GROUNDWATER/NAPL PILOT PROGRAM
EXTRACTION WELL AND PERFORMANCE EVALUATION
DESIGN REPORT

Prepared for

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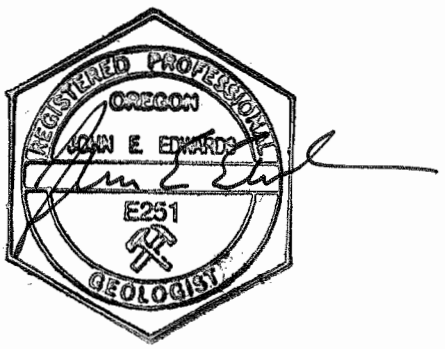
Design Report

The material and data in this report were prepared under the supervision and direction of the undersigned.



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1 INTRODUCTION

On behalf of NW Natural, Anchor Environmental, LLC (Anchor) is conducting a Groundwater/NAPL Pilot Program (Pilot Program) in support of source control actions at the NW Natural Gasco Facility, 7900 NW St. Helens Road, Portland, Oregon. Source control is also planned on a portion of the adjoining Siltronic facility. The location of the Gasco/Siltronic Site is shown on Figure 1.

The Pilot Program will assess the use of groundwater extraction wells to provide hydraulic containment of impacted upland groundwater migrating to Willamette River sediments. The rationale for evaluating hydraulic containment in a pilot program is described in the *Groundwater Source Control Pilot Plan* (Anchor, 2006). The wells will also be evaluated for their ability to prevent NAPL migration. Data to be obtained from testing the extraction wells will be used to assess hydraulic containment as a source control alternative or as a component of a source control alternative at the Gasco/Siltronic Site.

The extraction wells are designated PW-1 to PW-4 as shown on Figure 4. During the upland Remedial Investigation (Upland RI), extraction well PW-1 was installed and tested under the direction of Hahn and Associates, Inc (HAI) (Aquifer Test Evaluation Report, HAI, 2006). Under the current project schedule, extraction wells PW-2, -3, and -4 will be installed in June 2007 and will be pump tested in July 2007. Laboratory testing and data analysis will occur in August and September 2007. The Extraction Well Performance Report is planned to be submitted to DEQ in October 2007. Information obtained from operating the extraction wells will be used in evaluating and designing groundwater/NAPL source control alternatives. The Groundwater/NAPL Focused Feasibility Study (FFS) is planned to be submitted to DEQ in October 2007.

Section 2 of this report describes the installation and testing of monitoring wells installed at the locations of extraction wells PW-2, -3, and -4. Section 3 covers extraction well design. Section 4 contains the extraction well testing plan, and the plan for assessing source control alternatives is presented in Section 5.

2 MONITORING WELL CLUSTERS MW-18, -19, AND -20

2.1 Installation

During February and March 2007 monitoring well clusters MW-18, -19, and -20 were installed at the locations shown on Figure 2. The well construction details are summarized in Table 1. The wells were installed according to the plans outlined in the letter *Gasco Groundwater Pilot Borings, Proposed Modification to Install Monitoring Wells* (Anchor, January 2007). The monitoring well plan was approved by DEQ in the letter *Proposed Pilot Study Extraction Well Borings and Monitoring Wells, Northwest Natural Gas Company Site, Portland, Oregon, ECSI No. 84* (Oregon DEQ, February 2007).

The monitoring wells will serve multiple purposes for NW Natural's source control actions.

- Groundwater quality data from the wells are being used to design the extraction well screen intervals.
- Grain size data on soil samples from the borings are being used to design the extraction well screens.
- Some of the monitoring wells will be used for hydrology monitoring during pump testing of the extraction wells.
- Some of the monitoring wells will be used for performance monitoring of the hydraulic containment system.

The wells were installed with a Rotosonic drill rig operated by Boart Longyear. Continuous soil core samples were obtained during drilling and lithology logs were completed by Anchor geologists. The boring and well construction logs are in Appendix A. The soil cores were screened for the potential presence of NAPL by HAI field staff. The results of the NAPL field screen are in Table 2.

A summary of the lithology encountered in the borings and the monitoring well construction details are in Table 1.

The new monitoring well screen depths were designed to cover key depth intervals in the surficial fill and alluvial water-bearing zones (WBZs) that are not covered by other pre-existing upland monitoring wells. The new well screen depths in relation to the screens in

nearby pre-existing monitoring wells are shown on geologic cross section B-B' in Figure 3. A large scale map of the well locations is on Figure 4. The screen elevations were designed to be approximately equivalent to the screen elevations in nearby wells, subject to design variations resulting from lithologic differences between borings.

Table 1 shows that two wells were installed at location MW-18; well MW-18-30 screened in the surficial fill WBZ from 19 to 29 feet below ground surface (bgs), and well MW-18-180 screened in the alluvial WBZ from 170 to 180 ft bgs. Basalt bedrock was encountered at MW-18 at a depth of 230 ft bgs. The screen intervals at MW-18 complement the screen depths in the nearby MW-3 and MW-16 well clusters. Three monitoring wells were constructed at MW-19; well MW-19-22 screened in the surficial fill WBZ, well MW-19-125 screened in the intermediate depth alluvial WBZ, and well MW-19-180 screened in the lower alluvium. Basalt bedrock at MW-19 was at 222 ft bgs. Well MW-20-120 was installed to complement the screen depths in wells MW-5-100 and MW-5-175. Basalt bedrock was at 206.5 ft bgs at boring MW-20.

The wells were constructed with 2-inch diameter stainless steel wire wrapped screens. Per DEQ's request, a rubber "NAPL funnel" was installed in the well annulus at the base of each screen above the stainless steel sump. Each well was completed with a stickup locking casing surrounded by protective pipes. Each well screen was developed with a Waterra foot valve pumping system. Field measurements of groundwater pH, specific conductance, and temperature were measured during development. The well screens were developed until the pH, specific conductance and temperature stabilized and the pumped water was clear. The water quality data are in the field data sheets in Appendix B.

Well screen development water and purge water from sampling the wells was treated in the on-site granular activated carbon treatment system. Waste soil from drilling and well installation operations is currently stored in a drop box onsite. The drop box also contains waste soil from the shoreline GS borings. Representative samples of soil from the drop box are being tested to determine the appropriate offsite disposal option.

2.2 Sampling

Four of the six new monitoring wells were sampled following well construction and screen development. As they were completed, wells MW-18-180, MW-19-125, MW-19-180, and MW-20-120 were sampled between March 9 and March 29, 2007. The purpose of the sampling was to obtain groundwater quality data in the alluvial WBZ to assist in determining the appropriate capture depth for design of the extraction wells. The new wells installed in the surficial fill WBZ, MW-18-30 and MW-19-22, were not sampled. They will be sampled as part of future upland groundwater monitoring events.

The field sampling details are on the Field Data Sheets in Appendix B. The groundwater samples were tested by Columbia Analytical Services (CAS) for VOCs, semi-VOCs, total cyanide, amenable cyanide, and free cyanide. The laboratory testing methods and the water quality data are shown on Tables 3a, 3b, and 3c.

2.3 Findings

Subsurface profile B-B′ on Figure 3 shows the geologic units encountered in the monitoring well borings. The lithology of the fill and alluvium described in the cores is consistent with the geologic units characterized in the upland RI.

All of the groundwater quality data from the new monitoring wells is listed on Table 3 along with 2006/2007 data from nearby pre-existing monitoring wells. Table 3a contains BTEX, total PAH, free cyanide, amenable cyanide, and total cyanide data. Table 3b lists the concentrations of individual PAHs, and Table 3c lists total metals concentrations.

Groundwater plumes for target analytes benzene, naphthalene, free cyanide, amenable cyanide, and total cyanide are shown on subsurface profile B-B′, Figures 5a through 5e. The NAPL zones identified in the MW-18, -19, and -20 borings by HAI field screening are shown on the Figure 5 profiles. The plume boundaries shown on Figures 5a through 5e are defined primarily by the water quality data from upland monitoring wells, supplemented in some areas with data from groundwater grab samples from previous site borings.

Four of the wells, MW-18-180, MW-19-125, MW-19-180, and MW-20-120 were installed to delineate the depth to which MGP-related COPCs have migrated in the alluvium. Review of the profiles on Figures 5a through 5e show that data from wells MW-19-125 and MW-20-120 helped to confirm that significant concentrations of COPCs have not migrated below the approximate elevation of -100 ft MSL, Portland datum. The data from wells MW-18-180 and MW-19-180 confirm that only trace concentrations of benzene and naphthalene have migrated to the lower portion of the alluvial WBZ.

Amenable and free cyanide species are not detected in the alluvial WBZ below -100 ft elevation. The EPA and DEQ aquatic toxicity criterion for cyanide is based on the free cyanide concentration of 5.2 μg/l.

Soil samples were obtained during drilling at 10 ft depth intervals. Grain size analyses were conducted on all of the samples. The soil grain size data are on Table 4. Grain size curves are plotted on Figures 6a, 6b, and 6c. Use of the grain size data for design of the extraction wells is described in Section 3.

Most of the soil is very fine to medium grain sand, with silty zones, and silt interbeds. There is an increase in grain size with depth in the alluvium that is evident from the data in each boring. Figure 8 contains three bar graphs that plot soil classification vs. depth below ground surface. With respect to grain size there are two primary zones in the alluvium; an upper zone consisting of very fine to fine sand with silt interbeds, and a lower zone consisting primarily of medium sand with silt interbeds. Figure 8 shows that the boundary between these two zones increases in depth from about 100 ft bgs at MW-18 to 120 ft bgs at MW-20.

The increase in grain size results in an increase in the hydraulic conductivity in the alluvial WBZ. The estimated hydraulic conductivity increase is considered in the preliminary capture modeling completed for extraction well design, as described in Section 3.

3 EXTRACTION WELL DESIGN

3.1 Screen Interval

The extraction well screen depth interval is designed so that the well is capable of preventing the migration of dissolved COPCs and NAPL down to a specified depth interval in the alluvium. Based on the water quality data described in Section 2.3, the optimum containment depth is approximately -100 ft MSL. That is the approximate deepest elevation of significant concentrations of MGP-related COPCs.

SS Papadopulos & Associates (SSPA) has developed a groundwater model for the Site using the USGS MODFLOW program (McDonald, M. G. and A. W. Harbaugh, 1988). The model has been used to determine the extraction well screen interval suitable to attain hydraulic containment down to elevation -100 ft MSL. A description of the model and preliminary subsurface particle tracking profiles are described in Section 5.

Most of the groundwater contaminant flux occurring in the Gasco Upstream Zone is in the alluvial WBZ, based on the findings from the Upland RI and the Phase 1 offshore investigation. Therefore the pilot plan proposes to install the extraction wells in the alluvium to provide hydraulic containment in the alluvial WBZ. Water level monitoring completed during the Upland RI has shown a hydraulic connection between the alluvium and the overlying fill at certain near shore locations where the intervening silt unit is thin or absent. Therefore, operation of the extraction wells at near shore locations may affect groundwater levels in the fill. The results of the pilot aquifer test will be used to evaluate long term alternatives for groundwater source control. A Focused Feasibility Study will be conducted that evaluates various alternatives, including hydraulic containment, barrier wall containment, and combination systems.

The pilot extraction well screen depth interval is designed to minimize the pumping of fine grained soil, so the screen interval is adjusted to avoid silt and clay interbeds. The screen interval is also designed to minimize the potential for NAPL to migrate downward through the well annulus/screen from shallow to deeper zones in the alluvium. The well screen interval design is therefore a compromise that is affected by the target containment depth, the avoidance of silt/clay interbeds, and minimization of NAPL drainage down the well screen/annulus.

Well screen depth is also affected by the desire to avoid the potential of cascading water in the well screen during pumping. A shallow extraction well screen that intersects the drawdown cone has an increased potential of cascading water during pumping conditions. Cascading water can result in extraction well malfunction and may cause increased extraction well maintenance challenges and down-time resulting from the formation of precipitates and bacteria slimes on the screen. The Site groundwater is known to contain elevated concentrations of iron and manganese, which could form iron precipitates and iron slimes, requiring higher well screen maintenance costs. Cascading water will also tend to increase the emulsification of water/NAPL mixtures, resulting in more difficult oil/water separation prior to treatment. Therefore, the well screen depth interval is designed to be below the anticipated depth of drawdown under pumping conditions.

The proposed extraction well screen intervals are influenced by all of the above described design criteria. Each well screen has a unique depth interval because the depth of the silt beds is different at each borehole location. The proposed well screen numbers are listed below. The depth of the bottom of each well screen is shown on the well number. For example, extraction well PW-2-115 has a bottom screen depth of 115 ft bgs.

PW-2-115, screen interval 95 to 115 ft bgs
PW-3-93, screen interval 83 to 93 ft bgs
PW-3-116, screen interval 106 to 116 ft bgs
PW-4-85, screen interval 75 to 85 ft bgs
PW-4-118, screen interval 108 to 118 ft bgs

The modeling analysis described in Section 5 was used to estimate the ability of this well array to capture groundwater from the top of the alluvium to approximately 130 feet bgs (approximately -100 ft MSL, Portland Datum).

The well locations are shown on Figure 4. The well screen intervals are shown on the geologic profile, Figure 3, and the groundwater quality profiles on Figure 5.

Four wells are proposed, two each at the PW-3 and PW-4 locations. Two wells with different screen depths are designed to avoid the silt interbeds shown on Figure 3. If one screen was used across the entire vertical zone, this would increase the potential for NAPL movement downward in the well screen/annulus, thereby moving below the silt layers.

3.2 Well and Screen Design

The extraction well casing and screen will be 8 inch diameter. The screen will be stainless steel continuous wire-wrapped screen manufactured by Johnson Division. A diagram of the typical extraction well construction details is on Figure 7.

The grain size testing results were analyzed for the soil cores obtained from the alluvium in the proposed well screen depth intervals. The grain size data were analyzed to design the annular filter pack and well screen slot size. The filter pack was designed following the methods described in Groundwater and Wells (Driscoll, 1986). The filter pack and screen specifications are also based on recommendations from Johnson Division analysts who reviewed the grain size data. The screen slot size and annular sand pack for each well are specified below.

Well Number	Screen Slot Size (inches)	Annular Sand Pack
PW2-115	0.020	16-30
PW3-93	0.020	16-30
PW3-116	0.035	12-20
PW4-85	0.020	16-30
PW4-118	0.035	12-20

The filter pack material is designed to retain most of the fine grained materials in the alluvium. The filtering ability of the larger screen slot size will depend upon successful development of the sand pack to enable filtration of the fine grain fraction of the alluvium. The larger slot size should reduce the frequency of screen cleaning maintenance events.

The stainless steel screen will be welded to the steel casing and installed as a single unit. Each extraction well will have a 10 ft long steel pipe sump below the well screen and per DEQ's request; a "NAPL funnel" will be installed in the well annulus at the base of each screen above the steel sump.

3.3 Well Installation

Several drilling methods were considered for installation of the extraction wells. Well PW1-80 was installed at the Site using Rotosonic drilling methods. PW1-80 is a six-inch diameter well, and the planned extraction wells are 8 inch diameter. Boart Longyear drilling experts maintain that sonic drilling is unsuitable for installing an 8-inch well over 100 feet deep because the outside drill casing will have to be 12 inch diameter. With the larger diameter drill casing, the sonic vibrations are likely to dampen out at the proposed well screen depths. Heave of sand into the casing is particularly troublesome with sonic drilling, based on previous sonic experience at the Site. Air rotary drilling methods were also considered, but rejected because a large volume of contaminated water/solids would be generated, and because of worker health and safety issues potentially caused by entrainment of COPCs in the discharge air.

Boart Longyear recommends the use of cable tool drilling methods for installation of the extraction wells, for the following reasons.

- Cable methods are better suited for controlling formation heave than rotary methods
- It is simpler to control the depth of installation of well screen and casing using cable methods
- There is much less exposure of site workers to COPCs using cable methods

A potential drawback is that cable drilling is slower than rotary methods, in terms of footage drilled per day. For this reason NW Natural proposes to begin drilling as soon as approval can be obtained from DEQ, preferably in May 2007. It may be necessary to mobilize two drill rigs to the Site to allow the wells to be installed by June 27, 2007, as required on the current project schedule.

