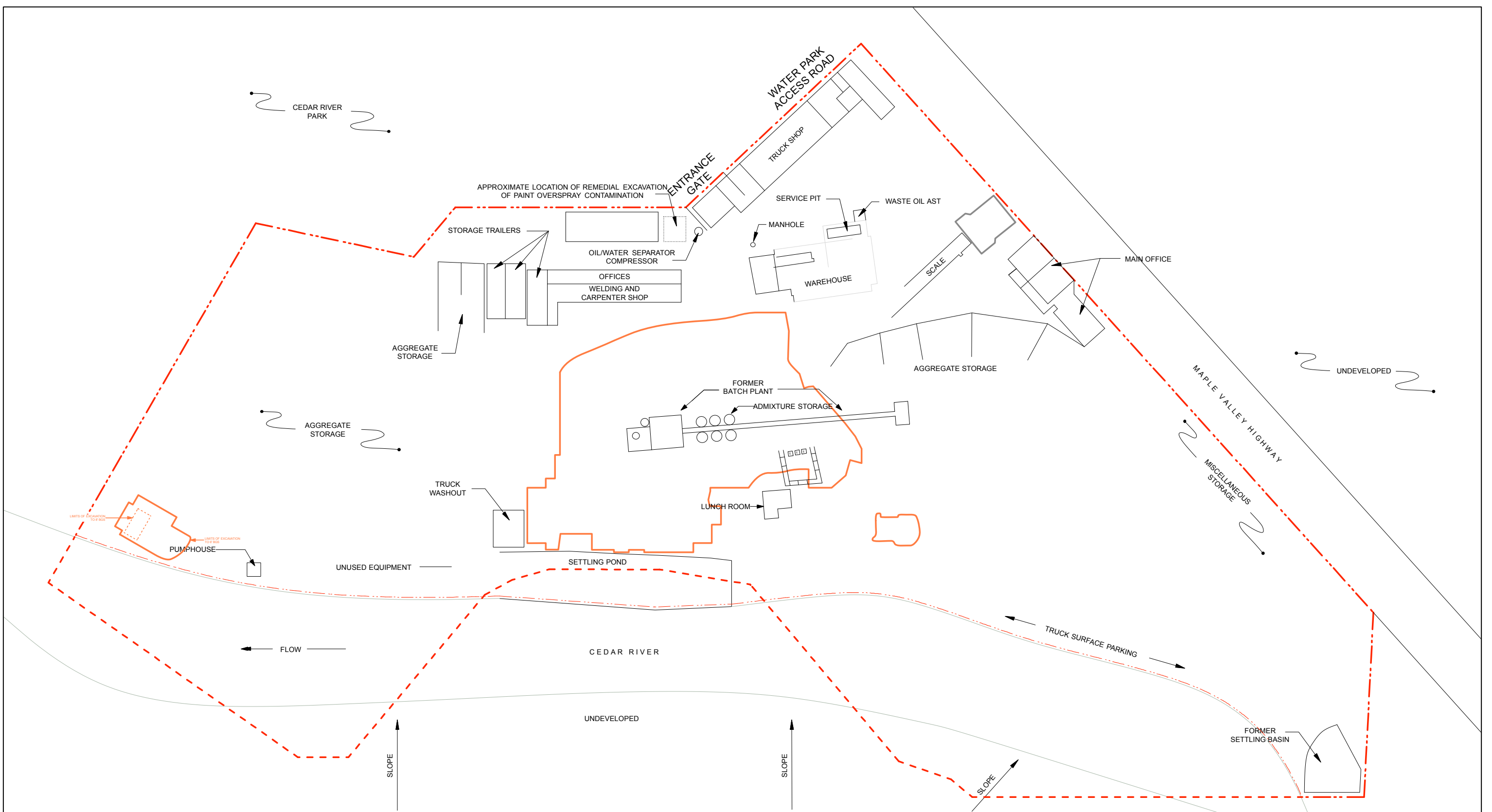
ENVIRONMENTAL PARTNERS INC

295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

FIGURE 1

GENERAL VICINITY MAP

PROJECT	43101.4		
PREPARED FOR	STONEWAY CONCRETE		
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON		
SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	ARM	ELC	12/03/10

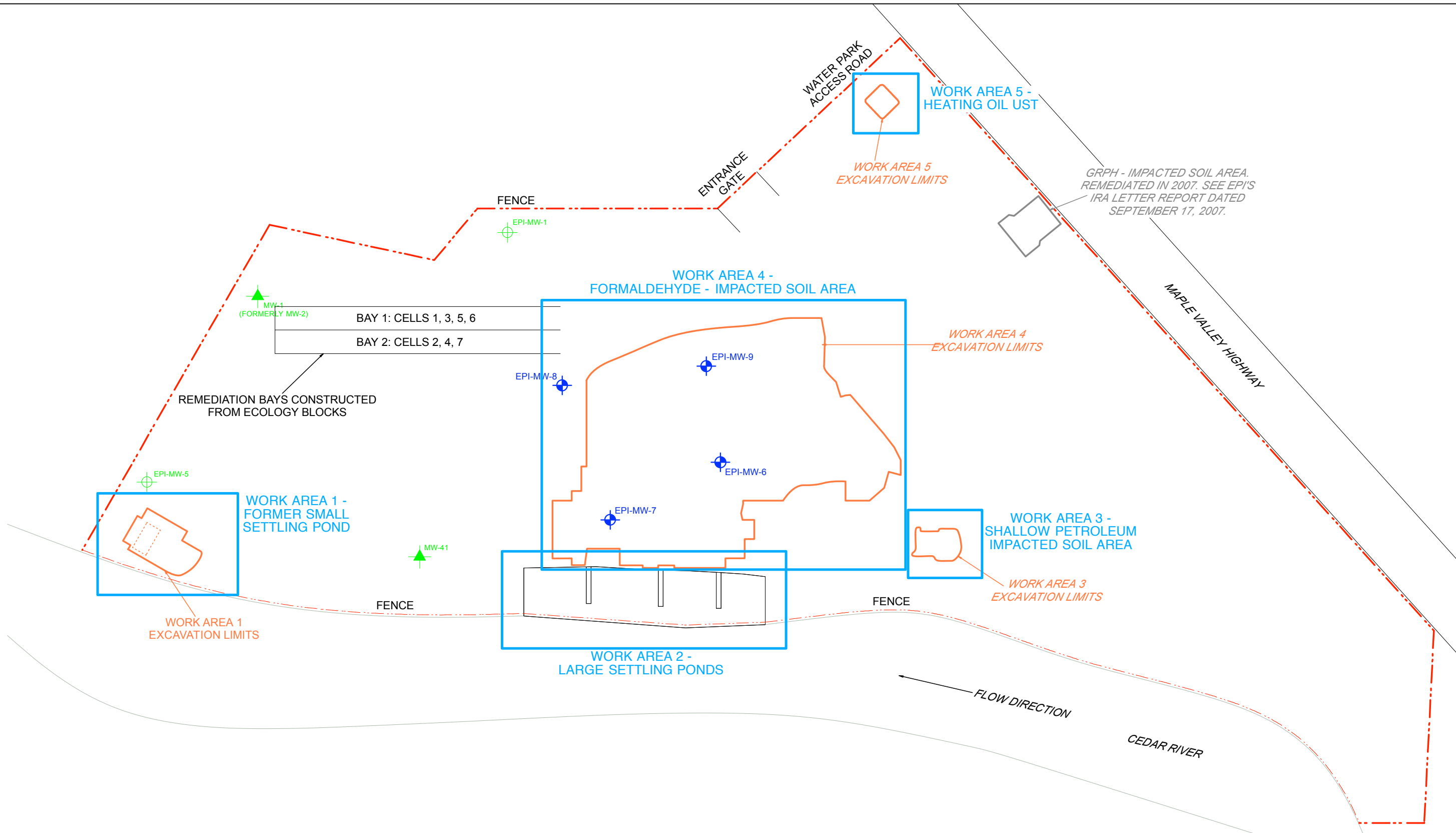


--- APPROXIMATE PROPERTY LINE
 - - - FENCE


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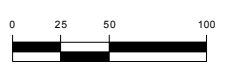
FIGURE 2
**PRE-REMEDIAL SITE REPRESENTATION
 SHOWING ESTIMATED EXTENT OF
 REMEDIATION EXCAVATION**

PROJECT	43101.0	CLEANUP ACTION PLAN
PREPARED FOR	STONEMAN CONCRETE	
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON	
SHEET	DRAWN BY	REVIEWED BY
1 of 1	ARM	ELC
		DATE
		12/03/10



KEY:





SCALE: 1" = 100'


--- FENCE

--- EXCAVATION BOUNDARY

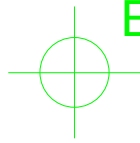
● NEW MONITORING WELL INSTALLED BY EPI

▲ EXISTING MONITORING WELL INSTALLED BY OTHERS

⊕ EXISTING MONITORING WELL INSTALLED BY EPI

 ENVIRONMENTAL PARTNERS INC <small>295 NE Gilman Boulevard, Suite 201 Issaquah, Washington 98027</small>	PROJECT 43101.4	
	PREPARED FOR STONEMAN CONCRETE	
FIGURE 3 CURRENT SITE REPRESENTATION	LOCATION 1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON	
	SHEET 1 of 1	DRAWN BY ARM
		DATE 12/03/10

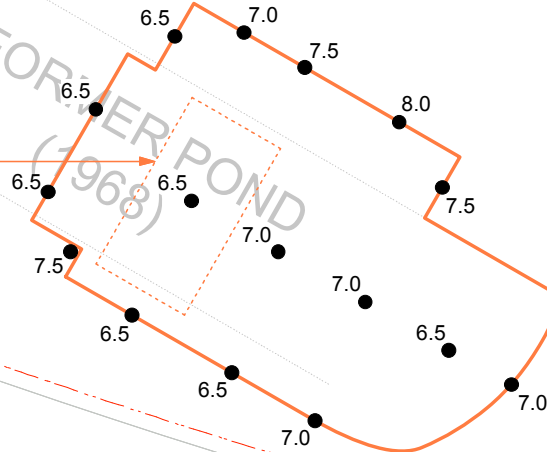
EPI-MW-5



FORMER POND
(1968)

LIMITS OF EXCAVATION
TO 8' BGS

LIMITS OF EXCAVATION
TO 6' BGS



KEY:

- 7.0 ● CONFIRMATIONAL SOIL FIELD SCREENING pH RESULTS
- - - - - APPROXIMATE PROPERTY LINE
- · - · - FENCE
- EXCAVATION BOUNDARY



SCALE: 1" = 30'



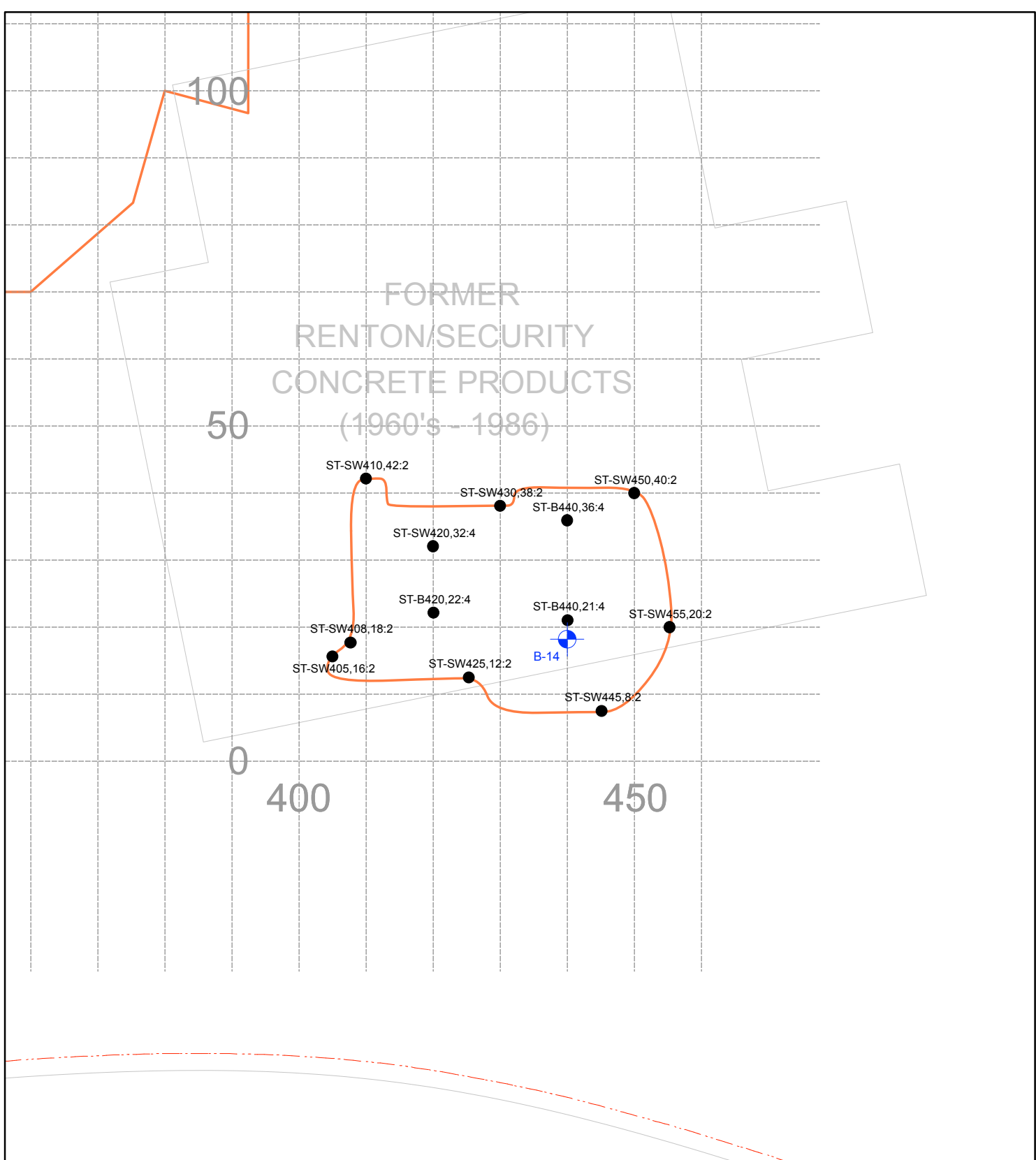
ENVIRONMENTAL PARTNERS INC

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Issaquah, Washington 98027

FIGURE 4

WORK AREA 1 -
FINAL EXCAVATION LIMITS OF
FORMER SMALL SETTLING POND AND
pH SOIL SAMPLE SCREENING RESULTS

PROJECT	43101.4		
PREPARED FOR	STONEWAY CONCRETE		
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON		
SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	ARM	ELC	12/03/10