During installation the 12 inch diameter outer casing will be driven to the proposed depth of the bottom of the steel sump. The cable bit/bailer system will be used to remove formation

material from inside the 12-inch casing as the casing is advanced. The soil/water slurry removed from the casing will be stored onsite in a tank. After the 12-inch casing is down to the target depth, the 8-inch casing/screen assembly will be lowered to the bottom of the 12-inch casing. After the 8-inch casing and screen assembly is set to the correct depth, the filter pack will be placed and a tremie pipe will be used to install the annular well seal, as shown on Figure 7. The 12-inch outer casing will be pulled as the annular material is placed. The driller will make frequent depth measurements using a weighted tape or equivalent method to assure that the annular seal and sand pack depths are correct.

The well annulus sand packs will be thoroughly developed using surging and pumping techniques. The water removed during development will be treated in the on-site carbon treatment system.

The soil/water slurry obtained during drilling will be separated into soil and water components using gravity methods. The soil component will be stored in an on-site drop box for later characterization and landfill disposal. The water will be pumped to the on-site carbon treatment system for discharge to the City of Portland POTW.

4 EXTRACTION WELL TESTING PLAN

4.1 Aquifer Test Plan

Aquifer tests will be conducted at each of the new extraction wells. The aquifer test at each extraction well will consist of the following components and steps.

1. A temporary centrifugal pump capable of a 20 to 40 gpm yield will be installed in the well down inside the steel pipe sump. The pump will be connected to the surface using a support cable and temporary discharge pipe. The pump will be connected to a portable electric power generator. The discharge pipe will be connected to a pipe header leading to the on-site carbon water treatment system. A totalizing flow meter and a sampling port will be installed on the discharge line.
2. Water level transducers will be installed in the pumping well, in the Willamette River on a pier support, and in selected monitoring wells indicated on Table 5.
3. The transducers will be turned on for one week to record static conditions and tidal fluctuations prior to beginning the pump test.
4. The forecasted river tide levels will be reviewed to try and find a period with low tide range for conducting the discharge portion of each test. If such a period can be reasonably used, given other schedule and logistical constraints, this could help minimize the tide induced groundwater level changes during the discharge test.
5. A one day (24 hour) discharge test will be conducted at a constant pumping rate of 20 gpm. Review of water level data from the 2006 HAI PW1-80 test report shows that water levels stabilized in less than 10 hours due to recharge from the river. Water levels will be monitored closely during testing of the new PW wells, and the discharge segment of the test will be stopped if static water level conditions are reached in less than 24 hours. The 20 gpm pumping rate is selected based on the results from the previous HAI pump test at Well PW1-80. The water levels in nearby monitoring wells will be carefully assessed for the first two hours of the test to check that adequate drawdown is being measured in nearby monitoring wells. Professional judgment will be used to determine if the drawdown being observed in nearby wells is large enough to be discernable considering the interference of river tide-induced fluctuations in ground water levels. If adequate drawdown is not being measured, the pump will be shut off to achieve static conditions and the pump restarted at a discharge rate 50% higher, i.e. 30

gpm. This rate should be adequate to achieve drawdown in nearby wells. The one day test will then be conducted at 30 gpm. If 30 gpm is insufficient, the shut down, recovery and restart process will be repeated until a satisfactory drawdown is achieved in nearby monitoring wells. The transducers will be used for continuous water level measurements during the discharge test.

6. A groundwater sample will be obtained from each extraction well at the beginning of the one day constant rate test. A second sample will be obtained just before the pump is turned off at the end of the test. The groundwater samples will be tested for VOCs, PAHs, and total metals as listed on Table 3c.

7. The recovery test will begin when the pump is turned off at the end of the constant rate discharge test. The transducers will continue to make water level readings. The recovery test will end when the water levels reach static conditions.

All five of the planned extraction wells will be tested using the above procedures.

8. The transducers will be left in place for several days following the final test to record tidal fluctuations and groundwater level fluctuations for later use during aquifer test analysis.

4.2 Aquifer Test Analysis

Anchor and SSPA will work together to evaluate the water level data from the aquifer tests to be conducted as described in Section 4.1. The primary purpose of the evaluation will be to determine the aquifer properties of the alluvium, including storage coefficient, hydraulic conductivity, and transmissivity. Those aquifer properties will be used in the MODFLOW model to assess the use of the extraction wells for hydraulic containment, as described in Section 5.

The assessment of the water level data will likely require the use of more than one test method for comparison purposes. The 2005 test of well PW1-80 (HAI, 2006) showed that water level data from testing the extraction wells will be affected by two primary interference factors:

1. effects from the Willamette River recharge boundary
2. daily groundwater level fluctuations induced by river tidal affects on the alluvium

The upland alluvium has a moderate to high tidal efficiency that results in significant daily fluctuations of groundwater levels in nearshore monitoring wells. These tidal fluctuations can mask the drawdown measured in monitoring wells. Because the river is a recharge boundary for the alluvium, the drawdown curve in the pumping well and in observation wells will flatten out when the cone of depression from the pumping well reaches the river. It is expected that recharge effects from the river will flatten out the water levels in the pumping wells and monitoring wells within less than ten hours of initiating each pump test.

HAI used the Hantush-Jacob leaky aquifer analysis method to assess the data from the 2005 aquifer test of well PW1-80. Because of the presence of the river recharge boundary and the river induced tidal fluctuations, the most appropriate analysis method will not be determined until the water level data have been gathered from all of the extraction wells. Anchor will confer with DEQ Hydrogeologists during the analysis process to make the evaluation a collaborative effort.

The transmissivity (T) and storage coefficients (S) determined from the aquifer tests can be further checked with the use of the equation for calculating aquifer properties from tidal time lag data. Transducer data obtained during step 3 (Section 4.1) baseline water level monitoring can be used to calculate the time lag between the river tidal fluctuations and the corresponding groundwater level fluctuations. Tidal time lag data are used in the tidal equation to calculate aquifer T and S (Carr, 1969). For this project we can plug the T and S values derived from the well aquifer tests into the tidal equation to calculate the time lag. If the calculated time lag is close to the field measured time lag, then we will have an independent check of the T and S values derived from the aquifer tests.

5 ANALYSIS OF PILOT STUDY FINDINGS

5.1 Gasco/Siltronic Flow Model

A groundwater model was constructed to achieve four objectives: to assist in design of the pilot test wells; to assist in analysis of pump tests; to evaluate potential for NAPL migration due to increased groundwater gradients from pumping; and to assist in designing a long-term extraction/containment system for the Gasco/Siltronic Site.

The model uses the USGS MODFLOW groundwater flow code and covers the area shown in Figure 9. The model extends to the basalt bluff to the west of the site and to the east side of the Willamette River channel on the east. The northwest and southeast boundaries are treated as no-flow boundaries. The vertical extent of the model is from ground surface to the basalt bedrock underlying the site. The basalt is interpreted as a no-flow boundary at the base of the alluvial aquifer.

The model grid consists of 107 rows and 116 columns with a uniform spacing in both directions of 40 feet by 40 feet. The model consists of 14 layers with one layer representing the fill, 2 layers representing the silty alluvium and 11 layers representing the sandy alluvium. The large number of layers in the sandy alluvium allows more exact location of the pumping well screen intervals and more rigorous evaluation of capture zone effectiveness above and below the screen interval. A typical cross section through the pilot test area is shown in Figure 10.

5.2 Shoreline Source Control Zones

Three source control zones were identified in the *Groundwater Source Control Pilot Plan* (Anchor, 2006).

- **Gasco Upstream Zone.** This zone extends from well MW-3 on the Gasco property to well WS-12 on the Siltronic property. Review of Figures 5a through 5e shows that groundwater in this reach of the Site generally has much higher concentrations of MGP-related constituents than the rest of the Site shoreline.
- **Gasco Downstream Zone.** This zone extends from well MW-3 to the downriver property boundary of Gasco. This zone is primarily characterized by elevated concentrations of cyanide species.

- **Siltronic Zone.** This zone extends from well WS-12 to the upriver property boundary of Siltronic.

The pilot extraction wells are located on the Gasco property portion of the Gasco Upstream Zone. In a May 31, 2006 comment letter DEQ recommended modifying the boundary of the Gasco Upstream Zone to extend farther south on the Siltronic property. As discussed with DEQ subsequently, due to the complexities that arise from possible hydraulic effects on the ongoing Siltronic pilot program, that modification is currently beyond the scope of this plan. NW Natural has been informed that Siltronic is proposing to conduct in-situ remediation of the Siltronic chlorinated solvent groundwater plume. The area of proposed in-situ remediation is coincident with a significant portion of the Gasco Upstream Zone as defined above. Operation of an extraction well hydraulic containment system on the Siltronic property might not be compatible with operation of a concurrent in-situ treatment system on the Siltronic property. NW Natural and Siltronic are meeting regularly to coordinate source control efforts in this area.

In correspondence with DEQ and Siltronic staff, NW Natural has stated that the pilot extraction wells are being designed to hydraulically influence groundwater/NAPL only on the Gasco portion of the Gasco Upstream Zone. However, the information gained from testing the pilot extraction wells can be used in the Groundwater Focused Feasibility Study (GWFFS) to evaluate hydraulic containment system alternatives on the Siltronic property, if the source control alternative selected is or includes hydraulic containment. The data gathered from testing the pilot extraction wells can be used in the GWFFS to evaluate source control alternatives for the Gasco Downstream Zone, if the risk analysis determines that active source control is necessary.

5.3 Evaluation of Hydraulic Containment

The extraction wells are being installed to provide hydraulic containment of groundwater and NAPL along the shoreline. As explained in Section 4, the pilot extraction wells will be tested to allow the determination of aquifer properties in the vicinity of each of the proposed extraction wells. The aquifer properties will be used in the MODFLOW model to design a complete hydraulic containment system using extraction wells in the Gasco Upstream Zone. The model will be used to evaluate the effectiveness of the pilot extraction

wells with the objective of providing containment down to -100 ft MSL. Modeling results may show that the extraction well pumping rates should vary between wells, or that additional extraction wells are needed.

The capture zone evaluation will pair MODFLOW with the particle tracking program Path3D (Zheng, 2001). Path3D uses the head distribution and hydraulic properties from MODFLOW and simulates the movement of groundwater by tracking particles in the flow field. Preliminary simulations of capture zones are shown in Figures 11 and 12. Figure 11 shows a cross section of particle tracks with initial particle locations covering the full depth of the sandy alluvium. The upper profile on Figure 11 shows the particle capture by PW-1 and PW-2 while the lower profile on Figure 11 shows particle capture by PW-3 and PW-4. Figure 12 shows capture zones in plan view. To evaluate the change in capture zone with depth, particles were distributed upgradient of the pilot well locations at the top and bottom of the sandy alluvium (Figures 12a and 12b, respectively). The figures show that the capture zone is wider in the shallow alluvium than in the deep alluvium, which is to be expected since the wells are screened closer to the top of the aquifer.

The hydraulic containment analysis will also include the evaluation of pumping in conjunction with a vertical barrier. The location and depth of a barrier wall will be represented in the MODFLOW model as a low permeability zone. Location and depth of a barrier wall and extraction wells will be tested using the model to evaluate the effectiveness of different wall depths and the pumping rate required to prevent groundwater flow under the wall. As described in the previous section, particle tracking will be used to evaluate groundwater containment by showing whether particles migrate from the site to the river or are captured by the extraction wells.

5.4 NAPL Migration from Upland Source Areas

In previous meetings DEQ has expressed concern that operation of the shoreline pilot extraction wells will cause unacceptable migration of NAPL from upland source areas toward the shoreline. Based on those concerns, NW Natural agreed to significantly shorten the operational period of the pilot study until the data collected from it could be further evaluated. Operation of the shoreline extraction wells is not likely to induce a large enough gradient increase in the potentiometric surface in NAPL source areas to cause significant

migration. NAPL studies at other sites have shown that hydraulic gradients of at least 1 are required to mobilize residual NAPL in alluvial sands similar to those present in the alluvium (Wiedemeier et.al., 1999). Such a high gradient will only be present adjacent to the extraction wells. NAPL has been detected in a few upland monitoring wells, indicating that there are limited areas of mobile NAPL that could be mobilized under a lower gradient than residual NAPL.

Well PW-2 is screened below the NAPL zone in the upper alluvium shown on the Figure 5 subsurface profiles. A proposed short term (24 hours or less) pumping test of well PW-2 is described in Section 4. During that test the increased downward hydraulic gradient could cause downward migration of the NAPL toward PW-2. Considering the short term of the test, the NAPL is unlikely to migrate downward more than a few inches, if at all. If migration does occur, the movement will be toward well PW-2, not toward the river.

The final operational design of the shoreline extraction wells will be determined in the GWFFS. For long term operation, the wells will be pumped at a discharge rate designed to achieve containment. However, the well discharge rate will be balanced to avoid over pumping. Over pumping would induce more river water than necessary to enter the extraction wells, and unnecessarily increase the potentiometric surface gradient in upland areas.

The MODFLOW model will be used to determine how much of a gradient increase will result from pumping the extraction wells. The modeled gradient will be compared with a predicted gradient that could be expected to cause NAPL mobilization from upland source areas.

6 REFERENCES

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TABLES

Table 1
Monitoring Well Construction Details
GASCO/Siltronic
Portland, Oregon

Well ID	Feet Below Ground Surface	Ground Surface Elevation (City of Portland Datum)	Elevation (feet) (City of Portland Datum)	Unit	Materials
MW-18-30	0 to 15	31.7	31.7 to 16.7	Annular seal	Cement/Bentonite chips
	15 to 30	31.7	16.7 to 1.7	Sand pack	10x20 Colorado Silica Sand
	0 to 19	31.7	31.7 to 12.7	Well casing	Schedule 80 PVC
	19 to 29	31.7	12.7 to 2.7	Well screen	Stainless steel wire wrap (0.020 slot size)
	29 to 30	31.7	2.7 to 1.7	Sump	Stainless steel sump
MW-18-180	0 to 166	31.7	31.7 to -134.3	Annular seal	Cement/Bentonite chips
	166 to 181	31.7	-134.3 to -149.3	Sand pack	10x20 Colorado Silica Sand
	0 to 170	31.7	31.7 to -138.3	Well casing	Schedule 80 PVC
	170 to 180	31.7	-138.3 to -148.3	Well screen	Stainless steel wire wrap (0.020 slot size)
	180 to 181	31.7	-148.3 to -149.3	Sump	Stainless steel sump
MW-19-22	0 to 10	27.4	27.4 to 17.4	Annular seal	Cement/Bentonite chips
	10 to 23	27.4	17.4 to 4.4	Sand pack	10x20 Colorado Silica Sand
	0 to 12	27.4	27.4 to 15.4	Well casing	Schedule 80 PVC
	12 to 22	27.4	15.4 to 5.4	Well screen	Stainless steel wire wrap (0.020 slot size)
	22 to 23	27.4	5.4 to 4.4	Sump	Stainless steel sump
MW-19-125	0 to 113	27.2	27.2 to -85.8	Annular seal	Cement/Bentonite chips
	113 to 126	27.2	-85.8 to -98.8	Sand pack	10x20 Colorado Silica Sand
	0 to 115	27.2	27.2 to -87.8	Well casing	Schedule 80 PVC
	115 to 125	27.2	-87.8 to -97.8	Well screen	Stainless steel wire wrap (0.020 slot size)
	125 to 126	27.2	-97.8 to -98.8	Sump	Stainless steel sump
MW-19-180	0 to 167.5	27.3	27.3 to -140.2	Annular seal	Cement/Bentonite chips
	167.5 to 181	27.3	-140.2 to -153.7	Sand pack	10x20 Colorado Silica Sand
	0 to 170	27.3	27.3 to -142.7	Well casing	Schedule 80 PVC
	170 to 180	27.3	-142.7 to -152.7	Well screen	Stainless steel wire wrap (0.020 slot size)
	180 to 181	27.3	-152.7 to -153.7	Sump	Stainless steel sump
MW-20-120	0 to 108	25.6	25.6 to -82.4	Annular seal	Cement/Bentonite chips
	108 to 121	25.6	-82.4 to -95.4	Sand pack	10x20 Colorado Silica Sand
	0 to 110	25.6	25.6 to -84.4	Well casing	Schedule 80 PVC
	110 to 120	25.6	-84.4 to -94.4	Well screen	Stainless steel wire wrap (0.020 slot size)
	120 to 121	25.6	-94.4 to -95.4	Sump	Stainless steel sump

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
Upland Borings														
GS-00	8-Nov-06	Roto-Sonic	85	0 - 1	no	no	no	no	no	no	negative	-	negative	-
				1 - 10	no	no	no	no	no	no	negative	-	negative	-
				10 - 16	**mild**	no	no	no	no	no	negative	-	negative	-
				16 - 19.5	**mild**	no	no	no	no	no	negative	negative	negative	negative
				19.5 - 23	no	no	no	no	no	no	negative	-	negative	-
				23 - 28	**strong**	**yes**	no	no	no	no	negative	negative	negative	negative
				28 - 31.5	no	no	no	no	no	no	negative	-	negative	-
				31.5 - 34.5	no	no	no	no	no	no	negative	-	negative	-
				34.5 - 38	no	no	no	no	no	no	negative	-	negative	-
				38 - 39	**mild**	no	no	no	no	no	negative	-	negative	-
				39 - 41.5	**mild**	no	no	no	no	no	negative	-	negative	-
				41.5 - 45	**mild**	no	no	no	no	no	negative	-	negative	-
				45 - 48	**mild**	no	no	no	no	no	negative	-	negative	-
				48 - 57	**mild**	no	no	no	no	no	negative	negative	negative	negative
				57 - 58	**mild**	no	no	no	no	no	negative	-	negative	-
				58 - 61.5	no	no	no	no	no	no	negative	-	negative	-
				61.5 - 64	no	no	no	no	no	no	negative	-	negative	-
				64 - 67	no	no	no	no	no	no	negative	-	negative	-
				67 - 68	no	no	no	no	no	no	negative	-	negative	-
				68 - 73	no	no	no	no	no	no	negative	-	negative	-
				73 - 76.5	no	no	no	no	no	no	negative	-	negative	-
				76.5 - 80	no	no	no	no	no	no	negative	-	negative	-
				80 - 82.5	no	no	no	no	no	no	negative	-	negative	-
				82.5 - 85	no	no	no	no	no	no	negative	-	negative	-
MW-18	26-Feb-07	Roto-Sonic	230	0 - 3	**mild**	**yes**	no	no	**yes**	no	**Positive**	**Positive**	-	negative
				3 - 6	**strong**	**yes**	**Oily tarry cobble&silt**	no	**yes**	no	**Positive**	**Positive**	-	negative
				6 - 8	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	-	-	negative
				8 - 10	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	-	-	negative
				10 - 11	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	**Positive**	-	negative
				11 - 13	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	-	-	negative
				13 - 14	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	**Positive**	-	negative
				14 - 15	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	**Positive**	-	negative
				15 - 17	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	**Positive**	-	negative
				17 - 19	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	**Positive**	-	negative
				19 - 21	**strong**	**yes**	**as above**	no	**yes**	no	**Positive**	**Positive**	-	negative
				21 - 23	**strong**	**yes**	**as above**	no	no	no	**Positive**	-	-	negative
				23 - 24	**strong**	**yes**	**as above**	no	no	no	**Positive**	-	-	negative
				24 - 26.5	**strong**	**yes**	**as above**	no	no	no	**Positive**	**Positive**	-	negative
				26.5 - 28	**strong**	**yes**	**as above**	no	no	no	**Positive**	-	-	negative
				28 - 30	**strong**	**yes**	**as above**	no	no	no	**Positive**	-	-	negative
				30 - 32	**strong**	**yes**	**as above**	no	no	no	**Positive**	-	-	negative
				32 - 34	**strong**	**yes**	**as above to 33'**	**yes, below 33'**	no	no	**Positive**	**Positive**	-	negative
				34 - 36	**strong**	**yes**	no	**yes**	no	no	**Positive**	-	-	negative
				36 - 38	**strong**	**yes**	no	**yes**	no	no	**Positive**	**Positive**	-	negative
				38 - 40	**strong**	**yes**	no	**yes**	no	no	**Positive**	**Positive**	-	negative
				40 - 42.5	**strong**	**yes**	no	**yes**	no	no	**Positive**	-	-	negative
				42.5 - 45.5	**strong**	**yes**	no	**yes, above 44'**	no	no	**Positive**	**Positive**	-	negative
				45.5 - 47	**strong**	**yes**	**Blebs**	no	no	no	**Positive**	-	-	negative
				47 - 50	**strong**	**yes**	**Blebs**	no	no	no	**Positive**	**Positive**	-	negative
				50 - 53	**strong**	**yes**	no	no	no	no	**Positive**	**Positive**	-	negative
				53 - 56	**mild**	**yes**	no	no	no	no	**Positive**	-	-	negative
				56 - 61.5	**mild**	**yes**	no	no	no	no	negative	negative	-	negative
				61.5 - 68	**mild**	**yes**	no	no	no	no	negative	negative	-	negative
				68 - 75	**mild[3]**	no	no	no	no	no	negative	negative	-	negative
				75 - 76.5	**mild[3]**	no	no	no	no	no	negative	-	-	negative
				76.5 - 80	no	no	no	no	no	no	negative	negative	-	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
MW-18 continued	26-Feb-07	Roto-Sonic	230	80 - 83	**mild**	**yes**	no	no	no	no	negative	negative	-	negative
				83 - 86	no	no	no	no	no	no	negative	-	-	negative
				86 - 89	no	no	no	no	no	no	negative	-	-	negative
				89 - 91	no	no	no	no	no	no	negative	-	-	negative
				91 - 93	no	no	no	no	no	no	negative	negative	-	negative
				93 - 96	no	no	no	no	no	no	negative	-	-	negative
				96 - 98	no	no	no	no	no	no	negative	negative	-	negative
				98 - 100.5	no	no	no	no	no	no	negative	-	-	negative
				100.5 - 103.5	no	no	no	no	no	no	negative	-	-	negative
				103.5 - 106	no	no	no	no	no	no	negative	negative	-	negative
				106 - 108.5	no	no	no	no	no	no	negative	-	-	negative
				108.5 - 111	no	no	no	no	no	no	negative	-	-	negative
				111 - 113.5	no	no	no	no	no	no	negative	-	-	negative
				113.5 - 116	no	no	no	no	no	no	negative	negative	-	negative
				116 - 120	no	no	no	no	no	no	negative	-	-	negative
				120 - 123	no	no	no	no	no	no	negative	-	-	negative
				123 - 126	no	no	no	no	no	no	negative	-	-	negative
				126 - 129	no	no	no	no	no	no	negative	negative	-	negative
				129 - 132	no	no	no	no	no	no	negative	-	-	negative
				132 - 134	no	no	no	no	no	no	negative	-	-	negative
				134 - 137	no	no	no	no	no	no	negative	-	-	negative
				137 - 140	no	no	no	no	no	no	negative	negative	-	negative
				140 - 144	no	no	no	no	no	no	negative	-	-	negative
				144 - 147	no	no	no	no	no	no	negative	-	-	negative
				147 - 150	no	no	no	no	no	no	negative	negative	-	negative
				150 - 153	no	no	no	no	no	no	negative	-	-	negative
				153 - 156	no	no	no	no	no	no	negative	-	-	negative
				156 - 158	no	no	no	no	no	no	negative	-	-	negative
				158 - 161	no	no	no	no	no	no	negative	negative	-	negative
				161 - 164	no	no	no	no	no	no	negative	-	-	negative
				164 - 167	no	no	no	no	no	no	negative	-	-	negative
				167 - 170	no	no	no	no	no	no	negative	negative	-	negative
				170 - 173	no	no	no	no	no	no	negative	-	-	negative
				173 - 176	no	no	no	no	no	no	negative	-	-	negative
				176 - 177	no	no	no	no	no	no	negative	-	-	negative
				177 - 179	no	no	no	no	no	no	negative	-	-	negative
				179 - 181	no	no	no	no	no	no	negative	negative	-	negative
				181 - 184	no	no	no	no	no	no	negative	-	-	negative
				184 - 187	no	no	no	no	no	no	negative	-	-	negative
				187 - 190	no	no	no	no	no	no	negative	-	-	negative
				190 - 193	no	no	no	no	no	no	negative	-	-	negative
				193 - 196	no	no	no	no	no	no	negative	negative	-	negative
				196 - 198	no	no	no	no	no	no	negative	-	-	negative
				198 - 201	no	no	no	no	no	no	negative	negative	-	negative
				201 - 204	no	no	no	no	no	no	negative	negative	-	negative
				204 - 207	no	no	no	no	no	no	negative	-	-	negative
				207 - 210	no	no	no	no	no	no	negative	negative	-	negative
				210 - 213	no	no	no	no	no	no	negative	negative	-	negative
				213 - 216	no	no	no	no	no	no	negative	-	-	negative
				216 - 219	no	no	no	no	no	no	negative	negative	-	negative
				219 - 222	no	no	no	no	no	no	negative	negative	-	negative
				222 - 225	no	no	no	no	no	no	negative	negative	-	negative
				225 - 228	no	no	no	no	no	no	negative	-	-	negative
				228 - 230	no	no	no	no	no	no	negative	negative	-	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
MW-19	4-Mar-07	Roto-Sonic	228	0 - 2	no	no	no	no	no	no	negative	negative	-	negative
				2 - 5	no	no	no	no	no	no	negative	-	-	negative
				5 - 7	no	no	no	no	no	no	negative	-	-	negative
				7 - 10	no	no	no	no	no	no	negative	negative	-	negative
				10 - 12	**mild**	**yes**	no	no	**yes**	no	**Positive**	**Positive**	-	negative
				12 - 15	**mild**	**yes**	**yes**	no	**yes**	no	**Positive**	negative	-	negative
				15 - 17	**mild**	**yes**	**yes@15.5'**	no	**yes @ 15.5'**	no	**Positive**	-	-	negative
				17 - 20	**strong**	**yes**	**yes-oily tar and soil mix**	no	**yes**	no	**Positive**	negative	-	negative
				20 - 22	**strong**	**yes**	no	no	**yes**	**yes**	**Positive**	**Positive**	-	negative
				22 - 25	no	no	no	no	no	no	negative	-	-	negative
				25 - 27	no	no	no	no	no	no	negative	-	-	negative
				27 - 29	no	no	no	no	no	no	negative	-	-	negative
				29 - 31.5	no	no	no	no	no	no	negative	negative	-	negative
				31.5 - 34	no	no	no	no	no	no	negative	-	-	negative
				34 - 37	no	no	no	no	no	no	negative	-	-	negative
				37 - 39	no	no	no	no	no	no	negative	-	-	negative
				39 - 41.5	no	no	no	no	no	no	negative	negative	-	negative
				41.5 - 44	no	no	no	no	no	no	negative	-	-	negative
				44 - 47	no	no	no	no	no	no	negative	-	-	negative
				47 - 50	no	no	no	no	no	no	negative	negative	-	negative
				50 - 53	no	no	no	no	no	no	negative	-	-	negative
				53 - 56	no	no	no	no	no	no	negative	-	-	negative
				56 - 59	no	no	no	no	no	no	negative	-	-	negative
				59 - 61	no	no	no	no	no	no	negative	-	-	negative
				61 - 63	no	no	no	no	no	no	negative	-	-	negative
				63 - 65	no	no	no	no	no	no	negative	negative	-	negative
				65 - 68	no	no	no	no	no	no	negative	-	-	negative
				68 - 70	no	no	no	no	no	no	negative	negative	-	negative
				70 - 73	no	no	no	no	no	no	negative	-	-	negative
				73 - 75	no	no	no	no	no	no	negative	-	-	negative
				75 - 76	no	no	no	no	no	no	negative	-	-	negative
				76 - 78	no	no	no	no	no	no	negative	-	-	negative
				78 - 81	no	no	no	no	no	no	negative	negative	-	negative
				81 - 84	no	no	no	no	no	no	negative	-	-	negative
				84 - 87	no	no	no	no	no	no	negative	-	-	negative
				87 - 90	no	no	no	no	no	no	negative	negative	-	negative
				90 - 92	no	no	no	no	no	no	negative	-	-	negative
				92 - 95	no	no	no	no	no	no	negative	-	-	negative
				95 - 97	no	no	no	no	no	no	negative	-	-	negative
				97 - 100	no	no	no	no	no	no	negative	negative	-	negative
				100 - 103	no	no	no	no	no	no	negative	-	-	negative
				103 - 105	no	no	no	no	no	no	negative	-	-	negative
				105 - 107	no	no	no	no	no	no	negative	-	-	negative
				107 - 110	no	no	no	no	no	no	negative	negative	-	negative
				110 - 113	no	no	no	no	no	no	negative	-	-	negative
				113 - 115	no	no	no	no	no	no	negative	-	-	negative
				115 - 118	no	no	no	no	no	no	negative	negative	-	negative
				118 - 120	no	no	no	no	no	no	negative	-	-	negative
				120 - 122	no	no	no	no	no	no	negative	-	-	negative
				122 - 125	no	no	no	no	no	no	negative	-	-	negative
				125 - 127	no	no	no	no	no	no	negative	-	-	negative
				127 - 130	no	no	no	no	no	no	negative	negative	-	negative
				130 - 133	no	no	no	no	no	no	negative	-	-	negative
				133 - 135	no	no	no	no	no	no	negative	-	-	negative
				135 - 138	no	no	no	no	no	no	negative	-	-	negative
				138 - 140	no	no	no	no	no	no	negative	negative	-	negative
				140 - 143	no	no	no	no	no	no	negative	-	-	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
MW-19 continued	4-Mar-07	Roto-Sonic	228	143 - 145	no	no	no	no	no	no	negative	-	-	negative
				145 - 148	no	no	no	no	no	no	negative	-	-	negative
				148 - 150.5	no	no	no	no	no	no	negative	-	-	negative
				150.5 - 153	no	no	no	no	no	no	negative	negative	-	negative
				153 - 155	no	no	no	no	no	no	negative	-	-	negative
				155 - 158	no	no	no	no	no	no	negative	-	-	negative
				158 - 160	no	no	no	no	no	no	negative	-	-	negative
				160 - 165	no	no	no	no	no	no	negative	negative	-	negative
				165 - 167	no	no	no	no	no	no	negative	-	-	negative
				167 - 170	no	no	no	no	no	no	negative	-	-	negative
				170 - 173	no	no	no	no	no	no	negative	-	-	negative
				173 - 175	no	no	no	no	no	no	negative	-	-	negative
				175 - 179	no	no	no	no	no	no	negative	-	-	negative
				179 - 183	no	no	no	no	no	no	negative	negative	-	negative
				183 - 186	no	no	no	no	no	no	negative	-	-	negative
				186 - 189	no	no	no	no	no	no	negative	-	-	negative
				189 - 192	no	no	no	no	no	no	negative	-	-	negative
				192 - 195	no	no	no	no	no	no	negative	negative	-	negative
				195 - 197	no	no	no	no	no	no	negative	-	-	negative
				197 - 200	no	no	no	no	no	no	negative	-	-	negative
				200 - 203	no	no	no	no	no	no	negative	-	-	negative
				203 - 206	no	no	no	no	no	no	negative	-	-	negative
				206 - 209	no	no	no	no	no	no	negative	-	-	negative
				209 - 212	no	no	no	no	no	no	negative	negative	-	negative
				212 - 215	no	no	no	no	no	no	negative	-	-	negative
				215 - 217	no	no	no	no	no	no	negative	-	-	negative
				217 - 219	no	no	no	no	no	no	negative	-	-	negative
				219 - 220	no	no	no	no	no	no	negative	-	-	negative
				220 - 222	no	no	no	no	no	no	negative	-	-	negative
				222 - 228	no	no	no	no	no	no	negative	negative	-	negative
MW-20	9-Mar-07	Roto-Sonic	211	0 - 2.5	no	no	no	no	no	no	negative	-	-	negative
				2.5 - 4	no	no	no	no	no	no	negative	-	-	negative
				4 - 6	no	no	no	no	no	no	negative	-	-	negative
				6 - 7	no	no	no	no	no	no	negative	-	-	negative
				7 - 9.5	no	no	no	no	no	no	negative	-	-	negative
				9.5 - 12.5	no	no	no	no	no	no	negative	-	-	negative
				12.5 - 15	no	no	no	no	no	no	negative	-	-	negative
				15 - 17	**yes**	**yes**	no	no	**carbon pitch**	no	**Positive**	**Positive**	-	negative
				17 - 20	no	no	no	no	no	no	negative	**Positive**	-	negative
				20 - 30	no	no	no	no	no	no	negative	-	-	negative
				30 - 35	no	no	no	no	no	no	negative	negative	-	negative
				35 - 36	no	no	no	no	no	no	negative	-	-	negative
				36 - 39	no	no	no	no	no	no	negative	-	-	negative
				39 - 41	no	no	no	no	no	no	negative	negative	-	negative
				41 - 44	no	no	no	no	no	no	negative	-	-	negative
				44 - 46	no	no	no	no	no	no	negative	-	-	negative
				46 - 48	no	no	no	no	no	no	negative	-	-	negative
				48 - 51	no	no	no	no	no	no	negative	-	-	negative
				51 - 54	no	no	no	no	no	no	negative	-	-	negative
				54 - 56	no	no	no	no	no	no	negative	-	-	negative
				56 - 57	no	no	no	no	no	no	negative	-	-	negative
				57 - 60	no	no	no	no	no	no	negative	negative	-	negative
				60 - 63	no	no	no	no	no	no	negative	-	-	negative
				63 - 66	no	no	no	no	no	no	negative	-	-	negative
				66 - 69	no	no	no	no	no	no	negative	-	-	negative
				69 - 71	**yes below 70'**	**yes below 70'**	**yes patchy below 70'**	no	no	no	**Positive**	**Positive**	-	negative
				71 - 73	**yes**	**yes**	**yes, patchy**	no	no	no	**Positive**	**Positive**	-	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
MW-20 continued	12-Mar-07	Roto-Sonic	211	73 - 76	**yes**	**yes**	**yes, patchy**	no	no	no	**Positive**	-	-	negative
				76 - 78	**yes**	**yes**	**yes, patchy**	no	no	no	**Positive**	-	-	negative
				78 - 81	**Yes to 79'**	**Yes to 79'**	**yes, patchy to 79'**	no	no	no	**Positive 79'**	**Positive**	-	negative
				81 - 83	no	no	no	no	no	no	negative	-	-	negative
				83 - 85	no	no	no	no	no	no	negative	-	-	negative
				85 - 87	no	no	no	no	no	no	negative	-	-	negative
				87 - 90	no	no	no	no	no	no	negative	-	-	negative
				90 - 93	no	no	no	no	no	no	negative	negative	-	negative
				93 - 96	no	no	no	no	no	no	negative	-	-	negative
				96 - 99	no	no	no	no	no	no	negative	-	-	negative
				99 - 102	no	no	no	no	no	no	negative		-	negative
				102 - 105	no	no	no	no	no	no	negative	-	-	negative
				105 - 108	no	no	no	no	no	no	negative	-	-	negative
				108 - 111	no	no	no	no	no	no	negative	negative	-	negative
				111 - 114	no	no	no	no	no	no	negative	-	-	negative
				114 - 117	no	no	no	no	no	no	negative	-	-	negative
				117 - 118	no	no	no	no	no	no	negative	-	-	negative
				118 - 120	no	no	no	no	no	no	negative	-	-	negative
				120 - 123	no	no	no	no	no	no	negative	negative	-	negative
				123 - 125	no	no	no	no	no	no	negative	-	-	negative
				125 - 128	no	no	no	no	no	no	negative	-	-	negative
				128 - 131	no	no	no	no	no	no	negative	-	-	negative
				131 - 134	no	no	no	no	no	no	negative	-	-	negative
				134 - 137	no	no	no	no	no	no	negative	-	-	negative
				137 - 139	no	no	no	no	no	no	negative	-	-	negative
				139 - 142	no	no	no	no	no	no	negative	negative	-	negative
				142 - 145	no	no	no	no	no	no	negative	-	-	negative
				145 - 148	no	no	no	no	no	no	negative	-	-	negative
				148 - 152	no	no	no	no	no	no	negative	negative	-	negative
				152 - 156	no	no	no	no	no	no	negative	-	-	negative
				156 - 159	no	no	no	no	no	no	negative	-	-	negative
				159 - 162	no	no	no	no	no	no	negative	-	-	negative
				162 - 165	no	no	no	no	no	no	negative	-	-	negative
				165 - 167	no	no	no	no	no	no	negative	-	-	negative
				167 - 169	no	no	no	no	no	no	negative	-	-	negative
				169 - 172	no	no	no	no	no	no	negative	negative	-	negative
				172 - 175	no	no	no	no	no	no	negative	-	-	negative
				175 - 179	no	no	no	no	no	no	negative	-	-	negative
				179 - 183	no	no	no	no	no	no	negative	-	-	negative
				183 - 186	no	no	no	no	no	no	negative	-	-	negative
				186 - 189	no	no	no	no	no	no	negative	-	-	negative
				189 - 191	no	no	no	no	no	no	negative	-	-	negative
				191 - 194	no	no	no	no	no	no	negative	-	-	negative
				194 - 196	no	no	no	no	no	no	negative	-	-	negative
				196 - 198	no	no	no	no	no	no	negative	-	-	negative
				198 - 200	no	no	no	no	no	no	negative	negative	-	negative
				200 - 203	no	no	no	no	no	no	negative	-	-	negative
				203 - 205	no	no	no	no	no	no	negative	-	-	negative
				205 - 208	no	no	no	no	no	no	negative	-	-	negative
				208 - 211	no	no	no	no	no	no	negative	negative	-	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
In-Water Borings														
GS-01	3-Jan-07	Roto-Sonic	80	0.0 - 2.0	**mild**	**yes**	no	no	no	no	negative	negative	negative	negative
				2.0 - 4.0	**mild**	**yes**	no	no	no	no	negative	negative	negative	negative
				4.0 - 10.0	**mild**	no	no	no	no	no	negative	negative	negative	negative
				10.0 - 14.5	**mild**	**yes**	no	no	no	no	negative	negative	negative	negative
				18.5 - 23.0	**strong**	no	no	no	no	no	negative	negative	negative	negative
				23.0 - 28.5	**mild**	no	no	no	no	no	negative	-	negative	negative
				28.5 - 30.5	**mild**	no	no	no	no	no	negative	negative	negative	negative
				30.5 - 33.0	**mild**	no	no	no	no	no	negative	negative	negative	negative
				33.0 - 35.0	**mild**	no	no	no	no	no	negative	-	negative	negative
				35.0 - 37.5	no	no	no	no	no	no	negative	-	negative	negative
				37.5 - 40.0	**mild**	no	no	no	no	no	negative	-	negative	negative
				40.0 - 42.5	no	no	no	no	no	no	negative	-	negative	negative
				42.5 - 45.5	no	no	no	no	no	no	negative	-	negative	negative
				45.5 - 48.0	no	no	no	no	no	no	negative	-	negative	negative
				48.0 - 50.0	no	no	no	no	no	no	negative	-	negative	negative
				50.0 - 52.0	no	no	no	no	no	no	negative	-	negative	negative
				52.0 - 54.5	no	no	no	no	no	no	negative	-	negative	negative
				54.5 - 57.0	no	no	no	no	no	no	negative	negative	negative	negative
				57.0 - 59.0	no	no	no	no	no	no	negative	-	negative	negative
				59.0 - 61.5	no	no	no	no	no	no	negative	-	negative	negative
				61.5 - 63.5	no	no	no	no	no	no	negative	-	negative	negative
				63.5 - 66.0	no	no	no	no	no	no	negative	-	negative	negative
				66.0 - 68.5	no	no	no	no	no	no	negative	-	negative	negative
				68.5 - 70.5	no	no	no	no	no	no	negative	negative	negative	negative
				70.5 - 73.0	no	no	no	no	no	no	negative	-	negative	negative
				73.0 - 76.5	no	no	no	no	no	no	negative	-	negative	negative
				76.5 - 77.5	no	no	no	no	no	no	negative	-	negative	negative
				77.5 - 78.0	no	no	no	no	no	no	negative	-	negative	negative
				78.0 - 79.5	no	no	no	no	no	no	negative	negative	negative	negative
				79.5 - 80.0	no	no	no	no	no	no	negative	-	negative	negative
GS-02	4-Jan-07	Roto-Sonic	90	0.0 - 4.0	**strong (to 1')**	no	no	no	no	no	negative	negative	negative	negative
				4.0 - 8.0	no	no	no	no	no	no	negative	-	negative	negative
				8.0 - 11.5	no	no	no	no	no	no	negative	-	negative	negative
				11.5 - 15.5	no	no	no	no	no	no	negative	-	negative	negative
				15.5 - 19.0	no	no	no	no	no	no	negative	-	negative	negative
				19.0 - 23.0	no	no	no	no	no	no	negative	negative	negative	negative
				23.0 - 24.0	no	no	no	no	no	no	negative	-	negative	negative
				24.0 - 26.0	no	no	no	no	no	no	negative	-	negative	negative
				26.0 - 27.0	no	no	no	no	no	no	negative	-	negative	negative
				27.0 - 29.5	no	no	no	no	no	no	negative	-	negative	negative
				29.5 - 32.0	no	no	no	no	no	no	negative	-	negative	negative
				32.0 - 34.5	no	no	no	no	no	no	negative	-	negative	negative
				34.5 - 36.0	no	no	no	no	no	no	negative	-	negative	negative
				36.0 - 38.0	no	no	no	no	no	no	negative	negative	negative	negative
				38.0 - 42.0	no	no	no	no	no	no	negative	-	negative	negative
				42.0 - 44.0	no	no	no	no	no	no	negative	-	negative	negative
				44.0 - 46.0	no	no	no	no	no	no	negative	-	negative	negative
				46.0 - 48.0	no	no	no	no	no	no	negative	-	negative	negative
				48.0 - 52.5	no	no	no	no	no	no	negative	-	negative	negative
				52.5 - 56.5	no	no	no	no	no	no	negative	-	negative	negative
				56.5 - 60.0	no	no	no	no	no	no	negative	-	negative	negative
				60.0 - 63.0	no	no	no	no	no	no	negative	-	negative	negative
				63.0 - 66.0	no	no	no	no	no	no	negative	-	negative	negative
				66.0 - 69.5	no	no	no	no	no	no	negative	-	negative	negative
				69.5 - 73.0	no	no	no	no	no	no	negative	-	negative	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-02 continued	4-Jan-07	Roto-Sonic	90	73.0 - 75.5	no	no	no	no	no	no	negative	-	negative	negative
				75.5 - 78.0	no	no	no	no	no	no	negative	-	negative	negative
				78.0 - 80.5	no	no	no	no	no	no	negative	-	negative	negative
				80.5 - 83.0	no	no	no	no	no	no	negative	-	negative	negative
				83.0 - 86.0	no	no	no	no	no	no	negative	-	negative	negative
				86.0 - 90.0	no	no	no	no	no	no	negative	-	negative	negative
GS-03	3-Jan-07	Roto-Sonic	123.5	0.0 - 2.5	**strong**	**yes**	no	no	no	no	**Positive**	negative	negative	negative
				2.5 - 6.0	**strong**	**yes**	no	no	no	no	**Positive**	negative	negative	negative
				6.0 - 10.0	**mild**	no	no	no	no	no	negative	negative	negative	negative
				10.0 - 13.5	**mild**	no	no	no	no	no	negative	negative	negative	negative
				13.5 - 17.0	**mild**	no	no	no	no	no	negative	negative	negative	negative
				17.0 - 19.0	**mild**	no	no	no	no	no	negative	negative	negative	negative
				19.0 - 22.0	**mild**	no	no	no	no	no	negative	negative	negative	negative
				22.0 - 23.0	**mild**	no	no	no	no	no	negative	-	negative	negative
				23.0 - 26.0	**mild**	no	no	no	no	no	negative	-	negative	negative
				26.0 - 29.0	**mild**	no	no	no	no	no	negative	-	negative	negative
				29.0 - 32.0	**mild**	no	no	no	no	no	negative	-	negative	negative
				32.0 - 35.5	**mild**	no	no	no	no	no	negative	-	negative	negative
				35.5 - 39.0	no	no	no	no	no	no	negative	negative	negative	negative
				39.0 - 43.0	no	no	no	no	no	no	negative	-	negative	negative
				43.0 - 48.0	no	no	no	no	no	no	negative	-	negative	negative
				48.0 - 50.0	no	no	no	no	no	no	negative	-	negative	negative
				50.0 - 52.0	no	no	no	no	no	no	negative	-	negative	negative
				52.0 - 54.5	no	no	no	no	no	no	negative	-	negative	negative
				54.5 - 56.5	no	no	no	no	no	no	negative	-	negative	negative
				56.5 - 60.0	no	no	no	no	no	no	negative	-	negative	negative
				60.0 - 63.5	no	no	no	no	no	no	negative	-	negative	negative
				63.5 - 68.0	no	no	no	no	no	no	negative	-	negative	negative
				68.0 - 70.0	no	no	no	no	no	no	negative	-	negative	negative
				70.0 - 73.0	no	no	no	no	no	no	negative	-	negative	negative
				73.0 - 75.0	no	no	no	no	no	no	negative	-	negative	negative
				75.0 - 78.0	no	no	no	no	no	no	negative	-	negative	negative
				78.0 - 81.0	no	no	no	no	no	no	negative	-	negative	negative
				81.0 - 83.0	no	no	no	no	no	no	negative	negative	negative	negative
				83.0 - 84.5	no	no	no	no	no	no	negative	-	negative	negative
				84.5 - 87.0	no	no	no	no	no	no	negative	-	negative	negative
				87.0 - 89.0	no	no	no	no	no	no	negative	-	negative	negative
				89.0 - 92.0	no	no	no	no	no	no	negative	-	negative	negative
				92.0 - 94.0	no	no	no	no	no	no	negative	-	negative	negative
				94.0 - 98.0	no	no	no	no	no	no	negative	-	negative	negative
				98.0 - 100.5	no	no	no	no	no	no	negative	-	negative	negative
				100.5 - 103.5	no	no	no	no	no	no	negative	-	negative	negative
				103.5 - 106.5	no	no	no	no	no	no	negative	negative	negative	negative
				106.5 - 109.5	no	no	no	no	no	no	negative	-	negative	negative
				109.5 - 112.0	no	no	no	no	no	no	negative	-	negative	negative
				112.0 - 115.0	no	no	no	no	no	no	negative	-	negative	negative
				115.0 - 118.0	no	no	no	no	no	no	negative	-	negative	negative
				118.0 - 120.5	no	no	no	no	no	no	negative	negative	negative	negative
				120.5 - 123.5	no	no	no	no	no	no	negative	negative	negative	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-04	18-Dec-06	Roto-Sonic	148	0.0 - 3.0	no	no	no	no	no	no	negative	negative	negative	negative
				3.0 - 9.0	no	no	no	no	no	no	negative	-	negative	negative
				9.0 - 15.0	no	no	no	no	no	no	-	-	negative	negative
				15.0 - 21.0	no	no	no	no	no	no	negative	negative	negative	negative
				21.0 - 27.0	no	no	no	no	no	no	negative	-	negative	negative
				27.0 - 30.0	no	no	no	no	no	no	-	-	negative	negative
				30.0 - 35.0	no	no	no	no	no	no	negative	-	negative	negative
				35.0 - 41.5	no	no	no	no	no	no	negative	-	negative	negative
				41.5 - 45.0	no	no	no	no	no	no	negative	-	negative	negative
				45.0 - 48.0	-	-	-	-	-	-	-	-	-	-
				48.0 - 50.0	no	no	no	no	no	no	negative	-	negative	negative
				50.0 - 54.5	no	no	no	no	no	no	negative	-	negative	negative
				54.5 - 59.0	no	no	no	no	no	no	negative	-	negative	negative
				59.0 - 63.5	no	no	no	no	no	no	negative	-	negative	negative
				63.5 - 68.5	no	no	no	no	no	no	negative	-	negative	negative
				68.5 - 73.0	no	no	no	no	no	no	negative	-	negative	negative
				73.0 - 75.0	no	no	no	no	no	no	-	-	negative	negative
				75.0 - 78.0	no	no	no	no	no	no	negative	-	negative	negative
				78.0 - 81.0	no	no	no	no	no	no	negative	-	negative	negative
				81.0 - 83.5	no	no	no	no	no	no	negative	-	negative	negative
				83.5 - 86.0	no	no	no	no	no	no	negative	-	negative	negative
				86.0 - 88.0	no	no	no	no	no	no	negative	-	negative	negative
				88.0 - 91.0	no	no	no	no	no	no	negative	-	negative	negative
				91.0 - 93.0	no	no	no	no	no	no	negative	-	negative	negative
				93.0 - 98.0	no	no	no	no	no	no	negative	-	negative	negative
				98.0 - 103.5	**sweet odor[3]**	no	no	no	no	no	negative	-	negative	negative
				103.5 - 106.5	**sweet odor[3]**	no	no	no	no	no	negative	-	negative	negative
				106.5 - 109.0	**sweet odor[3]**	no	no	no	no	no	negative	-	negative	negative
				109.0 - 111.5	**sweet odor[3]**	no	no	no	no	no	negative	-	negative	negative
				111.5 - 117.5	no	no	no	no	no	no	negative	-	negative	negative
				117.5 - 120.0	no	no	no	no	no	no	negative	-	negative	negative
				120.0 - 123.0	no	no	no	no	no	no	negative	-	negative	negative
				123.0 - 126.5	no	no	no	no	no	no	negative	-	negative	negative
				126.5 - 130.0	no	no	no	no	no	no	negative	-	negative	negative
				130.0 - 133.5	no	no	no	no	no	no	negative	-	negative	negative
				133.5 - 137.0	no	no	no	no	no	no	negative	-	negative	negative
				137.0 - 139.0	no	no	no	no	no	no	negative	-	negative	negative
				139.0 - 142.5	no	no	no	no	no	no	negative	-	negative	negative
				142.5 - 145.0	no	no	no	no	no	no	negative	-	negative	negative
				145.0 - 148.0	no	no	no	no	no	no	negative	-	negative	negative
GS-05	3-Nov-06	Roto-Sonic	200	0.0 - 5.0	**strong**	**yes**	no	no	no	no	negative	negative	negative	negative
				5 - 13	**strong**	**yes**	no	no	no	no	negative	-	negative	negative
				13 - 17	**mild**	no	no	no	no	no	negative	-	negative	-
				17 - 21	no	no	no	no	no	no	negative	-	negative	-
				21 - 23	**mild**	no	no	no	no	no	negative	-	negative	-
				23 - 25	no	no	no	no	no	no	negative	-	negative	-
				25 - 28	**mild**	no	no	no	no	no	negative	-	negative	-
				28 - 28.5	no	no	no	no	no	no	negative	-	negative	-
				28.5 - 33.5	no	no	no	no	no	no	negative	-	negative	-
				33.5 - 38	no	no	no	no	no	no	negative	-	negative	-
				38 - 39	no	no	no	no	no	no	negative	-	negative	-
				39 - 42	no	no	no	no	no	no	negative	-	negative	-
				42 - 45	no	no	no	no	no	no	negative	-	negative	-
				45 - 48	no	no	no	no	no	no	negative	-	negative	-
				48 - 52	**mild[3]**	no	no	no	no	no	negative	negative	negative	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-05 continued	3-Nov-06	Roto-Sonic	200	52 - 55	**mild[3]**	no	no	no	no	no	negative	-	negative	
				55 - 59	**mild[3]**	no	no	no	no	no	negative	-	negative	
				59 - 64	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				64 - 68	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				68 - 73	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				73 - 78	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				78 - 79	**moderate**	no	no	no	no	no	negative	negative	negative	negative
				79 - 82	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				82 - 85	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				85 - 88	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				88 - 89	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				89 - 92	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				92 - 95	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				95 - 98	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				98 - 108	-	no	no	no	no	no	negative	-	negative	-
				108 - 111	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				111 - 113	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				113 - 116	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				116 - 119.5	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				119.5 - 123	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				123 - 125	**strong[3]**	no	no	no	no	no	negative	negative	negative	negative
				125 - 128	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				128 - 131	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				131 - 134.5	**moderate[3]**	no	no	no	no	no	negative	negative	negative	-
				134.5 - 138	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				138 - 139.5	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				139.5 - 142.5	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				142.5 - 145.5	**moderate[3]**	no	no	no	no	no	negative	-	negative	-
				145.5 - 148	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				148 - 150	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				150 - 153	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				153 - 156.5	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				156.5 - 160	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				160 - 163	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				163 - 173	**mild[3]**	no	no	no	no	no	negative	-	negative	-
				173 - 180	**mild[3]**	no	no	no	no	no	negative	negative	negative	-
				180 - 184	**mild[3]**	no	no	no	no	no	negative	-	negative	negative
				184 - 187	no	no	no	no	no	no	negative	-	negative	-
				187 - 190	no	no	no	no	no	no	negative	-	negative	-
				190 - 193.5	no	no	no	no	no	no	negative	-	negative	-
				193.5 - 196.5	no	no	no	no	no	no	negative	-	negative	-
				196.5 - 200	no	no	no	no	no	no	negative	-	negative	-
GS-06	30-Jan-07	Roto-Sonic	148	0.0 - 0.5	no	no	no	no	no	no	negative	-	negative	negative
				0.5 - 4.0	no	no	no	no	no	no	negative	-	negative	negative
				4.0 - 7.0	no	no	no	no	no	no	negative	negative	negative	negative
				7.0 - 20	**mild**	no	no	no	no	no	negative	-	negative	negative
				20 - 23	no	no	no	no	no	no	negative	-	negative	negative
				23 - 27	no	no	no	no	no	no	negative	-	negative	negative
				27 - 33	no	no	no	no	no	no	negative	negative	negative	negative
				33 - 38.5	no	no	no	no	no	no	negative	-	negative	negative
				38.5 - 43	no	no	no	no	no	no	negative	-	negative	negative
				43 - 48	no	no	no	no	no	no	negative	-	negative	negative
				48 - 52	no	no	no	no	no	no	negative	-	negative	negative
				52 - 56.5	no	no	no	no	no	no	negative	-	negative	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-06 continued	30-Jan-07	Roto-Sonic	148	56.5 - 60.5	**sweet(mild)[3]**	no	no	no	no	no	negative	negative	negative	negative
				60.5 - 65	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				65 - 69	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				69 - 73	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				73 - 76	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				76 - 80	**sweet(mild)[3]**	no	no	no	no	no	negative	negative	negative	negative
				80 - 83	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				83 - 86.5	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				86.5 - 89.5	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				89.5 - 92.5	**sweet(mild)[3]**	no	no	no	no	no	negative	negative	negative	negative
				92.5 - 95	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				95 - 98	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				98 - 101.5	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				101.5 - 106	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				106 - 110	**sweet(mild)[3]**	no	no	no	no	no	negative	-	negative	negative
				110 - 115	no	no	no	no	no	no	negative	-	negative	negative
				115 - 119	no	no	no	no	no	no	negative	-	negative	negative
				119 - 123	no	no	no	no	no	no	negative	negative	negative	negative
				123 - 127	no	no	no	no	no	no	negative	-	negative	negative
				127 - 130.5	no	no	no	no	no	no	negative	-	negative	negative
				130.5 - 133.5	no	no	no	no	no	no	negative	-	negative	negative
				133.5 - 137	no	no	no	no	no	no	negative	-	negative	negative
				137 - 139	no	no	no	no	no	no	negative	-	negative	negative
				139 - 142.5	no	no	no	no	no	no	negative	-	negative	negative
				142.5 - 145	no	no	no	no	no	no	negative	-	negative	negative
				145 - 148	no	no	no	no	no	no	negative	negative	negative	negative
GS-07	1-Nov-06	Roto-Sonic	193	0 - 3	**mild**	no	no	no	no	no	negative	-	negative	-
				3 - 10	**strong**	**yes**	no	no	no	no	negative	**Positive**	negative	negative
				10 - 15	**strong**	**yes**	no	no	no	no	negative	negative	negative	negative
				15 - 23	**mild**	no	no	no	no	no	negative	negative	negative	-
				23 - 28	**mild**	**yes**	no	no	no	no	negative	-	negative	negative
				28 - 30	no	no	no	no	no	no	negative	negative	negative	-
				30 - 34	no	no	no	no	no	no	negative	negative	negative	-
				34 - 38	**mild**	no	no	no	no	no	negative	negative	negative	-
				38 - 41	**mild**	no	no	no	no	no	negative	-	negative	-
				41 - 44	**mild**	no	no	no	no	no	negative	negative	negative	-
				44 - 48	**mild**	no	no	no	no	no	negative	negative	negative	-
				48 - 53	**mild**	no	no	no	no	no	negative	-	negative	-
				53 - 56	**mild**	no	no	no	no	no	negative	-	negative	-
				56 - 60	**mild**	no	no	no	no	no	negative	negative	negative	-
				60 - 63	**mild**	no	no	no	no	no	negative	-	negative	-
				63 - 64	**mild**	no	no	no	no	no	negative	-	negative	-
				64 - 67	**mild**	no	no	no	no	no	negative	-	negative	-
				67 - 70	**mild**	no	no	no	no	no	negative	negative	negative	-
				70 - 73	**mild**	no	no	no	no	no	negative	-	negative	-
				73 - 78	**mild**	no	no	no	no	no	negative	-	negative	-
				78 - 80	**mild**	no	no	no	no	no	negative	-	negative	-
				80 - 84	**mild**	no	no	no	no	no	negative	-	negative	-
				84 - 88	**mild**	no	no	no	no	no	negative	-	negative	-
				88 - 89	**mild**	no	no	no	no	no	negative	-	negative	negative
				89 - 92	no	no	no	no	no	no	negative	-	negative	-
				92 - 95	no	no	no	no	no	no	negative	-	negative	-
				95 - 98	no	no	no	no	no	no	negative	-	negative	-
				98 - 103	no	no	no	no	no	no	negative	-	negative	-