KEY:

- SOIL SAMPLE LOCATION
- ⊕ IRA SOIL BORING LOCATION



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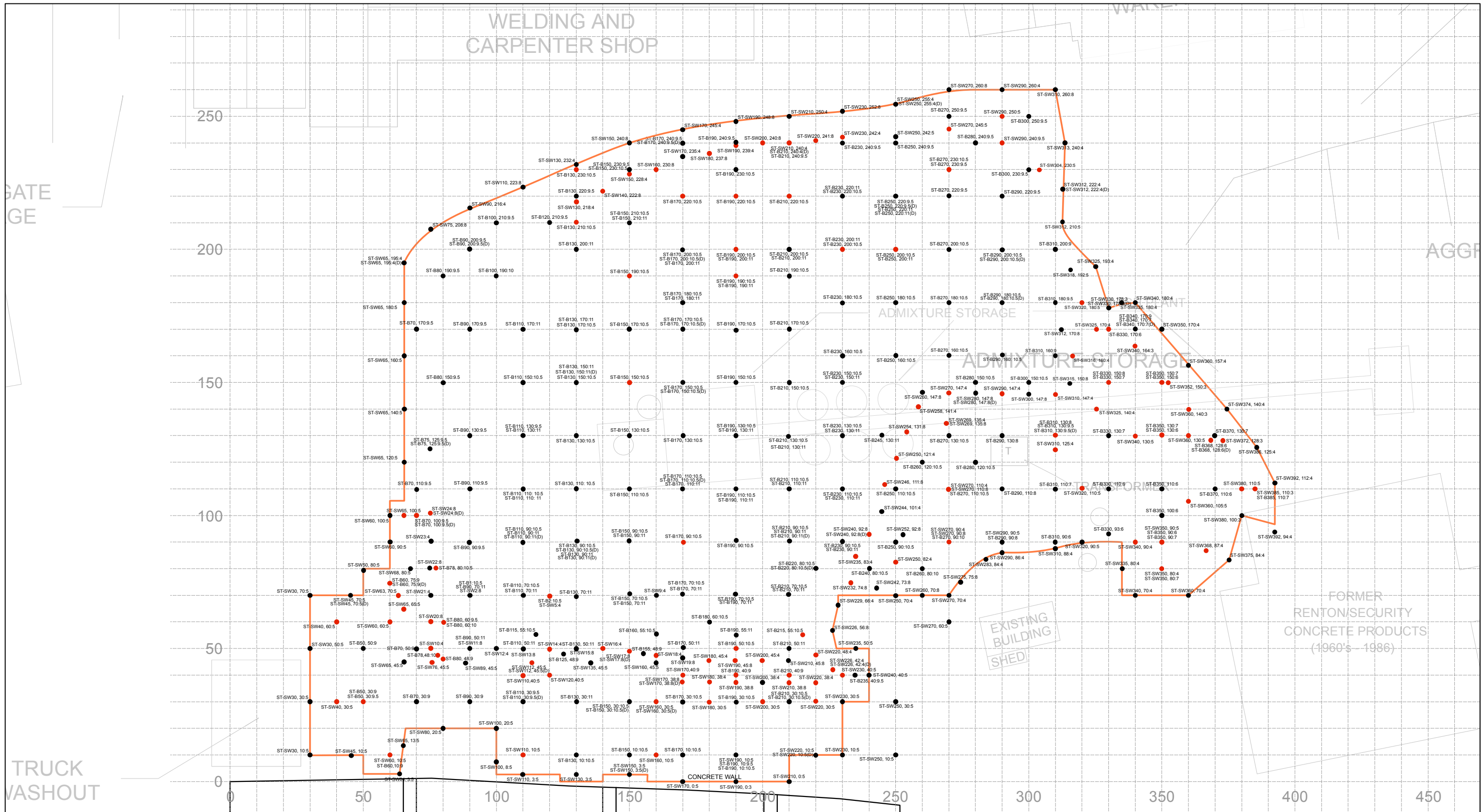
FIGURE 5







WORK AREA 3 -
FINAL EXCAVATION LIMITS FOR
SHALLOW PETROLEUM-IMPACTED AREA AND
FINAL PERFORMANCE SOIL SAMPLE LOCATIONS

PROJECT	43101.4		
PREPARED FOR	STONEWAY CONCRETE		
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON		
SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	ARM	ELC	12/03/10

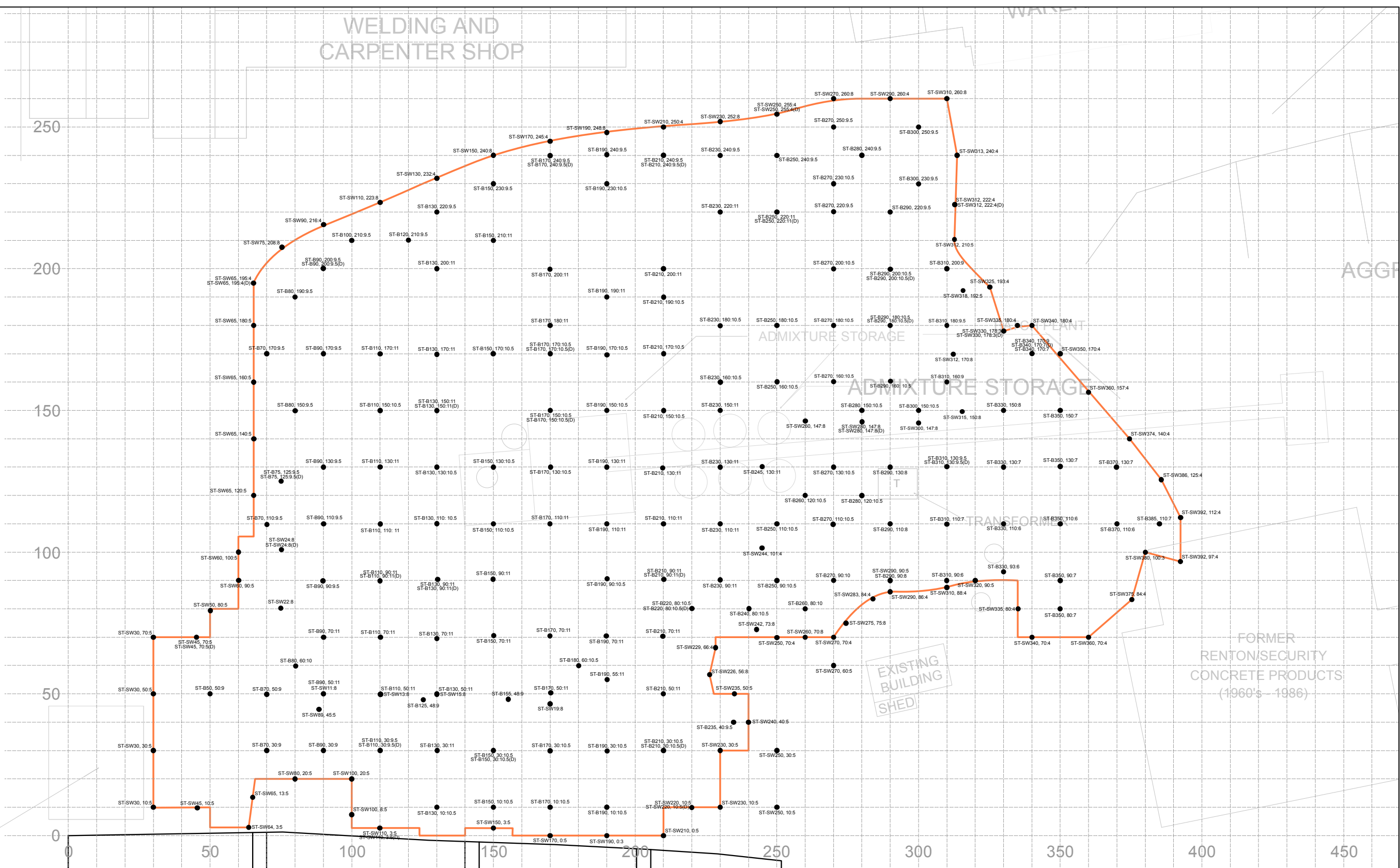


SCALE: 1" = 20'

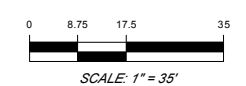


KEY:   SCALE: 1" = 35'	 EXCAVATION BOUNDARY	 SOIL SAMPLES WITH FORMALDEHYDE CONCENTRATIONS EQUAL OR GREATER THAN 0.04 ppm	PROJECT 43101.4 PREPARED FOR STONEWAY CONCRETE LOCATION 1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON SHEET 1 of 1 DRAWN BY ARM REVIEWED BY ELC DATE 12/03/10
	 SOIL SAMPLES WITH FORMALDEHYDE CONCENTRATIONS BELOW LABORATORY DETECTION LIMITS	 ENVIRONMENTAL PARTNERS INC 295 NE Gilman Boulevard, Suite 201 Issaquah, Washington 98027 FIGURE 6 WORK AREA 4 - FINAL EXCAVATION LIMITS FOR THE FORMALDEHYDE-IMPACTED AREA WITH ALL PERFORMANCE SAMPLE LOCATIONS	

WELDING AND CARPENTER SHOP



KEY:

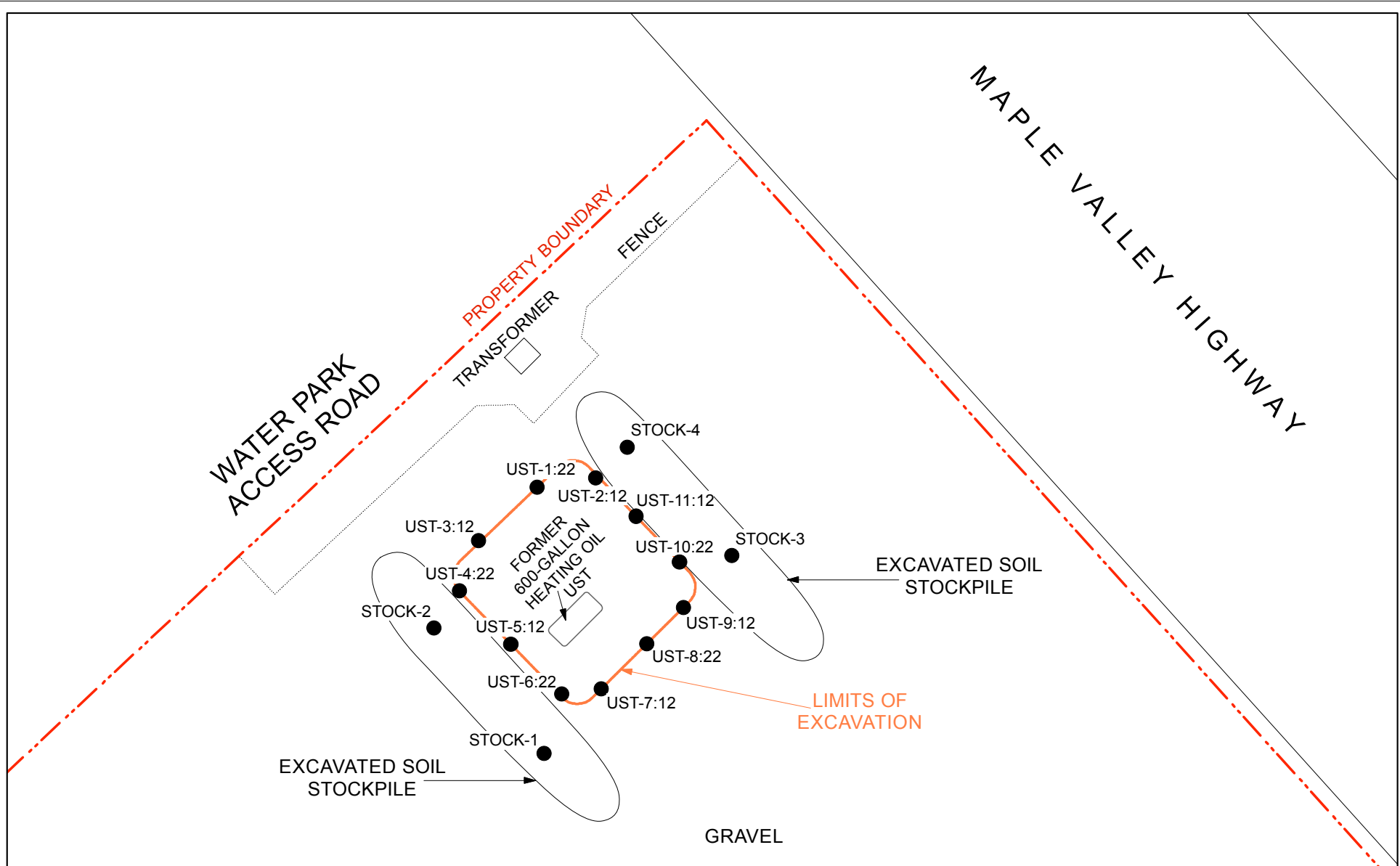


- EXCAVATION BOUNDARY
- SOIL SAMPLES WITH FORMALDEHYDE CONCENTRATIONS BELOW LABORATORY DETECTION LIMITS

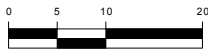
epl ENVIRONMENTAL PARTNERS INC
 295 NE Gilman Boulevard, Suite 201
 Issaquah, Washington 98027