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-07 continued	1-Nov-06	Roto-Sonic	193	103 - 106	no	no	no	no	no	no	negative	-	negative	-
				106 - 109	no	no	no	no	no	no	negative	-	negative	-
				109 - 113	no	no	no	no	no	no	negative	-	negative	-
				113 - 117	no	no	no	no	no	no	negative	-	negative	-
				117 - 120	no	no	no	no	no	no	negative	-	negative	-
				120 - 123	no	no	no	no	no	no	negative	-	negative	-
				123 - 128	no	no	no	no	no	no	negative	-	negative	-
				128 - 132.5	no	no	no	no	no	no	negative	-	negative	-
				132.5 - 138	no	no	no	no	no	no	negative	-	negative	-
				138 - 142	no	no	no	no	no	no	negative	-	negative	-
				142 - 145	no	no	no	no	no	no	negative	negative	negative	-
				145 - 148	no	no	no	no	no	no	negative	-	negative	-
				148 - 153	no	no	no	no	no	no	**Positive[1]**	negative	negative	negative
				153 - 156.5	no	no	no	no	no	no	negative	-	negative	-
				156.5 - 160	no	no	no	no	no	no	negative	-	negative	-
				160 - 163	no	no	no	no	no	no	negative	-	negative	-
				163 - 164	no	no	no	no	no	no	negative	-	negative	-
				164 - 167	no	no	no	no	no	no	negative	-	negative	-
				167 - 170	no	no	no	no	no	no	negative	-	negative	-
				170 - 173	no	no	no	no	no	no	negative	-	negative	-
				173 - 174.5	no	no	no	no	no	no	negative	-	negative	-
				174.5 - 177	no	no	no	no	no	no	negative	-	negative	-
				177 - 180	no	no	no	no	no	no	negative	-	negative	-
				180 - 183	no	no	no	no	no	no	negative	-	negative	-
				183 - 185	no	no	no	no	no	no	negative	negative	negative	-
				185 - 186.5	no	no	no	no	no	no	negative	-	negative	-
				186.5 - 188.5	no	no	no	no	no	no	negative	-	negative	-
				188.5 - 191.5	no	no	no	no	no	no	negative	-	negative	-
				191.5 - 193	no	no	no	no	no	no	negative	-	negative	-
GS-08	6-Nov-06	Roto-Sonic	148	0 - 4	**strong**	**yes**	no	no	no	no	negative	negative	negative	negative
				4 - 9	**strong**	**yes**	no	no	no	**Yes (5.5'-6.0')**	**Positive**	**Positive**	**Positive**	negative
				9 - 14	**strong**	no	no	no	no	no	negative	negative	negative	-
				14 - 19	**mild**	no	no	no	no	no	negative	negative	negative	negative
				19 - 23	**mild**	no	no	no	no	no	negative	-	negative	-
				23 - 30	**mild**	no	no	no	no	no	negative	-	negative	-
				30 - 33	**mild**	no	no	no	no	no	negative	-	negative	-
				33 - 38	**mild**	no	no	no	no	no	negative	-	negative	-
				38 - 43	**mild**	no	no	no	no	no	negative	-	negative	-
				43 - 45	**mild**	no	no	no	no	no	negative	-	negative	-
				45 - 48	**mild**	no	no	no	no	no	negative	-	negative	-
				48 - 53	**mild**	no	no	no	no	no	negative	-	negative	-
				53 - 63	**mild**	no	no	no	no	no	negative	negative	negative	negative
				63 - 65	**mild**	no	no	no	no	no	negative	-	negative	-
				65 - 67	**mild**	no	no	no	no	no	negative	-	negative	-
				67 - 70	**mild**	no	no	no	no	no	negative	-	negative	-
				70 - 73	**mild**	no	no	no	no	no	negative	-	negative	-
				73 - 79	**mild**	no	no	no	no	no	negative	-	negative	-
				79 - 84	**mild**	no	no	no	no	no	negative	-	negative	-
				84 - 88	**mild**	no	no	no	no	no	negative	-	negative	-
				88 - 90	**mild**	no	no	no	no	no	negative	-	negative	-
				90 - 92	**mild**	no	no	no	no	no	negative	-	negative	-
				92 - 95	**mild**	no	no	no	no	no	negative	-	negative	-
				95 - 98	**mild**	no	no	no	no	no	negative	-	negative	-
				98 - 106	**mild**	no	no	no	no	no	negative	-	negative	-
				106 - 113	**mild**	no	no	no	no	no	negative	-	negative	-

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-08 continued	6-Nov-06	Roto-Sonic	148	113 - 115	**mild**	no	no	no	no	no	negative	-	negative	-
				115 - 118	**mild**	no	no	no	no	no	negative	-	negative	-
				118 - 120	**mild**	no	no	no	no	no	negative	-	negative	-
				120 - 123	**mild**	no	no	no	no	no	negative	-	negative	-
				123 - 125	**mild**	no	no	no	no	no	negative	-	negative	-
				125 - 128	**mild**	no	no	no	no	no	negative	-	negative	-
				128 - 129	**mild**	no	no	no	no	no	negative	negative	negative	negative
				129 - 132	no	no	no	no	no	no	negative	-	negative	-
				132 - 135	no	no	no	no	no	no	negative	-	negative	-
				135 - 138	no	no	no	no	no	no	negative	-	negative	-
				138 - 141	no	no	no	no	no	no	negative	-	negative	-
				141 - 145	no	no	no	no	no	no	negative	-	negative	-
				145 - 148	no	no	no	no	no	no	negative	-	negative	-
GS-09	11-Oct-06	Roto-Sonic	187	0 - 2.5	**mild**	**yes**	no	no	no	no	**Positive**	-	negative	negative
				2.5 - 9	**mild**	**yes**	no	no	no	no	**Positive**	-	negative	negative
				9 - 11	**mild**	**yes**	no	no	no	no	**Positive**	negative	negative	negative
				11 - 14	**mild**	no	no	no	no	no	**Positive**	-	negative	negative
				14 - 16.5	**mild**	no	no	no	no	no	**Positive**	-	negative	negative
				16.5 - 23	**mild**	no	no	no	no	no	**Positive**	negative	negative	negative
				23 - 24.5	**mild**	no	no	no	no	no	negative	negative	negative	negative
				24.5 - 28	**mild**	no	no	no	no	no	negative	-	negative	negative
				28 - 30	**mild**	no	no	no	no	no	negative	-	negative	negative
				30 - 33	**mild**	no	no	no	no	no	negative	-	negative	negative
				33 - 35	**mild**	no	no	no	no	no	**Positive**	negative	negative	negative
				35 - 38	**mild**	no	no	no	no	no	negative	negative	negative	-
				38 - 43	**mild**	no	no	no	no	no	negative	negative	negative	-
				43 - 45	**mild**	no	no	no	no	no	negative	-	negative	-
				45 - 48	**mild**	no	no	no	no	no	negative	-	negative	-
				48 - 50	**mild**	no	no	no	no	no	negative	negative	negative	-
				50 - 53	**mild**	no	no	no	no	no	negative	-	negative	-
				53 - 55.5	**mild**	no	no	no	no	no	negative	-	negative	-
				55.5 - 58	**mild**	no	no	no	no	no	negative	-	negative	-
				58 - 59	**mild**	no	no	no	no	no	negative	-	negative	-
				59 - 62	**mild**	no	no	no	no	no	negative	-	negative	-
				62 - 65	**strong**	no	no	no	no	no	negative	-	negative	negative
				65 - 68	**strong**	no	no	no	no	no	negative	negative	negative	negative
				68 - 70.5	**strong**	no	no	no	no	no	negative	-	negative	negative
				70.5 - 73	**strong**	no	no	no	no	no	negative	-	negative	-
				73 - 76	**strong**	no	no	no	no	no	negative	negative	negative	-
				76 - 79	**strong**	no	no	no	no	no	negative	-	negative	-
				79 - 81	**strong**	no	no	no	no	no	negative	-	negative	-
				81 - 83	**mild**	no	no	no	no	no	negative	-	negative	-
				83 - 85	**mild**	no	no	no	no	no	negative	negative	negative	-
				85 - 87.5	**mild**	no	no	no	no	no	negative	-	negative	-
				87.5 - 90.5	**mild**	no	no	no	no	no	negative	-	negative	-
				90.5 - 93	**mild**	no	no	no	no	no	negative	-	negative	-
				93 - 95.5	**mild**	no	no	no	no	no	negative	negative	negative	-
				95.5 - 98	**mild**	no	no	no	no	no	negative	-	negative	-
				98 - 100	**mild**	no	no	no	no	no	negative	-	negative	-
				100 - 103	**mild**	no	no	no	no	no	negative	-	negative	-
				103 - 105.5	**mild**	no	no	no	no	no	negative	negative	negative	-
				105.5 - 108	none	no	no	no	no	no	negative	-	negative	-
				108 - 109	none	no	no	no	no	no	negative	-	negative	-