FIGURE 7
WORK AREA 4 - FINAL EXCAVATION LIMITS FOR THE FORMALDEHYDE-IMPACTED AREA WITH ALL FINAL PERFORMANCE SOIL SAMPLE LOCATIONS

PROJECT	43101.4
PREPARED FOR	STONEWAY CONCRETE
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON
SHEET 1 of 1	DRAWN BY ARM
	REVIEWED BY ELC
	DATE 12/03/10



KEY:



APPROXIMATE SCALE: 1" = 20'

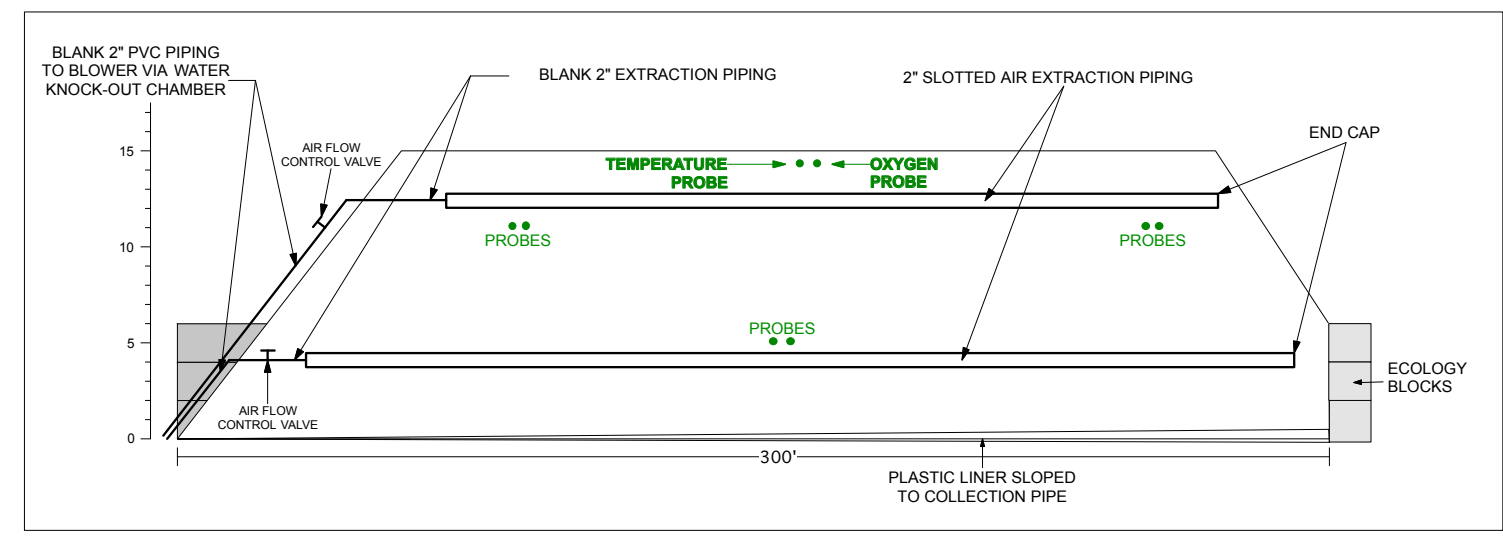
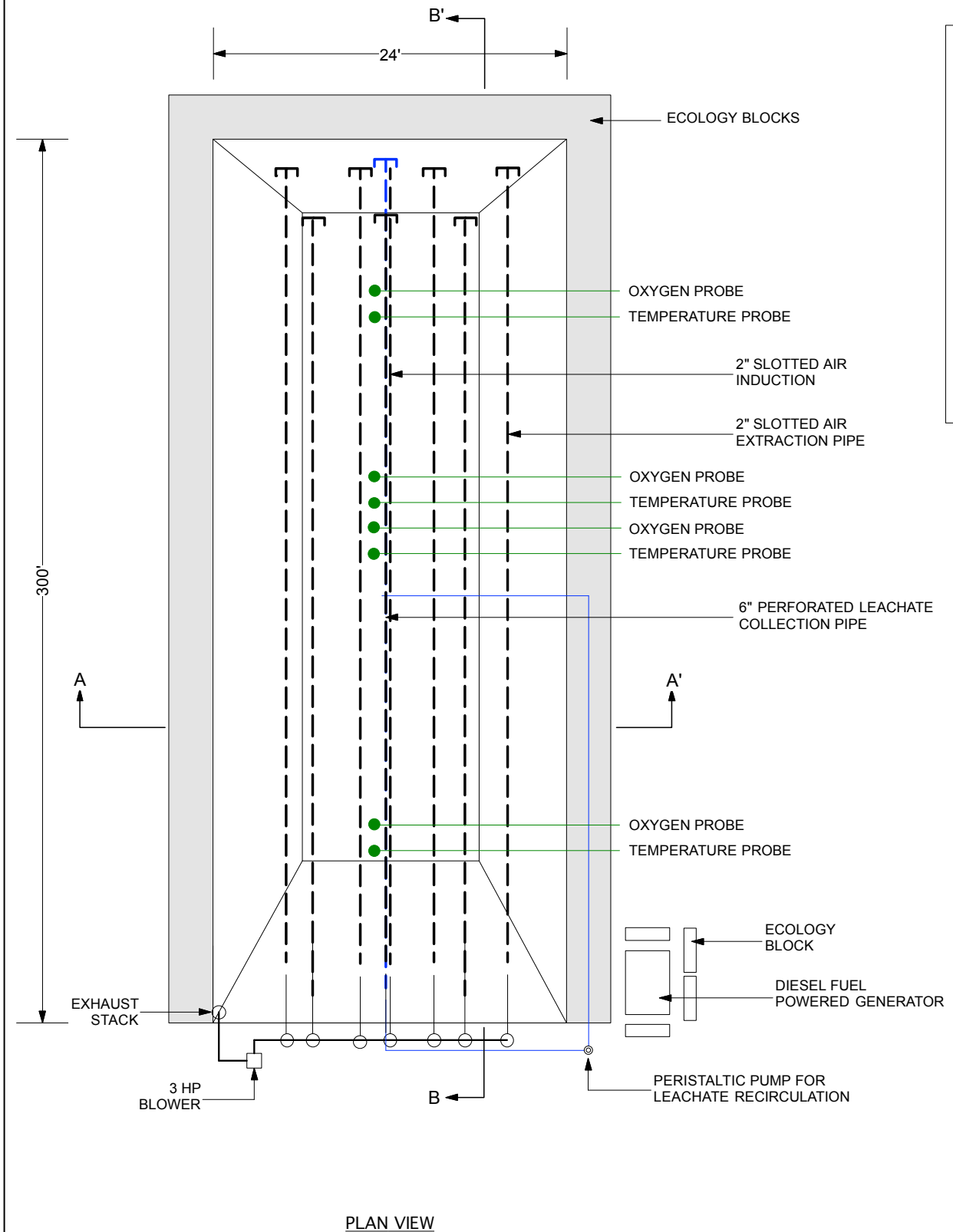
- · - · - APPROXIMATE PROPERTY BOUNDARY
- SOIL SAMPLE LOCATION

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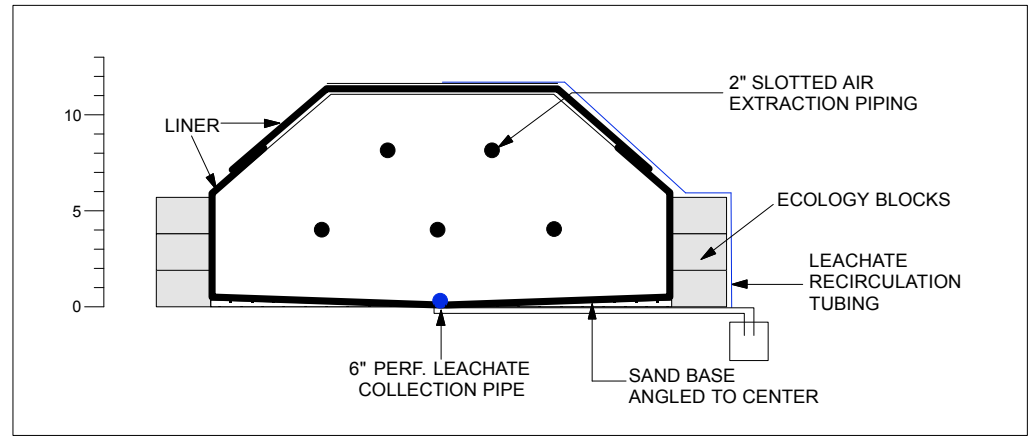
FIGURE 8

WORK AREA 5 -
 HEATING OIL UST AREA WITH
 FINAL PERFORMANCE
 SOIL SAMPLE LOCATIONS

PROJECT	43101.4		
PREPARED FOR	STONEWAY CONCRETE		
LOCATION	1915 MAPLE VALLEY HIGHWAY RENTON, WASHINGTON		
SHEET 1 of 1	DRAWN BY ARM	REVIEWED BY ELC	DATE 12/03/10



SECTION B-B'
SCALE 1" = 20'

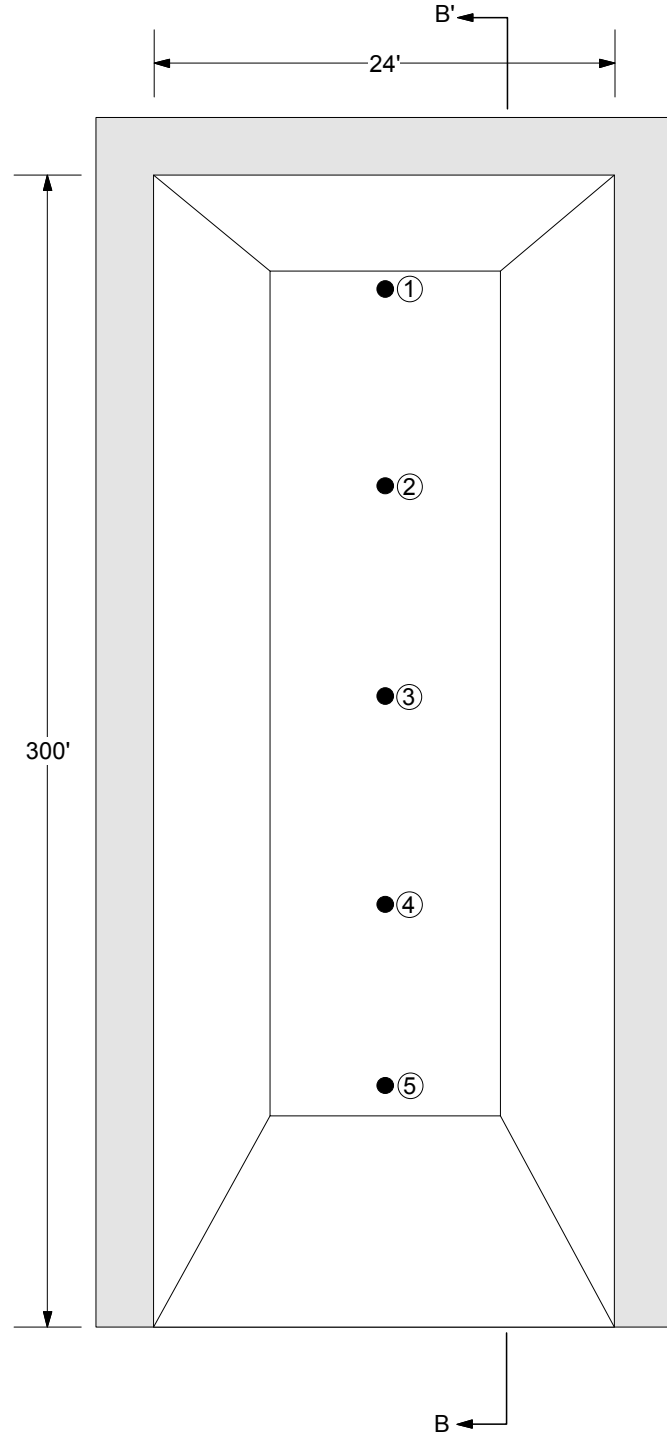


SECTION A-A'
SCALE 1" = 10'