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-09 continued	11-Oct-06	Roto-Sonic	187	109 - 111	none	no	no	no	no	no	negative	negative	negative	-
				111 - 113	none	no	no	no	no	no	negative	-	negative	-
				113 - 116.5	none	no	no	no	no	no	negative	-	negative	-
				116.5 - 120	none	no	no	no	no	no	negative	-	negative	-
				120 - 123	none	no	no	no	no	no	negative	-	negative	-
				123 - 125.5	none	no	no	no	no	no	negative	negative	negative	-
				125.5 - 129.5	none	no	no	no	no	no	negative	-	negative	-
				129.5 - 133	none	no	no	no	no	no	negative	-	negative	-
				133 - 136	none	no	no	no	no	no	negative	-	negative	-
				136 - 139.5	none	no	no	no	no	no	negative	negative	negative	-
				139.5 - 143	none	no	no	no	no	no	negative	-	negative	-
				143 - 145	none	no	no	no	no	no	negative	-	negative	-
				145 - 153	none	no	no	no	no	no	negative	negative	negative	-
				153 - 154	none	no	no	no	no	no	negative	-	negative	-
				154 - 158	none	no	no	no	no	no	negative	-	negative	-
				158 - 161	none	no	no	no	no	no	negative	-	negative	-
				161 - 164	none	no	no	no	no	no	negative	negative	negative	-
				164 - 167	none	no	no	no	no	no	negative	-	negative	-
				167 - 170	none	no	no	no	no	no	negative	-	negative	-
				170 - 173	none	no	no	no	no	no	negative	-	negative	-
				173 - 175	none	no	no	no	no	no	negative	-	negative	-
				175 - 178	none	no	no	no	no	no	negative	negative	negative	-
				178 - 181	none	no	no	no	no	no	negative	-	negative	-
				181 - 184	none	no	no	no	no	no	negative	-	negative	-
				184 - 187	none	no	no	no	no	no	negative	negative	negative	-
GS-10	1-Feb-07	Roto-Sonic	148	0.0 - 2.0	no	no	no	no	no	no	negative	-	negative	negative
				2.0 - 5.0	**mild**	**yes**	**Yes-Blebs**	no	no	no	**Positive-Patchy**	**Positive**	negative	negative
				5.0 - 8.0	**moderate**	**yes**	**Yes-Blebs**	no	no	no	**Positive-Patchy**	-	negative	negative
				8.0 - 11	**moderate**	**yes**	**Yes-Blebs**	no	no	no	**Positive-Patchy**	**Positive**	negative	negative
				11 - 14	**moderate**	**yes**	**Yes-Blebs**	no	no	no	**Positive-Patchy**	-	negative	negative
				14 - 17	**moderate**	**yes**	**Yes-Blebs**	no	no	no	**Positive-Patchy**	**Positive**	negative	negative
				17 - 21	no	no	no	no	no	no	negative	-	negative	negative
				21 - 23	no	no	no	no	no	no	negative	-	negative	negative
				23 - 24	no	no	no	no	no	no	negative	-	negative	negative
				24 - 30	no	no	no	no	no	no	negative	-	negative	negative
				30 - 33	no	no	no	no	no	no	negative	-	negative	negative
				33 - 36	no	no	no	no	no	no	negative	-	negative	negative
				36 - 39	no	no	no	no	no	no	negative	-	negative	negative
				39 - 42	no	no	no	no	no	no	negative	-	negative	negative
				42 - 45	no	no	no	no	no	no	negative	-	negative	negative
				45 - 48	no	no	no	no	no	no	negative	-	negative	negative
				48 - 51.5	no	no	no	no	no	no	negative	-	negative	negative
				51.5 - 55	no	no	no	no	no	no	negative	negative	negative	negative
				55 - 60	no	no	no	no	no	no	negative	-	negative	negative
				60 - 65	no	no	no	no	no	no	negative	-	negative	negative
				65 - 72	no	no	no	no	no	no	negative	negative	negative	negative
				72 - 78	no	no	no	no	no	no	negative	-	negative	negative
				78 - 81	no	no	no	no	no	no	negative	-	negative	negative
				81 - 84	no	no	no	no	no	no	negative	-	negative	negative
				84 - 87	no	no	no	no	no	no	negative	-	negative	negative
				87 - 90	no	no	no	no	no	no	negative	-	negative	negative
				90 - 93	no	no	no	no	no	no	negative	negative	negative	negative
				93 - 96	no	no	no	no	no	no	negative	-	negative	negative
				96 - 98	no	no	no	no	no	no	negative	-	negative	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-10 continued	1-Feb-07	Roto-Sonic	148	98 - 105	no	no	no	no	no	no	negative	-	negative	negative
				105 - 109	no	no	no	no	no	no	negative	-	negative	negative
				109 - 113	no	no	no	no	no	no	negative	-	negative	negative
				113 - 116	no	no	no	no	no	no	negative	negative	negative	negative
				116 - 119	no	no	no	no	no	no	negative	-	negative	negative
				119 - 123	no	no	no	no	no	no	negative	-	negative	negative
				123 - 126	no	no	no	no	no	no	negative	negative	negative	negative
				126 - 129	no	no	no	no	no	no	negative	-	negative	negative
				129 - 132	no	no	no	no	no	no	negative	-	negative	negative
				132 - 135	no	no	no	no	no	no	negative	-	negative	negative
				135 - 138	no	no	no	no	no	no	negative	negative	negative	negative
				138 - 141	no	no	no	no	no	no	negative	-	negative	negative
				141 - 145	no	no	no	no	no	no	negative	-	negative	negative
				145 - 148	no	no	no	no	no	no	negative	negative	negative	negative
GS-11	31-Jan-07	Roto-Sonic	173.5	0 - 4	no	no	no	no	no	no	negative	-	negative	negative
				4 - 9	mild	no	no	no	no	no	negative	negative	negative	negative
				9 - 14	no	no	no	no	no	no	negative	-	negative	negative
				14 - 18	no	no	no	no	no	no	negative	-	negative	negative
				18 - 23	no	no	no	no	no	no	negative	-	negative	negative
				24 - 27	no	no	no	no	no	no	negative	-	negative	negative
				27 - 30	no	no	no	no	no	no	negative	negative	negative	negative
				30 - 32	no	no	no	no	no	no	negative	-	negative	negative
				32 - 34	no	no	no	no	no	no	negative	-	negative	negative
				34 - 37	no	no	no	no	no	no	negative	-	negative	negative
				37 - 40	no	no	no	no	no	no	negative	-	negative	negative
				40 - 43	no	no	no	no	no	no	negative	-	negative	negative
				43 - 45	no	no	no	no	no	no	negative	negative	negative	negative
				45 - 48	no	no	no	no	no	no	negative	-	negative	negative
				48 - 51	no	no	no	no	no	no	negative	-	negative	negative
				51 - 54	no	no	no	no	no	no	negative	negative	negative	negative
				54 - 58	no	no	no	no	no	no	negative	-	negative	negative
				58 - 61	no	no	no	no	no	no	negative	-	negative	negative
				61 - 64	no	no	no	no	no	no	negative	-	negative	negative
				64 - 67	no	no	no	no	no	no	negative	-	negative	negative
				67 - 70	no	no	no	no	no	no	negative	-	negative	negative
				70 - 73	no	no	no	no	no	no	negative	-	negative	negative
				73 - 76	no	no	no	no	no	no	negative	-	negative	negative
				76 - 79.5	no	no	no	no	no	no	negative	-	negative	negative
				79.5 - 83	no	no	no	no	no	no	negative	-	negative	negative
				83 - 86	no	no	no	no	no	no	negative	-	negative	negative
				86 - 89	no	no	no	no	no	no	negative	negative	negative	negative
				89 - 91.5	no	no	no	no	no	no	negative	-	negative	negative
				91.5 - 95	no	no	no	no	no	no	negative	negative	negative	negative
				95 - 98	no	no	no	no	no	no	negative	-	negative	negative
				98 - 100	no	no	no	no	no	no	negative	-	negative	negative
				100 - 102.5	no	no	no	no	no	no	negative	-	negative	negative
				102.5 - 106	no	no	no	no	no	no	negative	-	negative	negative
				106 - 109	no	no	no	no	no	no	negative	-	negative	negative
				109 - 112.5	no	no	no	no	no	no	negative	-	negative	negative
				112.5 - 115	no	no	no	no	no	no	negative	-	negative	negative
				115 - 118.5	no	no	no	no	no	no	negative	-	negative	negative
				118.5 - 121.5	no	no	no	no	no	no	negative	-	negative	negative
				121.5 - 123	no	no	no	no	no	no	negative	-	negative	negative
				123 - 126.5	no	no	no	no	no	no	negative	-	negative	negative
				126.5 - 130	no	no	no	no	no	no	negative	-	negative	negative
				130 - 133.5	no	no	no	no	no	no	negative	-	negative	negative

Table 2
Tar and Dense Non-Aqueous Phase Liquid (DNAPL) Field Screening Summary

Groundwater Source Control Evaluation Boring Installation

Boring Number	HAI Screening Start Date	Installation Method	Total Boring Depth (feet bgs) or (feet bml)	Bagged Core Interval (feet bgs) or (feet bml)	HAI Post-Boring Installation Screening Results									
					Visual and Olfactory Methods						DNAPL Screening Methods			
					Odor[2]	Sheen	Visual Oil Blebs or Patchy Oil	Visual Oil Saturation	Visual Patchy Soil-Mixed Tar	Visual Tar	Ultraviolet Light Box	Sudan Dye Shake Kit	Sudan Dye Lens Spray	NAPL Dye Liner Strip
GS-11 continued	31-Jan-07	Roto-Sonic	173.5	133.5 - 137	no	no	no	no	no	no	negative	negative	negative	negative
				137 - 140	no	no	no	no		no	negative	-	negative	negative
				140 - 143.5	no	no	no	no	no	no	negative	-	negative	negative
				143.5 - 148	no	no	no	no	no	no	negative	-	negative	negative
				148 - 150.5	no	no	no	no	no	no	negative	-	negative	negative
				150.5 - 153.5	no	no	no	no	no	no	negative	-	negative	negative
				153.5 - 156.5	no	no	no	no	no	no	negative	negative	negative	negative
				156.5 - 160	no	no	no	no	no	no	negative	-	negative	negative
				160 - 163	no	no	no	no	no	no	negative	-	negative	negative
				163 - 165.5	no	no	no	no	no	no	negative	-	negative	negative
				165.5 - 169	no	no	no	no	no	no	negative	negative	negative	negative
				169 - 173	no	no	no	no	no	no	negative	-	negative	negative
				173 - 173.5	no	no	no	no	no	no	negative	-	negative	negative
GS-12	24-Jan-07	Roto-Sonic	148	0.0 - 3.0	no	no	no	no	no	no	negative	-	negative	negative
				3.0 - 7.0	no	no	no	no	no	no	negative	negative	negative	negative
				7.0 - 10	no	no	no	no	no	no	negative	-	negative	negative
				10 - 14	no	no	no	no	no	no	negative	-	negative	negative
				14 - 18	no	no	no	no	no	no	negative	-	negative	negative
				18 - 21	no	no	no	no	no	no	negative	-	negative	negative
				21 - 36	-	-	-	-	-	-	-	-	-	-
				36 - 38.5	no	no	no	no	no	no	negative	-	negative	negative
				38.5 - 41	no	no	no	no	no	no	negative	negative	negative	negative
				41 - 44.5	no	no	no	no	no	no	negative	-	negative	negative
				44.5 - 48	no	no	no	no	no	no	negative	-	negative	negative
				48 - 51	no	no	no	no	no	no	negative	-	negative	negative
				51 - 54	no	no	no	no	no	no	negative	-	negative	negative
				54 - 57.5	no	no	no	no	no	no	negative	-	negative	negative
				57.5 - 60.5	no	no	no	no	no	no	negative	-	negative	negative
				60.5 - 64	no	no	no	no	no	no	negative	negative	negative	negative
				64 - 67	no	no	no	no	no	no	negative	-	negative	negative
				67 - 70	no	no	no	no	no	no	negative	-	negative	negative
				70 - 73	no	no	no	no	no	no	negative	-	negative	negative
				73 - 76	no	no	no	no	no	no	negative	-	negative	negative
				76 - 78.5	no	no	no	no	no	no	negative	-	negative	negative
				78.5 - 83	no	no	no	no	no	no	negative	-	negative	negative
				83 - 86.5	no	no	no	no	no	no	negative	-	negative	negative
				86.5 - 90.5	no	no	no	no	no	no	negative	-	negative	negative
				90.5 - 94	no	no	no	no	no	no	negative	-	negative	negative
				94 - 98	no	no	no	no	no	no	negative	-	negative	negative
				98 - 103	no	no	no	no	no	no	negative	-	negative	negative
				103 - 106.5	no	no	no	no	no	no	negative	-	negative	negative
				106.5 - 110	no	no	no	no	no	no	negative	-	negative	negative
				110 - 112.5	no	no	no	no	no	no	negative	-	negative	negative
				112.5 - 114.5	no	no	no	no	no	no	negative	-	negative	negative
				114.5 - 117.5	no	no	no	no	no	no	negative	-	negative	negative
				117.5 - 120.5	no	no	no	no	no	no	negative	-	negative	negative
				120.5 - 123	no	no	no	no	no	no	negative	-	negative	negative
				123 - 127	no	no	no	no	no	no	negative	-	negative	negative
				127 - 130	no	no	no	no	no	no	negative	negative	negative	negative
				130 - 133	no	no	no	no	no	no	negative	-	negative	negative
				133 - 136	no	no	no	no	no	no	negative	-	negative	negative
				136 - 139	no	no	no	no	no	no	negative	-	negative	negative
				139 - 141.5	no	no	no	no	no	no	negative	-	negative	negative
				141.5 - 145	no	no	no	no	no	no	negative	-	negative	negative
				145 - 148	no	no	no	no	no	no	negative	negative	negative	negative

Notes:
1 = Positive ultraviolet indicator is corresponding to greenish "environmentally-friendly" drilling lube observed at this depth.
2 = Petroleum odor unless described otherwise.
3 = Described as "gym bag" (mildew/sweaty) odor.

Table 3a - Summary of Groundwater Data : BTEX, Total PAHs, and Cyanide
Pilot Borings and Associated Monitoring Well Clusters

Well Number	Sample Date	Screen Interval (feet bgs)	Analytical Results: EPA Method 8020/8021B/8260 or 8260B ug/l (ppb)				EPA Method 8270 SIM or 8270C ug/l (ppb)		EPA Method 9012A, 9010A, D4282-95M or 335.4 mg/l (ppm)		
			Benzene	Toluene	Ethylbenzene	Xylenes	Carcinogenic PAHs	Total PAHs	Total Cyanide	Amenable Cyanide	Free Cyanide
PW-1 CLUSTER											
MW-04-35	31-Mar-06	24 - 34	0.5 U	0.5 U	0.5 U	1. U	0.3	31.76	0.14	0.0389	0.0029
	18-Oct-06	(fill WBZ)	3.	0.48 J	0.13 U	2.11	1.7	42.33	0.17	0.002 U	0.005 U
MW-04-57	31-Mar-06	46 - 56	4,660.	25. U	500.	114.	0.54	550.76	2.24	0.044	0.0374
	31-Mar-06	(alluvial WBZ)	4,680.	25. U	509.	98.6	-	-	2.12	0.016	0.0353
	30-Oct-06		7,100.	11. J	450.	154.	0.72 J	806.12 J	2.6	0.13	0.0282
MW-04-101	29-Mar-06	89.5 -99.5	301.	5. U	5. U	10. U	ND	10.59	0.636	0.0604	0.0134
	18-Oct-06	(alluvial WBZ)	170.	2.	63.	6.3	0.01 J	6.32 J	0.8	0.002 U	0.008 J
PW-01	12-Oct-06	40 - 80 (alluvial WBZ)	7,300.	100.	520.	350.	2.8	4,269.51	-	1.5	0.005 U
PW-2 CLUSTER											
MW-16-45	3-Apr-06	30 - 45	4,210.	1,820.	736.	1,420.	3,028.5	53,847.5	0.117	0.0188	0.0013 U
	12-Dec-06	(alluvial WBZ)	5,000.	2,200.	770.	1,740.	21.3 J	11,429.3 J	0.14	0.01 U	0.005 U
MW-16-65	3-Apr-06	55 - 65	1,090.	8.19	262.	201.	1.21	3,321.77	0.301	0.127	0.0149
	23-Oct-06	(alluvial WBZ)	930.	4.8 J	170.	110.	0.35	2,623.47	0.31	0.002 U	0.005 U
MW-16-125	30-Mar-06	115-125	0.5 U	0.5 U	0.64	1. U	0.08	7.5	0.0777	0.0272	0.0016
	16-Oct-06	(alluvial WBZ)	0.26 J	0.94	0.18 J	1.38 J	0.06	2.74 J	0.13	0.01	0.005 U
MW-18-180	9-Mar-07	170 - 180 (alluvial WBZ)	0.19 J	0.11 U	0.13 U	0.11 U	0.01 J	3.08 J	0.04	0.003 U	0.005 U
PW-3 CLUSTER											
MW-17-79	26-Oct-06	38.5 - 78.5 (alluvial WBZ)	1.5	0.48 J	5.7	2.03	0.23	6.92	1.	0.15	0.005 U
MW-19-125	15-Mar-07	115-125 (alluvial WBZ)	2.6	0.45 J	0.13 U	1.64 J	0.01	3.68	0.02	0.003 U	0.005 U
MW-19-180	15-Mar-07	170-180 (alluvial WBZ)	0.54	0.36 J	0.13 U	0.11 U	ND	0.04	0.04	0.003 U	0.005 U
PW-4 CLUSTER											
MW-05-32	29-Mar-06	21 - 31	0.5 U	0.5 U	0.5 U	1. U	5.23	11.8	0.106	0.101	0.0031
	18-Oct-06	(fill / alluvial WBZ)	0.14 U	0.11 U	0.13 U	0.11 U	1.2	5.34	0.09	0.01	0.005 J
MW-05-100	4-Apr-06	88 - 98	11,300.	50. U	538.	345.	ND	8,408.6	0.814	0.106	0.0283
	27-Oct-06	(alluvial WBZ)	11,000.	18. J	560.	298.	ND	7,117. J	1.06	0.17	0.005 J
MW-20-120	29-Mar-06	110-120 (alluvial WBZ)	80.	0.86	1.6	28.8	0.02	53.74	0.13	0.003 U	0.005 U
MW-05-175	29-Mar-06	163 - 173	0.5 U	0.5 U	0.5 U	1. U	ND	0.08	0.018	0.0054	0.0013 U
	16-Oct-06	(alluvial WBZ)	0.14 U	1.1	0.13 U	0.11 U	ND	0.05 J	0.04	0.002 U	0.005 U

Note:
U = Non-detect above reporting detection limit
J = Estimated Concentration
ug/l = micrograms per liter
mg/l = milligrams per liter
EPA = U.S. Environmental Protection Agency
PAHs = polynuclear aromatic hydrocarbons
ppb = parts per billion
ppm = parts per million

Table 3b - Summary of Groundwater Data: PAHs by EPA Method 8270-SIM or 8270C
Pilot Borings and Associated Monitoring Well Clusters

PAHs by EPA Method 8270-SIM or 8270C			Analytical Results ug/l (ppb)																	
			Carcinogenic PAHs							Non-carcinogenic PAHs										
Well Number	Sample Date	Screen Interval (feet bgs)	Benzo (a) anthracene	Benzo (b) fluoranthene	Benzo (k) fluoranthene	Benzo (a) pyrene	Chrysene	Dibenzo (a,h) anthracene	Indeno (1,2,3-cd) pyrene	Acenaphthene	Acenaphthylene	Anthracene	Benzo (g,h,i) perylene	Fluoranthene	Fluorene	Naphthalene	Phenanthrene	Pyrene	Total Carcinogenic PAHs	Total PAHs
PW-1 CLUSTER																				
MW-04-35	31-Mar-06	24 - 34	0.13	0.0569 J	0.0481 U	0.0822 J	0.167	0.0481 U	0.0481 U	21.8	0.0595	0.249	0.0639 U	2.9	3.33	0.117	0.086 J	3.01	0.44	31.99
	18-Oct-06	(fill WBZ)	0.38	0.42	0.02 U	0.26	0.43	0.031 U	0.17 J	34.	2.9	2.6	0.21	4.6	9.8	2.4	2.4	4.8	1.66	65.37
MW-04-57	31-Mar-06	46 - 56	0.481 U	0.481 U	0.481 U	0.481 U	0.536 J	0.481 U	0.481 U	136.	1.23	0.884 J	0.481 U	1.63	10.6	393.	5.37	2.39	0.54	551.64
	30-Oct-06	(alluvial WBZ)	0.26 J	0.096 U	0.096 U	0.2 J	0.26 J	0.16 U	0.12 U	120.	3.9	3.6	0.082 U	1.9	14.	650.	9.8	2.2	0.72	806.12
MW-04-101	29-Mar-06	89.5 -99.5	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.0094 U	0.943	0.066 U	0.0377 U	0.0094 U	0.0094 U	0.0388	9.61	0.0189 U	0.0189 U	U	10.59
	18-Oct-06	(alluvial WBZ)	0.0039 U	0.0046 U	0.0051 U	0.0054 J	0.0053 U	0.0036 U	0.0038 J	0.67	0.034	0.0092 J	0.0051 J	0.034	0.027	5.5	0.013 J	0.014 J	0.01	6.32
PW-01	12-Oct-06	40 - 80 (alluvial WBZ)	0.54	0.33	0.31	0.53	0.67	0.045	0.37	59.	33.	4.5	0.41	5.	20.	4,100.	39.	5.8	2.8	4,269.51
PW-2 CLUSTER																				
MW-16-45	3-Apr-06	30 - 45	663.	267.	331.	559.	870.	68.5	270.	2,150.	246.	1,370.	413.	2,360.	1,450.	29,400.	10,400.	3,030.	3,028.5	53,847.5
	12-Dec-06	(alluvial WBZ)	12. J	9.6 U	9.6 U	8. U	9.3 J	16. U	12. U	140.	21. J	22. J	8.2 U	24. J	54. J	11,000.	120. J	27. J	21.3	11,429.3
MW-16-65	3-Apr-06	55 - 65	2.36 U	2.36 U	2.36 U	2.36 U	2.36 U	2.36 U	2.36 U	57.8	4.5	4.07	2.36 U	2.36 U	21.3	3,190.	44.1	4.72 U	U	3,321.77
	12-Dec-06	(alluvial WBZ)	0.11	0.023	0.024	0.033	0.14	0.0051 J	0.018 J	52.	4.1	3.4	0.021	2.2	23.	2,500.	36.	2.4	0.35	2,623.47
MW-16-125	30-Mar-06	115-125	0.0322	0.0102 U	0.0102 U	0.0102 U	0.0433	0.0102 U	0.0102 U	0.891	0.051	0.331	0.0102 U	0.569	0.519	0.452	3.88	0.783	0.08	7.55
	16-Oct-06	(alluvial WBZ)	0.026	0.0046 U	0.0051 U	0.0043 U	0.033	0.0036 U	0.0033 U	0.71	0.037	0.24	0.0041 U	0.48	0.47	0.13	0.061	0.55	0.06	2.74
MW-18-180	9-Mar-07	170 - 180 (alluvial WBZ)	0.0039 U	0.0046 U	0.0051 U	0.0043 U	0.0053 U	0.0038 J	0.0061 J	0.14	0.027	0.014 J	0.0073 J	0.02	0.083	2.6	0.16	0.019 J	0.01	3.08
PW-3 CLUSTER																				
MW-17-79	26-Oct-06	38.5 - 78.5 (alluvial WBZ)	0.043	0.028	0.027	0.044	0.059	0.0036 U	0.029	1.1	0.14	0.25	0.036	0.35	0.35	2.9	1.2	0.36	0.23	6.92
MW-19-125	15-Mar-07	115-125 (alluvial WBZ)	0.0053 J	0.0046 U	0.0051 U	0.0043 U	0.0053 U	0.0036 U	0.0033 U	0.044	0.0088 J	0.014 J	0.0041 U	0.036	0.03	3.4	0.11	0.035	0.01	3.68
MW-19-180	15-Mar-07	170-180 (alluvial WBZ)	0.0039 U	0.0046 U	0.0051 U	0.0043 U	0.0053 U	0.0036 U	0.0033 U	0.0041 J	0.0023 J	0.0039 U	0.0041 U	0.0047 U	0.0039 J	0.026	0.0045 J	0.0047 U	U	0.04
PW-4 CLUSTER																				
MW-05-32	29-Mar-06	21 - 31	0.919	0.677	0.598	1.08	1.31	0.142 J	0.65	0.0962 U	0.212	0.4	1.03	1.58	0.0962 U	0.192 U	0.339	3.	5.38	11.94
	18-Oct-06	(fill / alluvial WBZ)	0.22	0.24	0.086 J	0.21	0.26	0.031 U	0.18 J	0.028 J	0.96	1.5	0.19 J	0.31	0.072 J	0.068 J	0.083 J	0.93	1.2	5.34
MW-05-100	4-Apr-06	88 - 98	0.926 U	0.962 U	0.962 U	0.962 U	0.962 U	0.962 U	0.962 U	18.6	0.962 U	0.962 U	0.962 U	0.962 U	0.962 U	8,390.	0.962 U	1.92 U	U	8,408.6
	27-Oct-06	(alluvial WBZ)	1.2 U	2. U	2. U	1.6 U	1.4 U	3.1 U	2.4 U	17. J	1.1 U	1.5 U	1.7 U	1.3 U	1.2 U	7,100.	1.1 U	1.5 U	U	7,117.
MW-20-120	29-Mar-06	110-120 (alluvial WBZ)	0.007 J	0.0046 U	0.0051 U	0.0043 U	0.0057 J	0.0036 U	0.0034 J	0.22	0.034	0.039	0.0041 U	0.049	0.1	53.	0.24	0.046	0.02	53.74
MW-05-175	29-Mar-06	163 - 173	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0095 U	0.0796	0.0095 U	0.019 U	U	0.08
	16-Oct-06	(alluvial WBZ)	0.0039 U	0.0046 U	0.0051 U	0.0043 U	0.0053 U	0.0036 U	0.0033 U	0.0031 U	0.0023 U	0.0039 U	0.0041 U	0.0047 U	0.0036 U	0.047	0.0032 U	0.0047 U	U	0.05

Note: U = Non-detect above method reporting limit
J = Estimated Concentration
ppb = parts per billion
ug/l = micrograms per liter
PAHs = polynuclear aromatic hydrocarbons

Table 3c - Summary of Groundwater Data: Priority Pollutant Metals by EPA Methods 6010, 200.7 and/or 7000 Series
Pilot Borings and Associated Monitoring Well Clusters

			Analytical Results mg/l (ppm)																			
Well Number	Sample Date	Screen Interval (feet bgs)	Arsenic		Cadmium		Chromium		Copper		Lead		Mercury		Nickel		Selenium		Silver		Zinc	
PW-1 CLUSTER																						
MW-04-35	31-Mar-06	24 - 34	0.00312		-		0.001	U	0.002	U	0.001	U	-		0.005	U	-		-		0.005	U
	18-Oct-06	(fill WBZ)	0.00605		0.00005		0.00133		0.00074		0.00029		0.00002	B	0.0011		0.0011		0.000007	U	0.927	
MW-04-57	30-Mar-06	46 - 56	0.0138		-		0.00214		0.00364		0.001	U	-		0.00892		-		-		0.005	U
	30-Oct-06	(alluvial WBZ)	0.0144		0.00007		0.00456		0.00103		0.00017		0.00002	U	0.0084		0.0006	B	0.000007	U	0.0072	
MW-04-101	29-Mar-06	89.5 -99.5	0.0134		-		0.001	U	0.002	U	0.001	U	-		0.002	U	-		-		0.005	U
	18-Oct-06	(alluvial WBZ)	0.0113		0.00006		0.00043		0.0003		0.00004		0.00002	B	0.0006		0.0004		0.000007	U	0.0073	
PW-01	12-Oct-06	40 - 80 (alluvial WBZ)	0.00491		0.00003		0.00072		0.00007	B	0.00001	B	0.00002	B	0.0005		0.0006	B	0.000007	U	0.0016	
PW-2 CLUSTER																						
MW-16-45	3-Apr-06	30 - 45	0.0109		-		0.0111		0.02	U	0.0133		-		0.02	U	-		-		0.05	U
	12-Dec-06	(alluvial WBZ)	0.00838		0.00015		0.00267		0.00291		0.0022		-		0.0065		0.004		0.000032		0.0066	
MW-16-65	3-Apr-06	55 - 65	0.00353		-		0.00112		0.001	U	0.001	U	-		0.002	U	-		-		0.005	U
	23-Oct-06	(alluvial WBZ)	0.00311		0.00006		0.00133		0.00092		0.00014		0.00002	U	0.0024		0.0004	B	0.000007	B	0.127	
MW-16-125	30-Mar-06	115-125	0.00509		-		0.001	U	0.002		0.001	U	-		0.00202		-		-		0.005	U
	16-Oct-06	(alluvial WBZ)	0.00505		0.00006		0.00114		0.0215		0.00089	U	0.00002	U	0.0024		0.0003	B	0.000007	B	0.0089	
MW-18-180	9-Mar-07	170 - 180 (alluvial WBZ)	0.0016		0.00006		0.0007		0.00167		0.000204		0.00002	U	0.0017		0.0003	B	0.000006	B	0.0072	
PW-3 CLUSTER																						
MW-17-79	26-Oct-06	38.5 - 78.5 (alluvial WBZ)	0.00159		0.00006		0.00122		0.00059		0.000056		0.00003	B	0.00645		0.0003	B	0.000007	U	0.895	
MW-19-125	15-Mar-07	115-125 (alluvial WBZ)	0.0098		0.00002	U	0.00073		0.00053		0.000089		0.00002	U	0.0019		0.0005	B	0.00008	B	0.0031	
MW-19-180	15-Mar-07	170-180 (alluvial WBZ)	0.0023		0.00003		0.00061		0.00056		0.000097		0.00002	U	0.0018		0.0005	B	0.000008	B	0.0055	
PW-4 CLUSTER																						
MW-05-32	29-Mar-06	21 - 31	0.001	U	-		0.00143		0.002	U	0.001	U	-		0.00483		-		-		0.005	U
	18-Oct-06	(fill / alluvial WBZ)	0.00047	B	0.00003		0.00123		0.00084		0.00012		0.00002	B	0.0035		0.0003	B	0.000007	U	0.564	
MW-05-100	4-Apr-06	88 - 98	0.00762		-		0.01	U	0.002	U	0.001	U	-		0.002	U	-		-		0.005	U
	27-Oct-06	(alluvial WBZ)	0.0107		0.00011		0.0013		0.00059		0.00012		0.00002	U	0.0051		0.0005	B	0.000008	B	0.801	
MW-20-120	15-Mar-07	110-120 (alluvial WBZ)	0.0092		0.00004		0.00264		0.00458		0.00119		0.00002	U	0.0029		0.0005	B	0.000013	B	0.0103	
MW-05-175	29-Mar-06	163 - 173	0.00439		-		0.001	U	0.002	U	0.001	U	-		0.00218		-		-		0.005	U
	16-Oct-06	(alluvial WBZ)	0.00391		0.00002	U	0.00035		0.00005	B	0.00004		0.00002	B	0.002		0.0006	B	0.000007	U	0.0019	