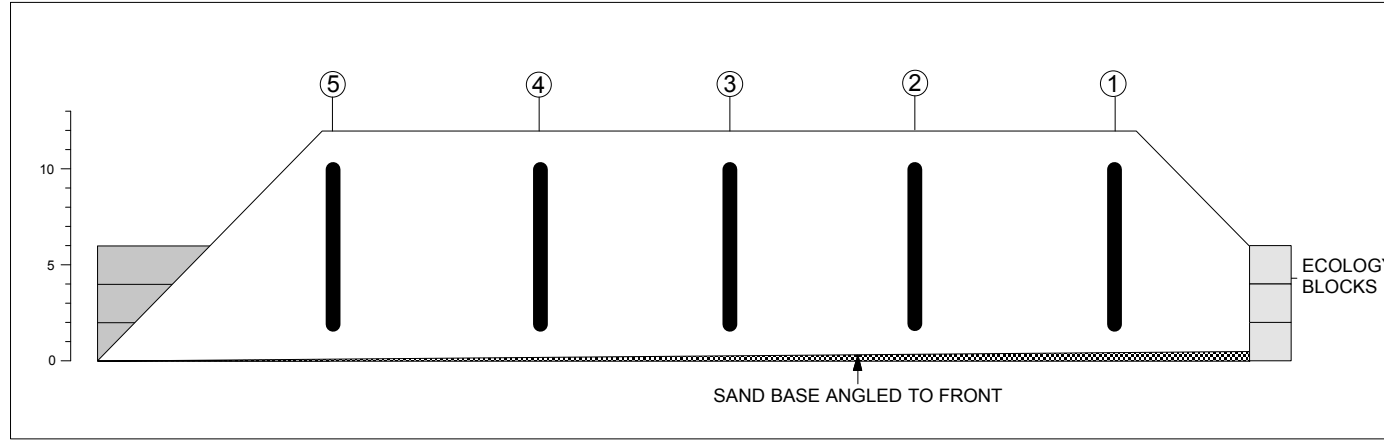
 ENVIRONMENTAL PARTNERS INC. 295 NE Gilman Boulevard, Suite 201 Issaquah, Washington 98027 FIGURE 9	PROJECT	43101.4	DATE	12/03/10
	PREPARED FOR	STONEWAY CONCRETE	DRAWN BY	ARM
AS-BUILT DIAGRAM OF TYPICAL SOIL BIOREMEDIATION CELL	LOCATION	1915 MAPLE VALLEY HIGHWAY RENTON, WASHINGTON	REVIEWED BY	ELC
	SHEET	1 of 1		

KEY:	2" SLOTTED AIR EXTRACTION PIPING	6" PERFORATED LEACHATE COLLECTION PIPING	1/2" LEACHATE RECIRCULATION TUBING	TEMPERATURE AND OXYGEN PROBES
	---	---	---	● ●

SCALE: 1" = 10'



PLAN VIEW



SECTION B-B'
SCALE 1" = 10'

PROJECT	43101.4
PREPARED FOR	STONEWAY CONCRETE
LOCATION	1915 MAPLE VALLEY HIGHWAY RENTON, WASHINGTON
SHEET	1 of 1
DRAWN BY	ARM
REVIEWED BY	ELC
DATE	12/03/10

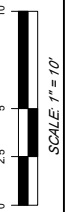
ENVIRONMENTAL PARTNERS INC
295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

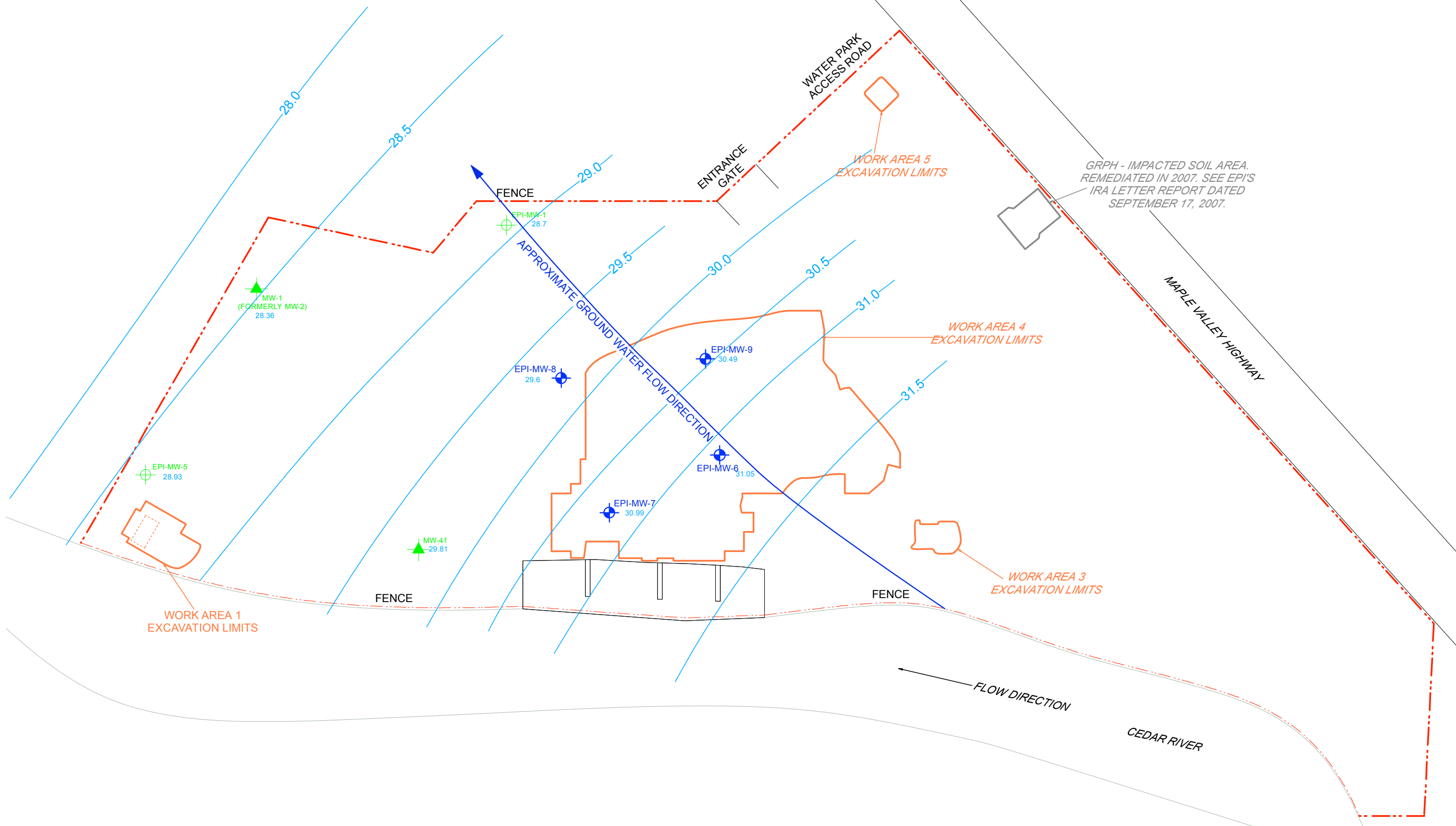
FIGURE 10
BIOREMEDIATION CELL
CONFIRMATION SOIL SAMPLE LOCATIONS

KEY:
① = SAMPLE LOCATION

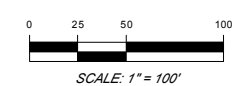


= COMPOSITE SOIL SAMPLE FROM A DEPTH OF 3' TO 10'





KEY:



- - - - FENCE
- EXCAVATION BOUNDARY
- ~~~~~ GROUND WATER CONTOUR WITH ELEVATION (MSL)
- ⊕ NEW MONITORING WELL INSTALLED BY EPI
- ▲ EXISTING MONITORING WELL INSTALLED BY OTHERS
- ⊕ EXISTING MONITORING WELL INSTALLED BY EPI

epl ENVIRONMENTAL PARTNERS INC
 295 NE Gilman Boulevard, Suite 201
 Issaquah, Washington 98027

FIGURE 11
 SITE REPRESENTATION SHOWING
 PIEZOMETRIC CONDITIONS FOR
 SEPTEMBER 2010

PROJECT	43101.4		
PREPARED FOR	STONEWAY CONCRETE		
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON		
SHEET 1 of 1	DRAWN BY ARM	REVIEWED BY ELC	DATE 12/03/10

EPI-MW-1			
Date	Formaldehyde	Arsenic	pH
3/18/09	<5	<5	7.28
6/8/09	<5	<5	6.96
9/29/09	<5	1.7	7.24
12/14/09	<5	1.6	7.42
3/3/10	<5	2.4	7.86
6/1/10	<5	<1.8	7.66
9/14/10	<5	2.1	7.14

MW-1			
Date	Formaldehyde	Arsenic	pH
3/18/09	<5	<5	7.29
6/8/09	<5	<5	7.13
9/29/09	6	<1	7.06
12/14/09	<5	1.1	7.74
3/3/10	<5	<1.8	8.04
6/1/10	<5	<1.8	7.48
9/14/10	<5	<1.8	7.09

EPI-MW-8			
Date	Formaldehyde	Arsenic	pH
3/18/09	NS	NS	NS
6/8/09	<5	<5	8.15
9/29/09	5	3.9	8.36
12/14/09	<5	4.2	8.58
3/3/10	<5	4.7	8.25
6/1/10	<5	3.1	8.93
9/14/10	<5	4.7	7.98

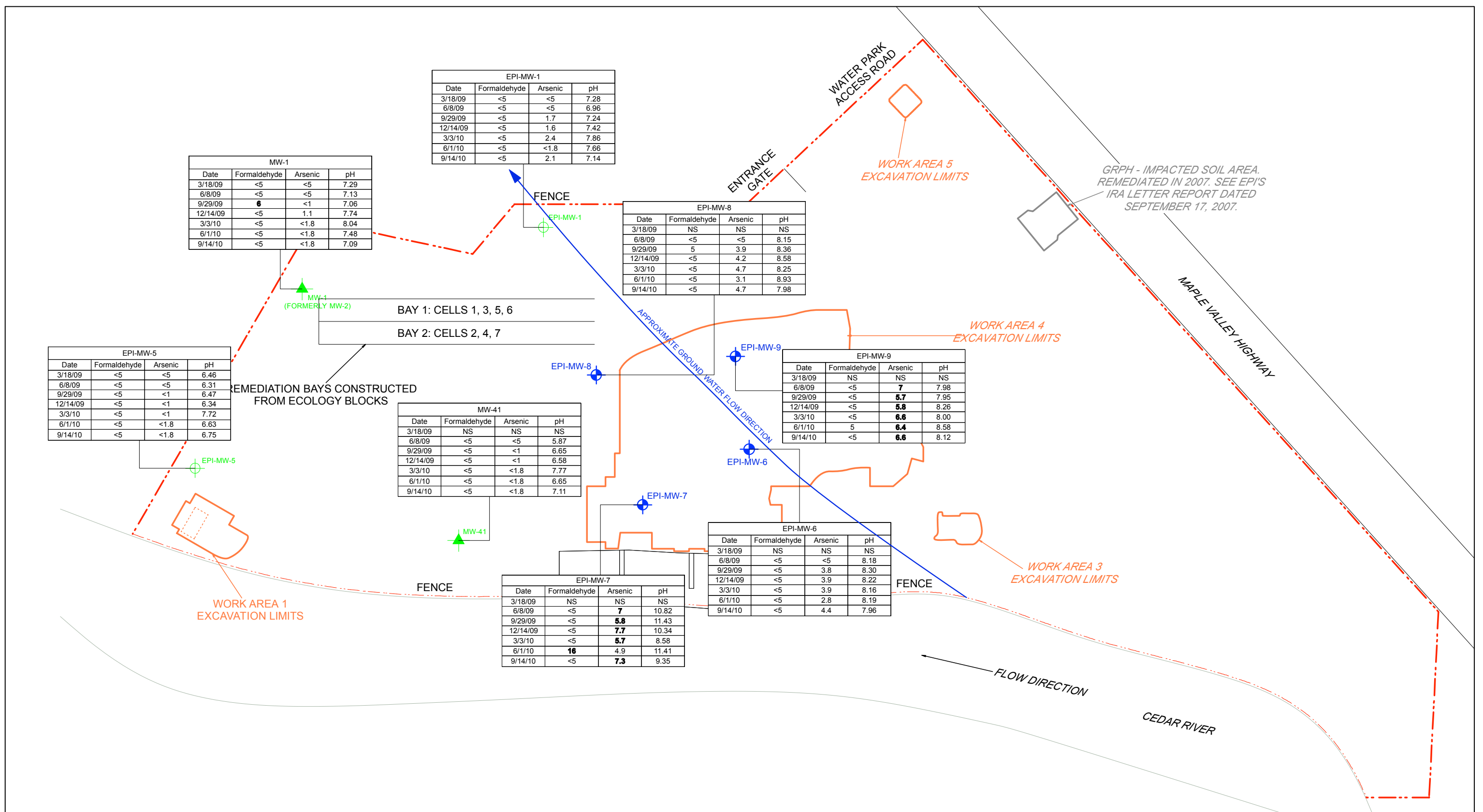
EPI-MW-5			
Date	Formaldehyde	Arsenic	pH
3/18/09	<5	<5	6.46
6/8/09	<5	<5	6.31
9/29/09	<5	<1	6.47
12/14/09	<5	<1	6.34
3/3/10	<5	<1	7.72
6/1/10	<5	<1.8	6.63
9/14/10	<5	<1.8	6.75

MW-41			
Date	Formaldehyde	Arsenic	pH
3/18/09	NS	NS	NS
6/8/09	<5	<5	5.87
9/29/09	<5	<1	6.65
12/14/09	<5	<1	6.58
3/3/10	<5	<1.8	7.77
6/1/10	<5	<1.8	6.65
9/14/10	<5	<1.8	7.11

EPI-MW-9			
Date	Formaldehyde	Arsenic	pH
3/18/09	NS	NS	NS
6/8/09	<5	7	7.98
9/29/09	<5	6.7	7.95
12/14/09	<5	6.8	8.26
3/3/10	<5	6.6	8.00
6/1/10	5	6.4	8.58
9/14/10	<5	6.6	8.12

EPI-MW-7			
Date	Formaldehyde	Arsenic	pH
3/18/09	NS	NS	NS
6/8/09	<5	7	10.82
9/29/09	<5	5.8	11.43
12/14/09	<5	7.7	10.34
3/3/10	<5	5.7	8.58
6/1/10	16	4.9	11.41
9/14/10	<5	7.3	9.35

EPI-MW-6			
Date	Formaldehyde	Arsenic	pH
3/18/09	NS	NS	NS
6/8/09	<5	<5	8.18
9/29/09	<5	3.8	8.30
12/14/09	<5	3.9	8.22
3/3/10	<5	3.9	8.16
6/1/10	<5	2.8	8.19
9/14/10	<5	4.4	7.96



GRPH - IMPACTED SOIL AREA. REMEDIATED IN 2007. SEE EPI'S IRA LETTER REPORT DATED SEPTEMBER 17, 2007.

REMEDIATION BAYS CONSTRUCTED FROM ECOLOGY BLOCKS

BAY 1: CELLS 1, 3, 5, 6
BAY 2: CELLS 2, 4, 7

CLEANUP LEVELS:
Formaldehyde - 5 µg/L
Arsenic - 5 µg/L

epi ENVIRONMENTAL PARTNERS INC
295 NE Gilman Boulevard, Suite 201
Issaquah, Washington 98027

FIGURE 12

SITE REPRESENTATION SHOWING GROUND WATER ANALYTICAL RESULTS

PROJECT	43101.4		
PREPARED FOR	STONEWAY CONCRETE		
LOCATION	1915 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON		
SHEET	DRAWN BY	REVIEWED BY	DATE
1 of 1	ARM	ELC	02/01/11

KEY:

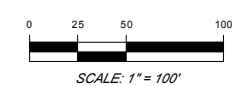
FENCE

 EXCAVATION BOUNDARY

 NEW MONITORING WELL INSTALLED BY EPI

 EXISTING MONITORING WELL INSTALLED BY OTHERS

 EXISTING MONITORING WELL INSTALLED BY EPI



UNITS OF REPORTED FORMALDEHYDE AND ARSENIC ARE µg/L

Attachment A
UST Decommissioning Documentation



CITY OF RENTON

Tank Removal Permit

Permit Number: F080250

Permission is hereby given to do the following described work,
according to the conditions hereon and according to the approved plans
and specifications pertaining thereto, subject to compliance with the Ordinances of the City of Renton.

Nature of Work:

REMOVAL OF 600 GAL UG TANK

Job Address:

1915 MAPLE VALLEY HWY

Owner:

**ANMARCO
9125 10TH AVE S
SEATTLE WA 98108**

Tenant:

STONEWAY

Contractor:

**GARY MERLINO CONST CO INC
9125 10TH AVE S
SEATTLE, WA 98108**

Contractor License **GARYMCC150MW**
Contractor Phone **206-762-9125**
City License **26062**

Contact Name: **MIKE MERLINO**

Contact Phone **206-793-7747**

Other Information:

Date of Issue **08/28/2008**
Date of Expiration **02/28/2009**
Construction Value **\$1,000.00**

Total Fees: **\$120.02**

The contractor is required to be present during all field inspections. A reinspection fee of \$30 per hour, with a one hour minimum, may be assessed for each reinspection when a portion of the work required for inspection is not complete, corrections not made, or contractor fails to keep the appointment.

I hereby certify that no work is to be done except as described above and in approved plans, and that work is to conform to Renton codes and ordinances.

Subject to compliance with the Ordinances of the City of Renton and information filed herewith permit is granted.

Applicant X *[Signature]*

William Flora

Fire Marshal



CITY OF RENTON

Inspection Record

Permit Number: **F080250**

24 HOUR NOTICE REQUIRED FOR ALL INSPECTIONS
Call for inspections - Phone 425-430-7000

Nature of Work: **REMOVAL OF 600 GAL UG TANK**

Job Address: **1915 MAPLE VALLEY HWY**
Lot#/Unit#/Bldg#/Tenant: **STONEWAY**

Owner:
ANMARCO

Contractor: **GARY MERLINO CONST CO INC**

Phone: **206-762-9125**

Inspection Type	Date	Inspector	Comments
Site Safety Plan	9/30/08	CMY	
Tank and Piping Drained and Cleaned	9/30/08	CMY	
Tank and Piping Removal	9/30/08	CMY	
Tank and Piping Inertion	9/30/08	CMY	
Environmental Closure Report			
Tank Final	9/30/08	CMY	

Post this record at job site at all times



Permit Number: **F080250**

Item

1: FINAL INSPECTION

CALL FOR A FINAL INSPECTION TO CLOSE OUT THE CONDITIONS OF THE PERMIT AT THE COMPLETION OF THE PROJECT. A MINIMUM 24 HOUR ADVANCE NOTICE PRIOR TO INSPECTION IS REQUESTED.

2: A. TANKS SHALL BE REMOVED WITHIN 30 DAYS FROM THE DATE OF APPLICATION.

B. THE TANKS AND PROCESS PIPING SHALL BE DRAINED AND CLEANED FREE OF PRODUCT. CERTIFICATION IS REQUIRED FROM THE ORGANIZATION THAT PROVIDES SUCH SERVICES.

C. TANKS CANNOT BE REMOVED FROM THE GROUND UNTIL FIRE DEPARTMENT INSPECTION AND MARINE CHEMIST CERTIFICATION.

D. TANK AND PIPING SHALL BE INERTED WITH CO₂.

E. TANKS ARE TO BE REMOVED FROM THE SITE WITHIN 24 HOURS OF GROUND REMOVAL.

3: ROPE OR RIBBON BARRICADES MUST BE PROVIDED, CIRCLING 10 FEET FROM THE OPERATION OR ENCLOSED IN A FENCED YARD.

"NO SMOKING" SIGNS MUST BE POSTED IN READILY VISABLE LOCATIONS.

TWO (2) 20-BC PORTABLE FIRE EXTINGUISHERS ARE TO BE ON SITE WITHIN 50 FEET OF THE OPERATION.

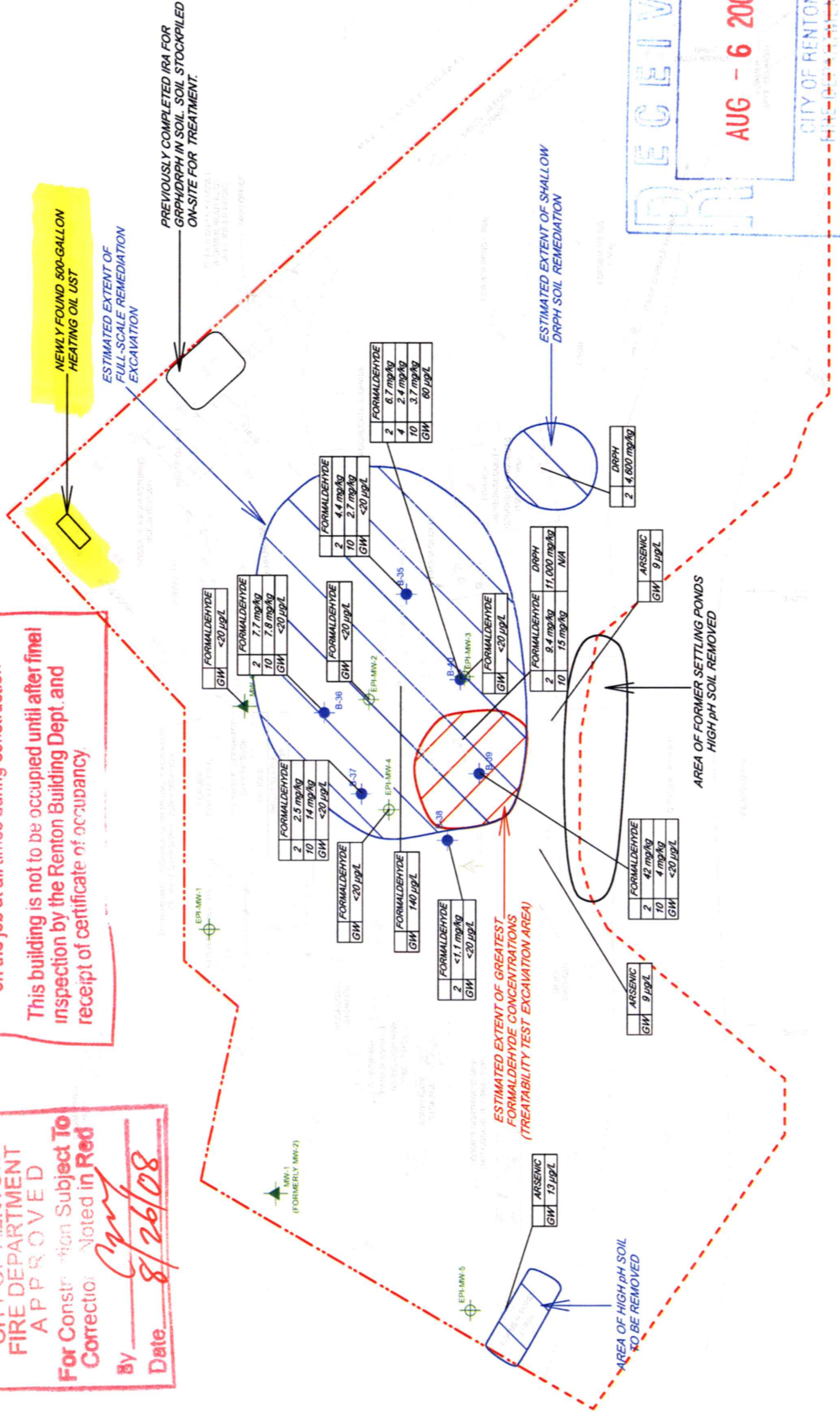
4: GROUND CONTAMINATION IS TO BE REPORTED IMMEDIATELY TO THE FIRE MARSHAL'S OFFICE AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY.

5: PROVIDE DOCUMENTATION THAT PROPER DISPOSAL OF TANK HAS BEEN COMPLETED.

BUILDERS COPY

This set of approved plans **MUST** be on the job at all times during construction. This building is not to be occupied until after final inspection by the Renton Building Dept. and receipt of certificate of occupancy.

CITY OF RENTON
FIRE DEPARTMENT
APPROVED
For Construction Subject To
Corrective Action Noted in Red
By: *[Signature]*
Date: 8/26/08



RECEIVED
AUG - 6 2008
CITY OF RENTON

ENVIRONMENTAL PARTNERS INC.
295 NE Culture Boulevard, Suite 207
Tumac, Washington 98027

PROJECT: 43101.4
PREPARED FOR: STONEWAY CONCRETE
LOCATION: 185 SE MAPLE VALLEY HIGHWAY RENTON, WASHINGTON
SHEET: 1 of 1
DATE: 08/10/08
DRAWN BY: ARM
REVIEWED BY: EC

FIGURE 3
AREAS OF PLANNED REMEDIATION EXCAVATION

KEY:
 - - - - - APPROXIMATE PROPERTY LINE
 - - - - - FENCE
 - - - - - EXISTING MONITORING WELL
 - - - - - MONITORING WELL INSTALLED BY EPI
 - - - - - DPT SAMPLING LOCATION FOR THE ADDITIONAL PHASE OF INVESTIGATION

SOIL AND GROUND WATER SAMPLING LOCATION FROM THE INITIAL PHASE OF INVESTIGATION
 SURFACE SOIL SAMPLING LOCATION FROM THE INITIAL PHASE OF INVESTIGATION
 TEST PIT LOCATION FROM THE INITIAL PHASE OF INVESTIGATION

SCALE 1" = 100'

MARINE CHEMIST CERTIFICATE

SERIAL No 45256

Survey Requested by ENVIRONMENTAL PARTNERS, INC. Vessel Owner or Agent 30 Sep 2008 Date
 Vessel UST Type of Vessel UST Specific Location of Vessel 1915 MAPLE VALLEY HWY
 Last Three (3) Loadings HEATING OIL (Diesel) X3 Tests Performed VISUAL O₂, LEL, CO, H₂S, THE Time Survey Completed 0945 HRS

~ 600 GALLON UST

ATMOSPHERE SAFE FOR EXCAVATION

SAFE FOR TRANSPORTATION

PLEASE NOTE

① TANK IS NOT AT ALL EXPLOSIVE AND DOES NOT NEED BREATHING.

$O_2 = 20.9 \pm 0.1\%$, $LEL = 0 \pm 1\%$,
 $CO \& H_2S = 0 \pm 2ppm$, $THE = 135 ppm$

In the event of any physical or atmospheric changes adversely affecting the gas-free condition of the above spaces, or if in any doubt, immediately stop all work and contact the undersigned Marine Chemist.

QUALIFICATIONS: Transfer of ballast or manipulation of valves or closure equipment tending to alter conditions in pipe lines, tanks or compartments subject to gas accumulation, unless specifically approved in this Certificate, requires inspection and endorsement or reissue of Certificate for the spaces so affected. All lines, vents, heating coils, valves, and similarly enclosed appurtenances shall be considered "not safe" unless otherwise specifically designated.

STANDARD SAFETY DESIGNATIONS

SAFE FOR WORKERS. Means that in the compartment or space so designated (a) the oxygen content of the atmosphere is at least 19.5 percent by volume, and that, (b) toxic materials in the atmosphere are within permissible concentrations, and that, (c) the residues are not capable of producing toxic materials under existing atmospheric conditions while maintained as directed on the Marine Chemist's Certificate

NOT SAFE FOR WORKERS. Means that in the compartment or space so designated, the requirements of Safe for Workers has not been met.

SAFE FOR HOT WORK. Means that in the compartment so designated: (a) oxygen content of the atmosphere is at least 19.5 percent by volume, with the exception of inerted spaces or where external hot work is to be performed; and that, (b) the concentration of flammable materials in the atmosphere is below 10 percent of the lower flammable limit; and that, (c) the residues are not capable of producing a higher concentration than permitted by (b) above under existing atmospheric conditions in the presence of fire, and while maintained as directed on the Marine Chemist's Certificate; and further, that, (d) all adjacent spaces have been cleaned sufficiently to prevent the spread of fire, or are satisfactorily inerted, or, in the case of fuel tanks, or lube oil tanks, or engine room or fire room bilges, have been treated in accordance with the Marine Chemist's requirements.

NOT SAFE FOR HOT WORK. Means that in the compartment so designated, the requirements of Safe for Hot Work have not been met

CHEMIST'S ENDORSEMENT This is to certify that I have personally determined that all spaces in the foregoing list are in accordance with NFPA 306 Control of Gas Hazards on Vessels and have found the condition of each to be in accordance with its assigned designation.

"The undersigned acknowledges receipt of this Certificate under Section 2-6 of NFPA 306 and understands conditions and limitations under which it was issued."

This Certificate is based on conditions existing at the time the inspection herein set forth was completed and is issued subject to compliance with all qualifications and instructions.

Signed [Signature] Name EPI Company 30 Sep 08 Date [Signature] Signed Craig R Tuttle #688 Marine Chemist Certificate No.

CALL 206-313-6933

Attachment B
Results of Biorespiration Rates Tables

**Results of Biorespiration Rates
Remediation Cell #2
Collected on September 3, 2008**

Time	Probe E			Probe F			Probe G			Probe H		
	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂
7:16	20.9	23	0.0	20.8	23	0.1	20.9	24	0.0	20.9	NR	0.0
7:45	20.4	23	0.0	20.2	23	0.3	20.9	24	0.0	20.8	NR	0.0
8:15	19.9	23	0.1	19.9	23	0.4	20.7	24	0.0	20.6	NR	0.1
8:45	19.9	23	0.2	19.9	23	0.4	20.7	24	0.0	20.6	NR	0.1
9:15	19.9	23	0.2	19.8	23	0.4	20.5	24	0.0	20.5	NR	0.1
10:15	19.7	23	0.4	19.6	23	0.4	20.4	24	0.0	20.4	NR	0.2
11:15	19.6	23	0.4	19.5	23	0.4	20.4	24	0.0	20.4	NR	0.2
12:15	19.3	23	0.4	19.2	23	0.4	20.1	24	0.0	20.1	NR	0.2
13:15	19.2	23	0.6	19.2	23	0.4	19.9	24	0.2	20.0	NR	0.2
14:15	18.9	23	0.6	19.0	23	0.5	19.6	24	0.2	19.8	NR	0.2
15:15	18.9	23	0.6	18.9	23	0.6	19.5	24	0.2	19.7	NR	0.2

Notes:

- Oxygen and carbon dioxide concentrations measured with GasTech Model GT-202 meter
- Temperature readings collected using a Humboldt Concrete Maturity Meter

NR = No reading obtained

**Results of Biorespiration Rates
Remediation Cell #3
Collected on September 3, 2008**

Time	Probe I			Probe J			Probe K			Probe L		
	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂
7:16	20.6	23	0.5	19.8	22	1.0	20.9	24	0.0	20.4	23	0.4
7:45	19.3	23	1.0	19.2	22	1.2	20.4	24	0.0	20.4	23	0.4
8:15	19.2	23	1.0	19.2	22	1.2	20.2	24	0.0	20.1	23	0.4
8:45	19.2	23	1.0	19.2	22	1.4	20.2	24	0.1	20.1	23	0.4
9:15	19.2	23	1.0	19.3	22	1.2	20.2	24	0.0	20.1	23	0.4
10:15	19.0	23	1.0	19.2	22	1.2	20.1	24	0.2	20.3	23	0.4
11:15	19.0	23	1.0	19.2	22	1.4	20.1	24	0.2	20.3	23	0.4
12:15	18.9	23	1.0	19.0	22	1.4	19.9	24	0.2	19.8	23	0.5
13:15	18.7	23	1.0	19.0	22	1.4	19.8	24	0.2	20.3	23	0.4
14:15	18.6	23	1.2	18.9	22	1.2	19.7	24	0.2	20.4	23	0.2
15:15	18.6	23	1.2	18.9	22	1.4	19.6	24	0.2	20.4	23	0.3

Notes:

- Oxygen and carbon dioxide concentrations measured with GasTech Model GT-202 meter
- Temperature readings collected using a Humboldt Concrete Maturity Meter

**Results of Biorespiration Rates
Remediation Cell #4
Collected on November 13, 2008**

Time	Probe M			Probe N			Probe O			Probe P		
	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂
8:15	20.9	NR	0.0	20.8	NR	0.4	21.3	NR	0.0	21.2	NR	0.1
8:45	21.1	NR	0.0	20.9	NR	0.4	21.7	NR	0.0	21.5	NR	0.2
9:15	20.9	14	0.0	20.7	14	0.4	21.4	14	0.0	21.4	14	0.2
9:45	20.9	14	0.0	20.3	14	0.4	21.1	14	0.0	21.0	14	0.2
10:15	20.7	14	0.0	19.8	14	0.4	20.9	14	0.0	20.4	14	0.2
10:45	20.6	14	0.0	19.6	14	0.4	20.9	14	0.0	20.4	14	0.1
11:15	20.6	14	0.0	19.5	14	0.6	20.9	14	0.0	20.4	14	0.2
11:45	20.6	14	0.0	19.5	14	0.6	20.7	14	0.0	NR	14	NR
12:15	19.9	14	0.0	18.7	14	0.5	19.4	14	0.0	20.2	14	0.1
12:45	19.5	14	0.0	18.4	14	0.5	19.5	14	0.0	19.9	14	0.1
13:15	19.5	14	0.0	18.3	14	0.5	19.4	14	0.0	20.0	14	0.1
13:45	19.5	14	0.0	18.4	14	0.6	19.4	14	0.0	20.1	14	0.1
14:45	19.6	14	0.0	18.4	14	0.6	19.4	14	0.0	20.1	14	0.1
14:45	19.5	14	0.0	18.3	14	0.6	19.2	14	0.0	20.0	14	0.1
15:15	19.8	14	0.0	18.4	14	0.6	19.4	14	0.0	20.7	14	0.1
15:45	19.6	14	0.0	18.4	14	0.6	19.2	14	0.0	20.2	14	0.1
16:15	19.8	14	0.0	18.3	14	0.6	19.4	14	0.0	20.5	14	0.1

Notes:

- Oxygen and carbon dioxide concentrations measured with GasTech Model GT-202 meter
 - Temperature readings collected using a Humboldt Concrete Maturity Meter
- NR = No reading obtained

**Results of Biorespiration Rates
Remediation Cell #6
Collected on March 9, 2009**

Time	Probe T			Probe U			Probe V		
	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂
8:05	20.8	8	0.0	17.5	9	0.0	18.0	9	0.0
8:30	20.6	8	0.1	16.8	9	0.0	18.3	9	0.0
9:00	20.6	8	0.0	16.0	9	0.0	17.0	9	0.0
9:30	20.5	8	0.0	15.5	9	0.0	16.8	9	0.0
10:00	19.9	8	0.0	14.9	9	0.0	16.7	9	0.0
10:30	19.9	8	0.0	14.7	9	0.0	16.5	9	0.0
11:00	19.8	8	0.0	14.7	9	0.0	16.7	9	0.0
11:30	19.7	8	0.1	14.5	9	0.0	15.7	9	0.0
12:00	19.7	8	0.1	14.7	9	0.0	15.6	9	0.0
12:30	19.6	8	0.1	14.5	9	0.0	15.1	9	0.0
13:00	19.6	8	0.1	14.4	9	0.0	15.0	9	0.0
13:30	19.3	8	0.1	14.1	9	0.0	15.2	9	0.0
14:00	19.5	9	0.2	14.2	9	0.0	14.2	9	0.0
14:30	19.0	9	0.2	13.6	10	0.0	14.0	9	0.0
15:00	18.9	9	0.2	13.6	10	0.0	13.9	10	0.0
15:30	19.2	8	0.2	13.6	9	0.0	14.1	9	0.0
16:00	19.0	9	0.2	13.5	9	0.0	14.4	9	0.0

Notes:

- Oxygen and carbon dioxide concentrations measured with GasTech Model GT-202 meter
- Temperature readings collected using a Humboldt Concrete Maturity Meter

**Results of Biorespiration Rates
Remediation Cell #7
Collected on May 1, 2009**

Time	Probe W			Probe X ⁽¹⁾			Probe Y		
	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂	% O ₂	Temp (°C)	% CO ₂
8:15	21.2	12	0.0	NR	NR	0.0	21.0	12	0.0
8:30	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
9:00	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
9:30	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
10:00	21.0	12	0.0	NR	NR	0.0	21.0	12	0.0
10:30	21.2	12	0.0	NR	NR	0.0	21.2	12	0.0
11:00	20.9	12	0.0	NR	NR	0.0	20.4	12	0.0
11:30	20.9	12	0.0	NR	NR	0.0	20.7	12	0.0
12:00	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
12:30	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
13:00	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
13:30	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
14:00	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
14:30	20.9	12	0.0	NR	NR	0.0	20.8	12	0.0
15:00	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
15:30	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0
16:00	20.8	12	0.0	NR	NR	0.0	20.8	12	0.0
16:15	20.9	12	0.0	NR	NR	0.0	20.9	12	0.0

Notes:

- Oxygen and carbon dioxide concentrations measured with GasTech Model GT-202 meter
 - Temperature readings collected using a Humboldt Concrete Maturity Meter
- (1) NR - No results, tubing to probe clogged

Attachment C
As-built Ground Water
Monitoring Well Diagrams

Boring/Well Designation: EPI-MW-6

<p>Client: Stoneway Concrete</p> <p>Logged By: E. Caddey</p> <p>Date of Drilling: 5/26/09</p> <p>Location: 1915 SE Maple Valley Hwy, Renton, WA</p> <p>Drilling Contractor: Cascade Drilling, Inc.</p> <p>Drill Rig: Track-mounted limited access rig</p> <p>Method: Hollow Stem Auger</p> <p>Borehole: 8"</p>	<p>Site Representation:</p>
--	------------------------------------

Depth	SUBSURFACE PROFILE			SAMPLE			PID (ppm)	Well Data	Comments
	Log	USCS Code	Description	Interval	Recovery	Blows per 6"			
0			Ground Surface						
1		SM	Silty Sand Brown; Damp; mostly fine to coarse sand with some silt and organics from remediation cell						Above Ground Completion-3' Stick-up metal monument Hydrated bentonite chips 2" blank sch.40 PVC
2									
3									
4									
5									
6									
7									
8									
9									
10									
11		GP	Poorly Graded Gravel Brown; Saturated; Mostly fine to coarse gravel with few cobbles					Colorado Silica Sand Pack	12', 2" Sch 40 PVC 0.010-slot screen
12									
13									
14									
15									
16									
17									
18			End of Borehole						
19									
20									

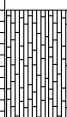
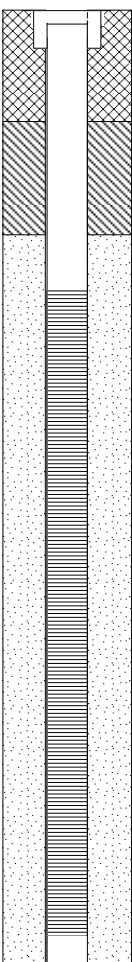
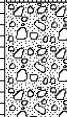
Boring/Well Designation: EPI-MW-7

<p>Client: Stoneway Concrete Logged By: E. Caddey Date of Drilling: 5/26/09 Location: 1915 SE Maple Valley Hwy, Renton, WA Drilling Contractor: Cascade Drilling, Inc. Drill Rig: Track-mounted limited access rig Method: Hollow Stem Auger Borehole: 8"</p>	<p>Site Representation:</p>
--	------------------------------------

Depth	SUBSURFACE PROFILE			SAMPLE			PID (ppm)	Well Data	Comments
	Log	USCS Code	Description	Interval	Recovery	Blows per 6"			
0			Ground Surface						
1		SM	Silty Sand Brown; Damp; Mostly fine to coarse sand with some silt and organics from remediation cell						Above Ground Completion-3' Stick-up metal monument Hydrated bentonite chips 2" blank sch.40 PVC
2									
3									
4									
5									
6									
7									
8									
9									
10		GP	Poorly Graded Gravel Brown; Saturated; Mostly fine to coarse gravel with few cobbles						
11									12', 2" Sch 40 PVC 0.010-slot screen
12									
13									
14									
15									
16									
17									
18			End of Borehole						
19									
20									

Boring/Well Designation: EPI-MW-8

<p>Client: Stoneway Concrete Logged By: E. Caddey Date of Drilling: 5/26/09 Location: 1915 SE Maple Valley Hwy, Renton, WA Drilling Contractor: Cascade Drilling, Inc. Drill Rig: Track-mounted limited access rig Method: Hollow Stem Auger Borehole: 8"</p>	<p>Site Representation:</p>
--	------------------------------------

Depth	SUBSURFACE PROFILE			SAMPLE			PID (ppm)	Well Data	Comments
	Log	USCS Code	Description	Interval	Recovery	Blows per 6"			
0			Ground Surface						
1		SM	Silty Sand Brown; Damp; Mostly fine to coarse sand with some silt and organics from remediation cell						Above Ground Completion- 3' Stick-up metal monument Hydrated bentonite chips 2" blank sch.40 PVC
2									
3									
4									
5									
6									
7		GP	Poorly Graded Gravel Brown; Saturated; Mostly fine to coarse gravel with few cobbles						Colorado Silica Sand Pack
8									
9									
10									
11									12', 2" Sch 40 PVC 0.010-slot screen
12									
13									
14									
15									
16									
17			End of Borehole						Screw-on end cap
18									
19									
20									

Boring/Well Designation: EPI-MW-9

<p>Client: Stoneway Concrete Logged By: E. Caddey Date of Drilling: 5/26/09 Location: 1915 SE Maple Valley Hwy, Renton, WA Drilling Contractor: Cascade Drilling, Inc. Drill Rig: Track-mounted limited access rig Method: Hollow Stem Auger Borehole: 8"</p>	<p>Site Representation:</p>
--	------------------------------------

Depth	SUBSURFACE PROFILE			SAMPLE			PID (ppm)	Well Data	Comments
	Log	USCS Code	Description	Interval	Recovery	Blows per 6"			
0			Ground Surface						
1		SM	Silty Sand Brown; Damp; Mostly fine to coarse sand with some silt and organics from remediation cell						Above Ground Completion- 3' Stick-up metal monument
2									
3									
4									Hydrated bentonite chips
5									2" blank sch.40 PVC
6									Colorado Silica Sand Pack
7									
8									
9									
10									
11									
12									
13									
14		GP	Poorly Graded Gravel Brown; Saturated; Mostly fine to coarse gravel with few cobbles						12', 2" Sch 40 PVC 0.010-slot screen
15									
16									
17									
18									
19									
20			End of Borehole						Screw-on end cap

Attachment D
Regional Hydrogeologic
and Piezometric Data

Well Field Monitoring Study

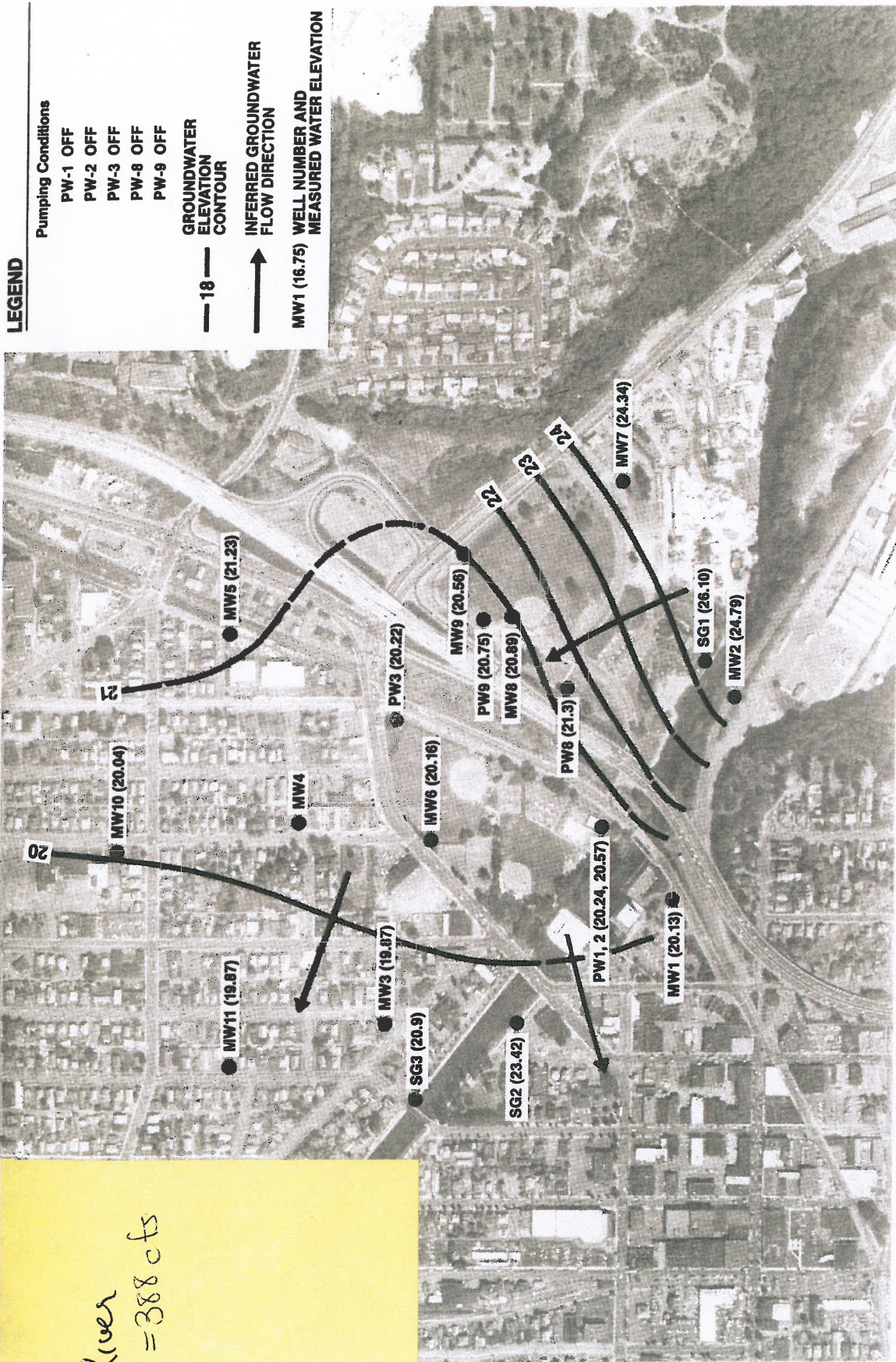
Prepared for
City of Renton

March 1988



Engineers
Planners
Economists
Scientists

River
 $\bar{Q} = 388 \text{ cfs}$



Note: Contours indicate approximate elevations and are best estimates of spatial variations throughout the site. Actual levels may vary point to point due to local changes in hydrogeologic or other influences.



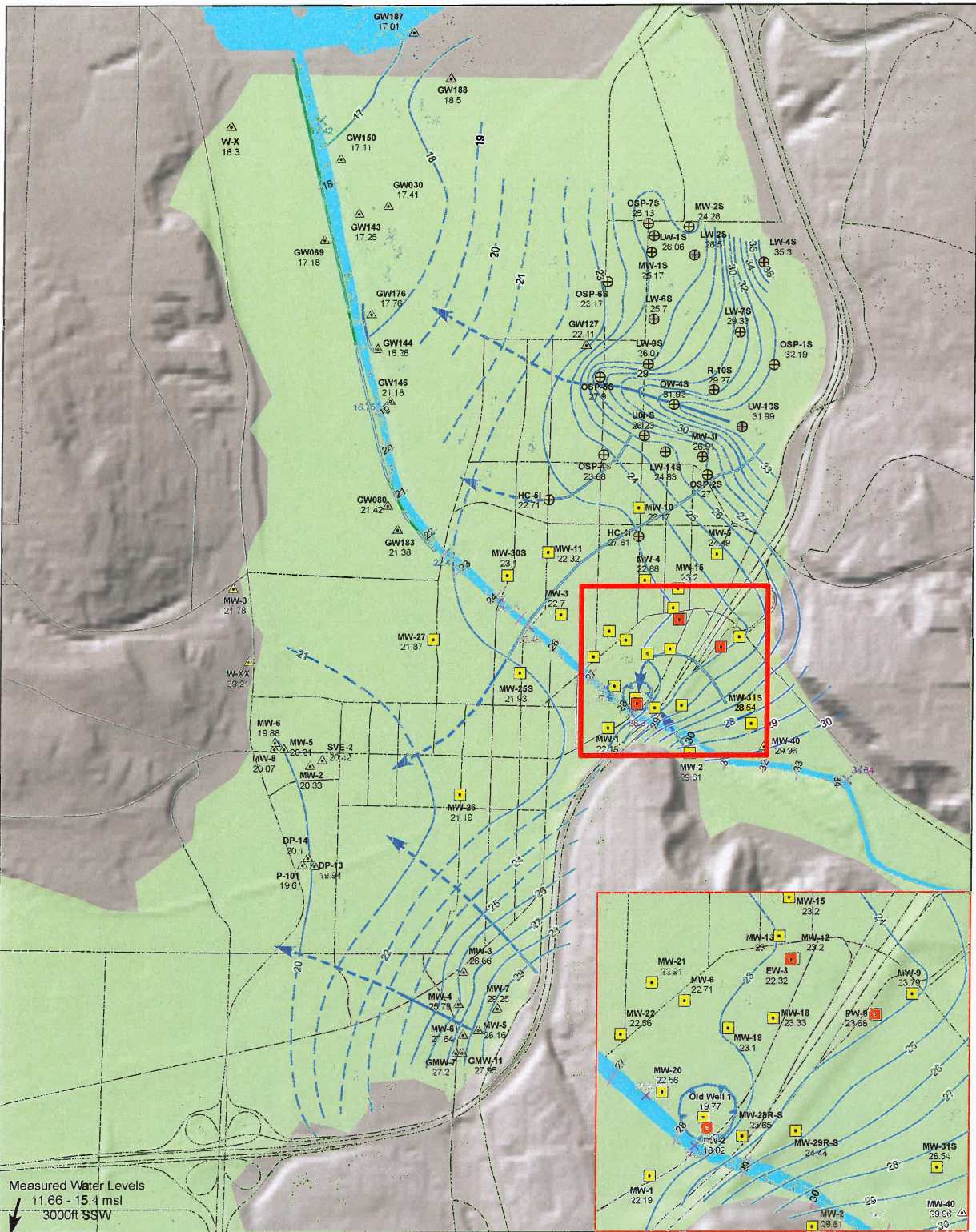
0 250 500 FT
 SCALE (Approx.)

FIGURE 3-2
GROUNDWATER ELEVATIONS
(FT. ABOVE NGVD) JANUARY 23, 1987
CITY OF RENTON, WA

PACIFIC groundwater **GROUP**

**GROUNDWATER LEVEL TRENDS
NEAR THE CITY OF RENTON**

October 2007



Measured Water Levels
11.66 - 15.4 msl
3000ft SSW

Renton_CSCSL.mxd

- 18.75
 - ✕ River Stage Elevations
 - River Stage Contours
 - Sheet Pile Wall
 - Groundwater Level Contours (Dashed Where Inferred)
 - ⊕ Cone of Depression
 - Groundwater Flow Direction (Dashed Where Inferred)
 - Lowland Alluvial Deposits
- | Data Confidence and Well Ownership | | |
|------------------------------------|--------|------|
| Low | Medium | High |
| □ | □ | □ |
| ⊕ | ⊕ | ⊕ |
| △ | △ | △ |
- City of Renton
 - Paccar
 - Other
- Well ID
- Groundwater Level Elevation

Notes:
Elevation Datum = NAVD88
Groundwater level measurements taken
December 8 & 9, 2005 (River at 420 cfs, Lake at 16.78 feet)
River level measurements taken October 9, 2006
(River at 385 cfs, Lake at 17.23 feet)



Figure 23
Groundwater Level Elevations in the Downtown Renton Vicinity

Cite only

**SUMMARY OF GROUNDWATER MODELING
EFFORTS IN SUPPORT OF
RENTON AQUIFER MANAGEMENT**

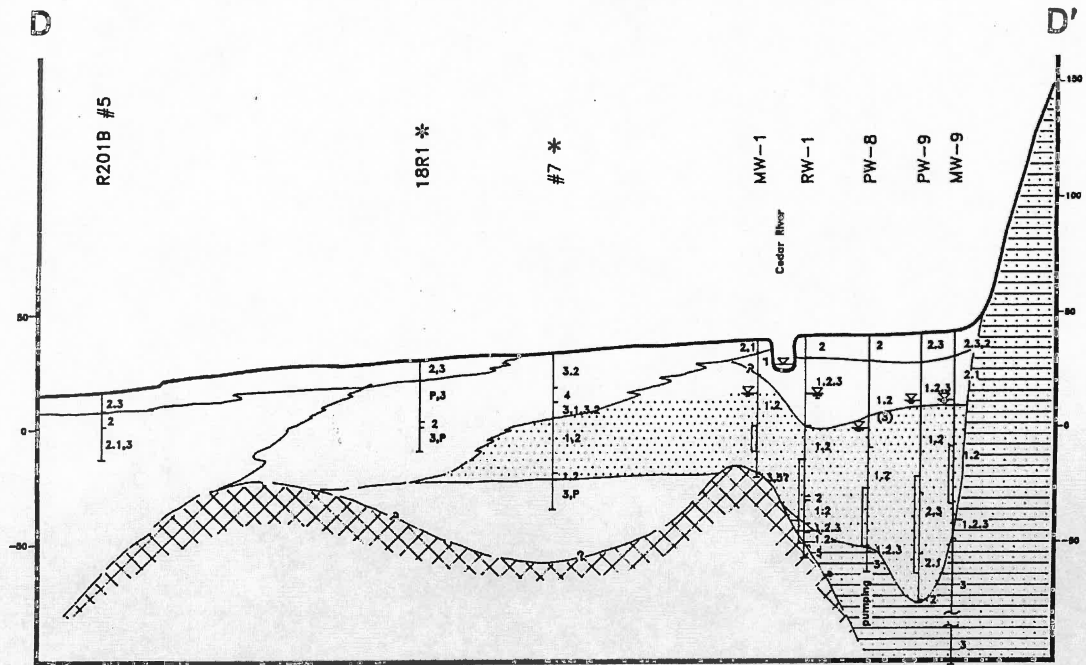
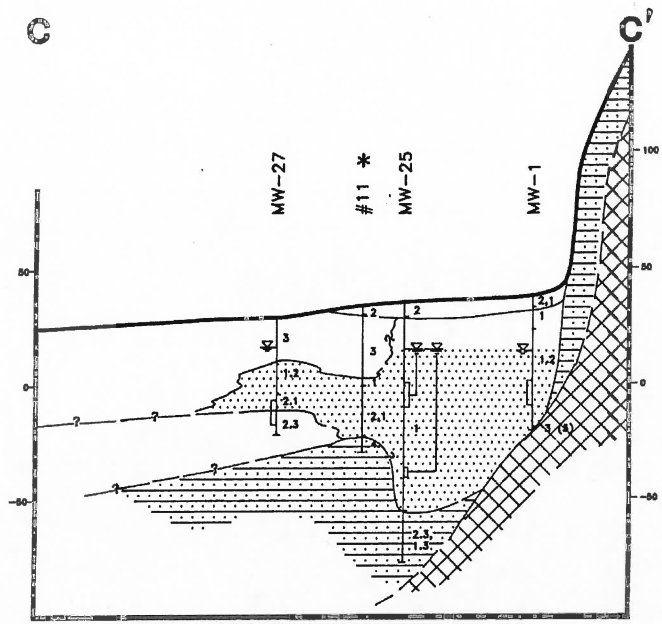
PREPARED FOR THE CITY OF RENTON BY:

**RH2 ENGINEERING, P. S.
1410 MARKET STREET
PO BOX 1180
KIRKLAND, WA 98083**

**TELEPHONE NO:
488-0941
887-8400**




**PACIFIC GROUNDWATER GROUP
2877 EASTLAKE AVENUE EAST
SEATTLE, WA 98108**

**TELEPHONE NO:
828-0141**



Boring Log Explanation

- 3 — SILT
- Water Level (if known)
- 1.2 — SAND & GRAVEL
- 2.3 — Silty SAND
- 1.2, 2 — Sandy GRAVEL and SAND
- 2 — Screen Section (if known)
- 4 — Till
- 5 — Bedrock (typically sandstone)
- Read commas as "and"
- Read decimal as adjectives
- * Log from CH2MHill, 1988

-  Highly Productive Aquifer Zone
-  Overconsolidated Glacial Soils
-  Bedrock

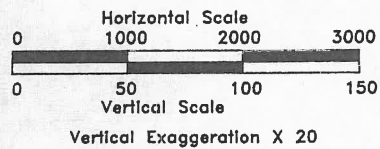


Figure 6
Sections C-C' and D-D'



Pacific Groundwater Group
2377 Eastlake Ave. E., Suite 200
Seattle, Washington 98102
206-329-0141 FAX 329-6968

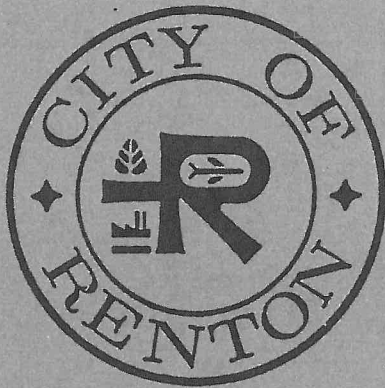
Ray sled
228-1902
George skull
772-1299

Pan Olson
745-3379
770-5311 day weekend

Pan Price
631-1237

ANALYSIS REPORT FOR THE CITY OF RENTON CEDAR RIVER VALLEY AQUIFER TEST

(Conducted June 24, 25, and 26, 1987)



RH2 Engineering

1410 Market Street
Kirkland, WA 98033
206-827-6400



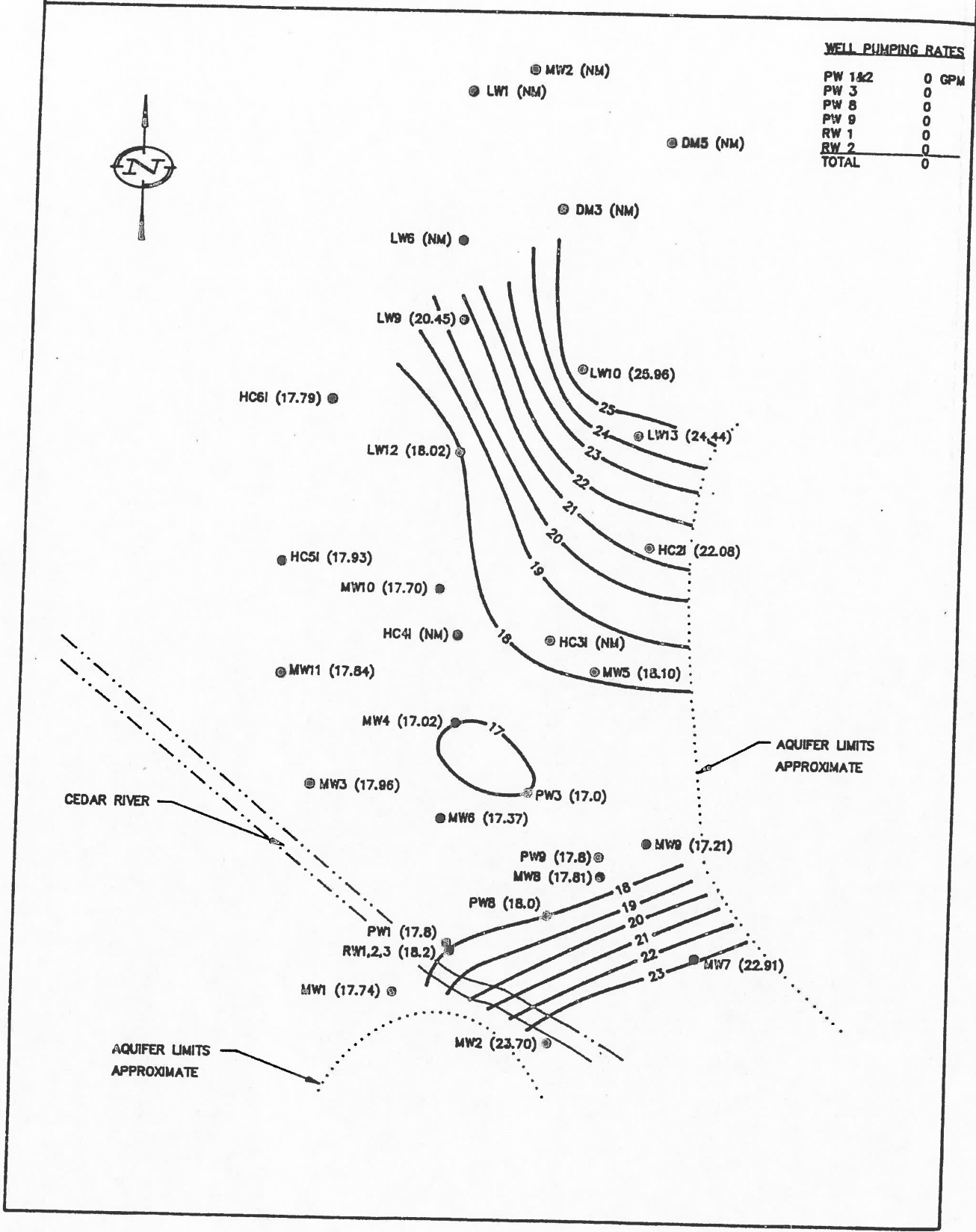
AQUIFER HYDRAULIC CONTOURS
AFTER 8 HOUR RECOVERY PERIOD (6/24/87 AM)

FIGURE 4



WELL PUMPING RATES

PW 1&2	0 GPM
PW 3	0
PW 8	0
PW 9	0
RW 1	0
RW 2	0
TOTAL	0



Ron Ober



HARTCROWSER

Earth and Environmental Technologies

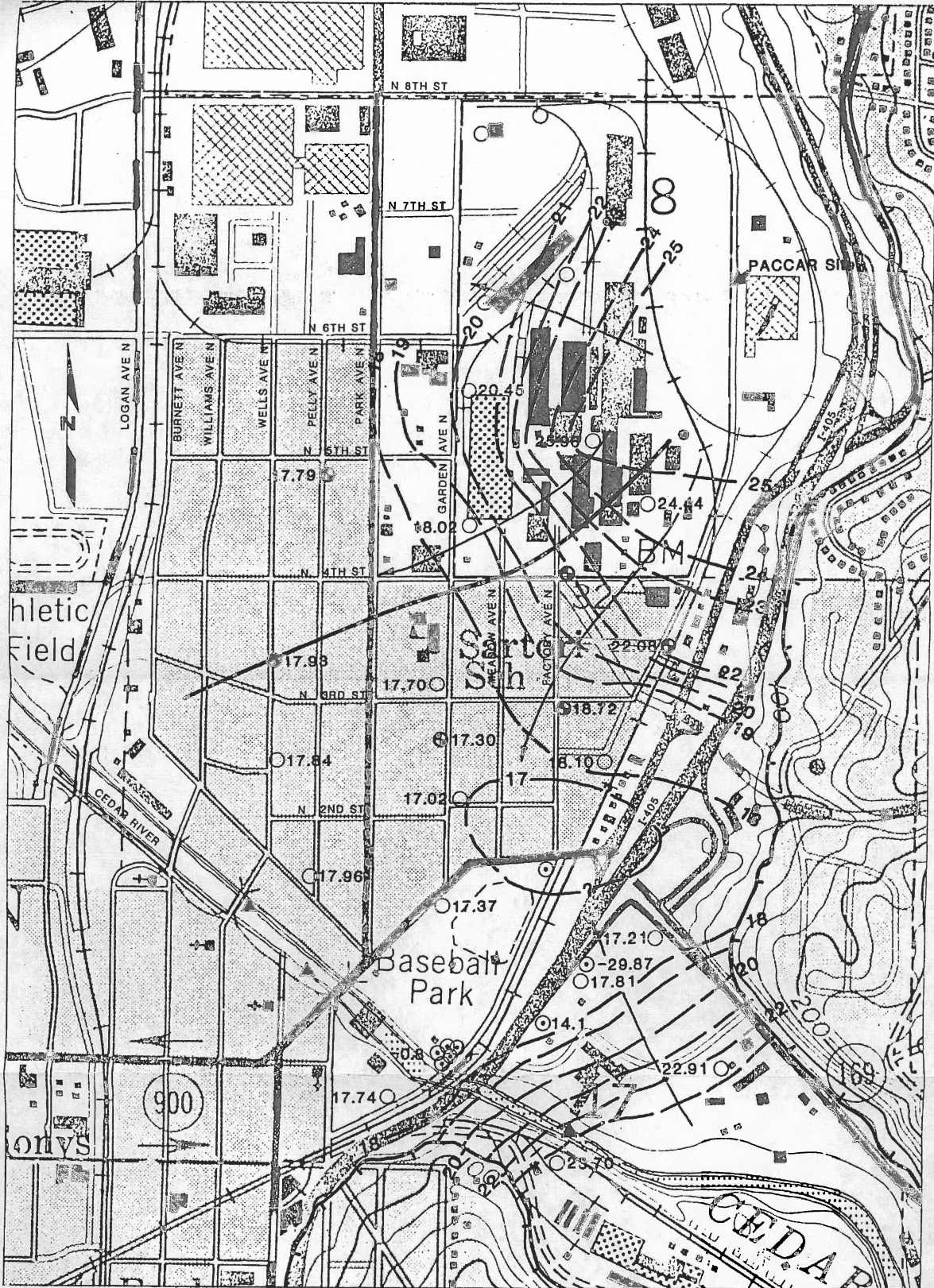
**Additional Groundwater Flow
Assessment Data
PACCAR Defense Systems Facility
Renton, Washington**

**Prepared for
PACCAR Defense Systems**

**October 5, 1987
J-1639-04**

1910 Fairview Avenue East Seattle, Washington 98102-3699 206.324.9530

Groundwater Elevation Contour Map
Lower Sand Unit June 24, 1987 *



Base map prepared from USGS 7.5-minute quadrangles of Mercer Island and Renton, Washington.

- | | | | | | | |
|-------|------------------------------------|--------|---|---------------|---|------|
| ○ | Monitoring Well | — 20 — | Groundwater Elevation Contour in Feet | 0 | 500 | 1000 |
| ⊙ | Piezometer | — | Groundwater Divide | Scale in Feet | | |
| ⊕ | City of Renton Production Well | — | Groundwater Divide Approximate Location | ▲ | River Staff Gage | |
| 19.64 | Spot Groundwater Elevation in Feet | * | Measurements Taken Prior to Initiating Pumping. | → | Horizontal Projection of Groundwater Flow Lines | |

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 Figure 10