Note:
U = Non-detect above reporting detection limit
J = Estimated Concentration
EPA = U.S. Environmental Protection Agency
B = Detected in method blank
mg/l = milligrams per liter
ppm = parts per million

Table 4
Soil Grain SIze Data
Pilot Borings
Gasco/Siltronic
Portland, Oregon

Location ID	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18	MW-18
Sample ID	MW-18-S (30)	MW-18-S (40)	MW-18-S (50)	MW-18-S (60)	MW-18-S (70)	MW-18-S (80)	MW-18-S (90)	MW-18-S (100)	MW-18-S (110)	MW-18-S (120)	MW-18-S (130)	MW-18-S (140)	MW-18-S (150)	MW-18-S (160)	MW-18-S (170)	MW-18-S (180)	MW-18-S (190)	MW-18-S (200)	MW-18-S (210)	MW-18-S (222)
Sample Date	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/22/2007	2/23/2007	2/23/2007	2/23/2007	2/23/2007	2/23/2007	2/23/2007	2/26/2007	2/26/2007	2/26/2007
Chemical Name																				
Grain Size (%)																				
Gravel	3.09	57.5	3.66	7.66	10.7	0.37	0.66	0.03	1.8	0.04	0.03	0.02	0	0.39	0.04	0.42	0.22	3.36	1.97	84.7
Sand, Very Coarse	2.44	6.44	0.96	0.42	0.95	0.34	0.47	0.08	0.34	0.56	0.06	0.02	0.01	0.04	0.04	0.04	3.03	9.48	6.41	3.37
Sand, Coarse	1.52	3.51	0.74	0.4	0.44	0.51	1.67	4.88	18.9	22.8	7.37	1.03	0.41	1.16	3.41	3.54	32.5	40.9	40.6	2.37
Sand, Medium	13.3	2.69	3.76	18	4.6	35.6	24	63.9	58	58.1	57.4	42.3	11.6	30.8	64.2	51.5	45.3	34.7	38.5	1.59
Sand, Fine	58.5	3.01	23.9	28	28.9	40.3	20.2	21.7	9.12	10.1	20.4	31.1	55.8	37	19.9	23.2	11.8	4.64	4.94	1.16
Sand, Very Fine	8.54	3.74	15.9	10.77	20.2	8.05	6.49	3.32	2.29	2.18	3.62	6.55	11.3	12.8	3.11	5.69	2.1	1.23	1.28	1
Silt	7.95	13.8	39.2	26.7	23.7	9.29	33.9	5.67	5.91	5.02	8.75	13.4	14.3	13.9	4.99	11	0	3.48	4.31	3.39
Clay	2.79	10.8	13.1	8.77	11.3	4.32	9.06	1.63	1.9	1.43	2.4	4.21	3.85	3.76	1.23	3.24	1.27	1.25	1.59	1.07
	98.13	101.5	101.2	100.7	101	98.78	96.45	101.21	98.26	100.23	100	98.63	97.27	99.85	96.9	98.63	96.2	99.04	99.6	98.7

Location ID	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19	MW-19
Sample ID	MW-19-S (30)	MW-19-S-(40)	MW-19-S-(50)	MW-19-S-(60)	MW-19-S-(70)	MW-19-S-(80)	MW-19-S-(90)	MW-19-S-(100)	MW-19-S-(110)	MW-19-S-(120)	MW-19-S-(130)	MW-19-S-(140)	MW-19-S-(150)	MW-19-S-(160)	MW-19-S-(170)	MW-19-S-(180)	MW-19-S-(190)	MW-19-S-(200)
Sample Date	2/28/2007	2/28/2007	2/28/2007	2/28/2007	2/28/2007	2/28/2007	2/28/2007	2/28/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007	3/1/2007
Chemical Name																		
Grain Size (%)																		
Gravel	0	0	0.35	0.01	0.28	0.17	0	2.08	0.05	0.05	0.17	0	0.01	0	0	0.03	12.6	85.1
Sand, Very Coarse	0.04	0	0.49	0.85	2.07	0.07	0	0.4	0.17	0.3	0.37	0.02	5.98	0.02	0.06	0.28	13.2	4.23
Sand, Coarse	0.07	0.02	0.3	1.22	0.94	0.52	1.1	1.35	17.2	14.5	12.8	0.53	63	0.33	3.75	18.6	43.6	8.52
Sand, Medium	7.17	10.9	8.5	2.53	2.86	39.2	57	22.4	63.7	66.8	53	37.9	23.2	23.3	68.7	51.4	22.8	5.9
Sand, Fine	50.9	69.2	34	12.8	9.01	46.9	28.4	11.8	7.63	11.9	15.8	43.9	2.69	41.1	16	8.01	2.67	1.16
Sand, Very Fine	24.7	13.2	19.7	14.7	11.1	4.36	3.44	7.79	0.69	1.22	3.38	6.64	0.29	16	2.86	2.79	0.96	0.31
Silt	12.7	5.44	29.4	48.4	51	6.66	6.81	41.2	6.1	3.28	0.82	5.49	4.07	12.5	6.63	12.9	3.1	0.89
Clay	3.6	1.28	7.15	14.2	15.4	2.08	2.44	12.6	1.81	1.32	1.32	2.92	1.21	4.03	2.24	2.34	1.03	0.39
	99.18	100	99.89	94.71	92.7	99.96	99.19	99.62	97.35	99.37	87.66	97.4	100.5	97.28	100	96.35	100	106.5

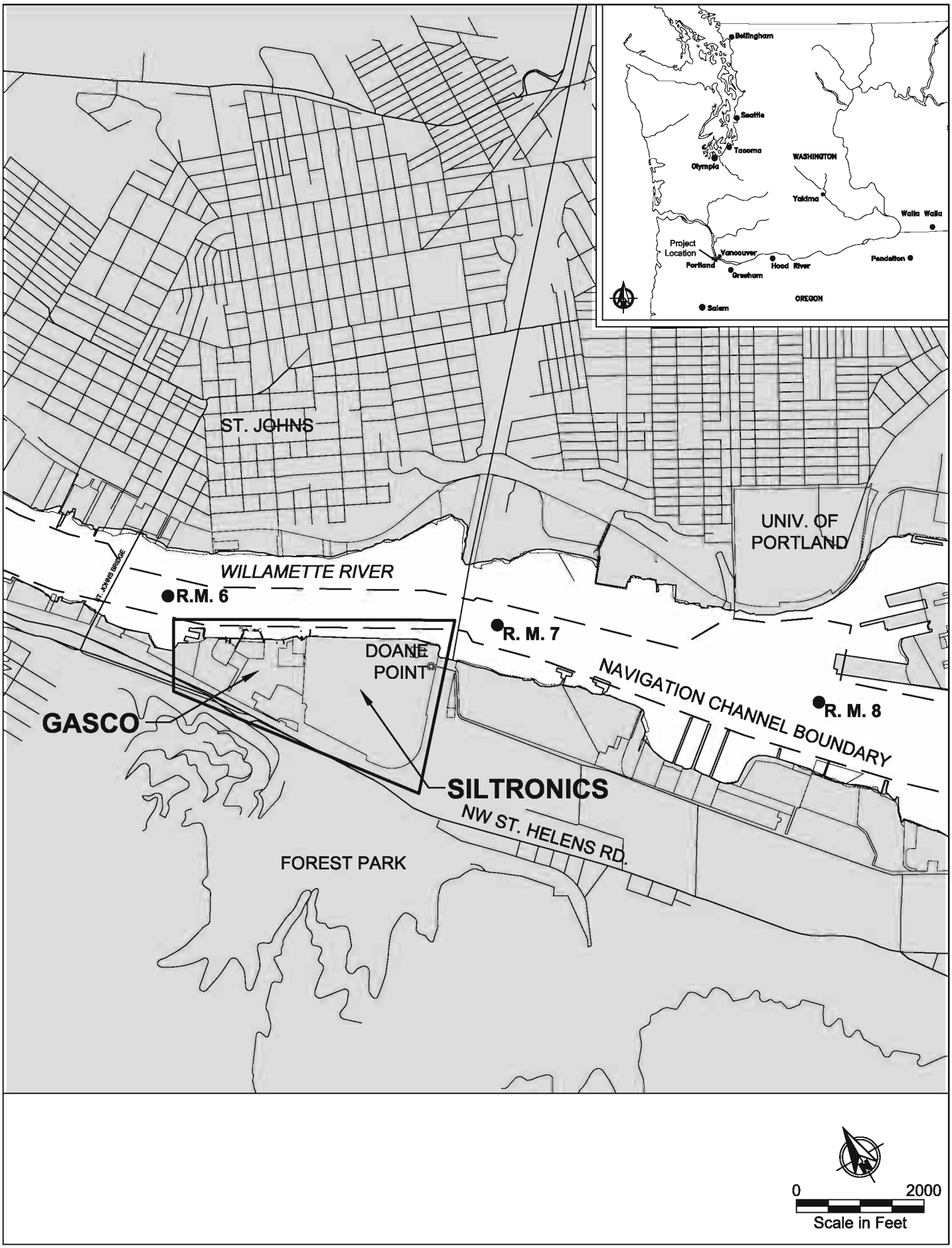
Location ID	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20	MW-20
Sample ID	MW-20-S-(30)	MW-20-S-(40)	MW-20-S-(50)	MW-20-S-(60)	MW-20-S-(70)	MW-20-S-(80)	MW-20-S-(90)	MW-20-S-(100)	MW-20-S-(110)	MW-20-S-(120)	MW-20-S-(130)	MW-20-S-(140)	MW-20-S-(150)	MW-20-S-(160)	MW-20-S-(170)	MW-20-S-(180)	MW-20-S-(190)	MW-20-S-(200)
Sample Date	3/7/2007	3/7/2007	3/7/2007	3/7/2007	3/7/2007	3/7/2007	3/7/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007	3/8/2007
Chemical Name																		
Grain Size (%)																		
Gravel	11.1	0.01	0.1	0.03	0	0.12	0.57	0.13	0	0	0.02	0.02	0	0	0.14	0.06	0.2	81.8
Sand, Very Coarse	3.59	0.06	0.22	0.05	0	0.04	1.34	0.27	0.13	0.12	0.21	0.08	0.02	0.02	0.25	0.58	1.23	3.91
Sand, Coarse	3.34	0.14	0.17	0.11	0.03	4.28	0.57	0.48	17.9	15.2	6.52	10.3	1.27	1.52	0.75	15.2	29.4	7.73
Sand, Medium	9.53	19.5	0.6	36.8	20.6	58.6	0.81	10.5	68.8	64.9	50.8	63.6	55.7	42.8	30.2	55	51.4	3.52
Sand, Fine	26.1	64.7	3.1	47.6	69.4	34.8	3.72	6.8	10	15.7	28.4	14.8	34.5	44	41.5	24.5	8.19	1.05
Sand, Very Fine	17.3	10.4	12	5.46	10.4	4.69	9.64	10.3	1.47	1.53	3.71	4.2	4.36	7	13.2	4.14	3.26	0.63
Silt	25.2	8.1	74.1	6.81	5.91	4.27	65.2	62.6	2.95	1.83	8.92	9.58	6.27	9.7	17.4	6.61	10.5	1.99
Clay	12	2.96	16.5	2.25	1.68	1.18	18.1	17.3	1.11	0.66	3.36	3.74	2.8	3.39	4.88	2.41	4.78	0.92
	108.2	105.9	106.8	99.11	108	108	99.95	108.38	102.4	99.94	101.9	106.3	104.9	108.43	108	108.5	109	101.55

Table 5
Aquifer Test Plan Details
Gasco/Siltronic
Portland, Oregon

Monitoring Well	PW-2 Pump Test	PW-3 Pump Test	PW-4 Pump Test
MW-03-26	X		
MW-03-56	X		
MW-05-32			X
MW-05-100			X
MW-05-175			X
MW-16-125	X		
MW-16-45	X		
MW-16-65	X		
MW-17-79		X	
MW-18-30	X		
MW-18-180	X		
MW-19-22		X	
MW-19-125		X	
MW-19-180		X	
MW-20-120			X
PW-01	X	X	
PW-02			
PW-03			X
PW-04		X	
WS-14			X
Willamette River	X	X	X

X = Planned observation well for pump test shown.

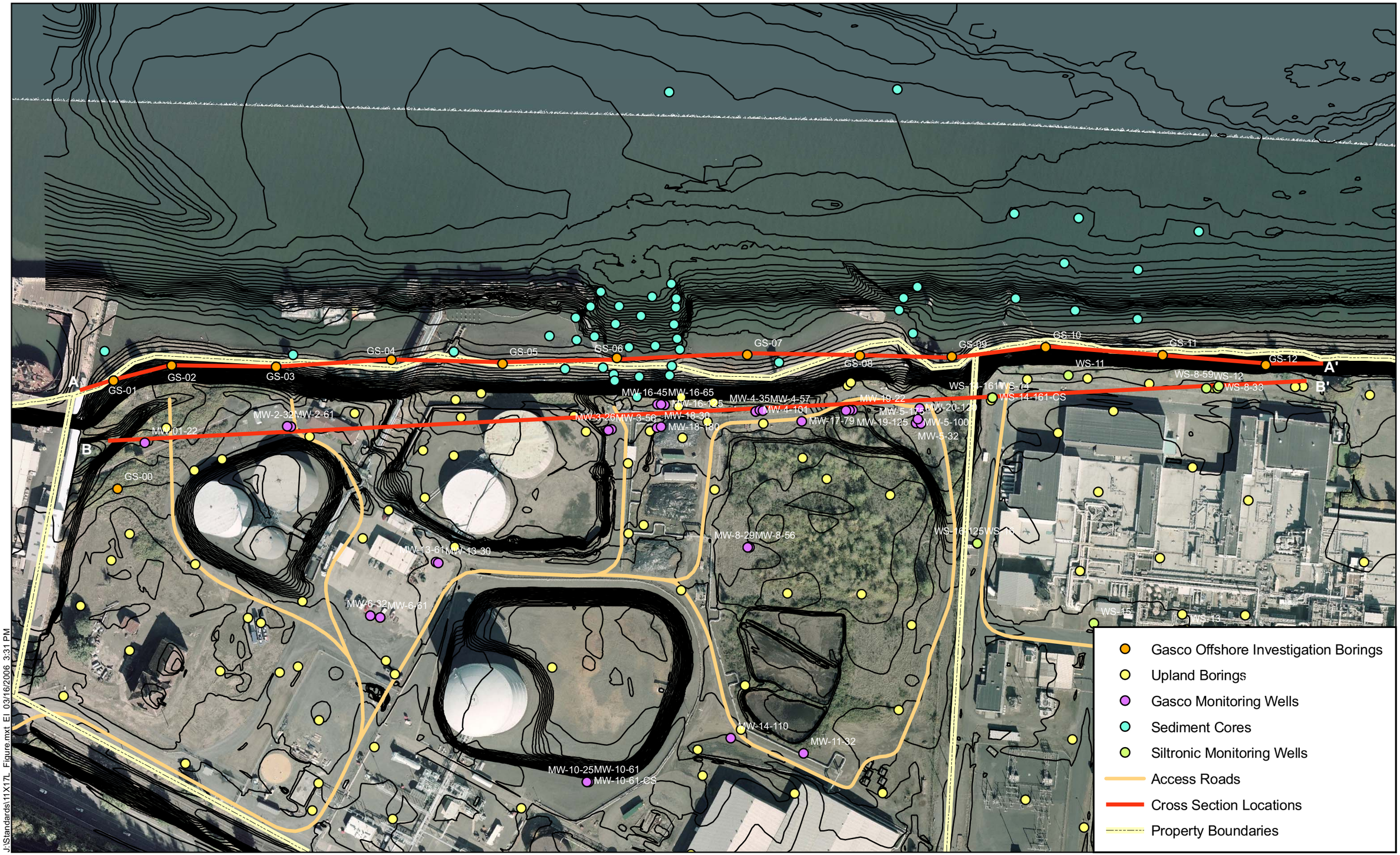
FIGURES



Oct 10, 2005 11:14am cdavidson K:\Jobs\000029-GASCO\00002902\00002902-118.dwg FIG 1

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 1
Vicinity Map
Gasco and Siltronics Site



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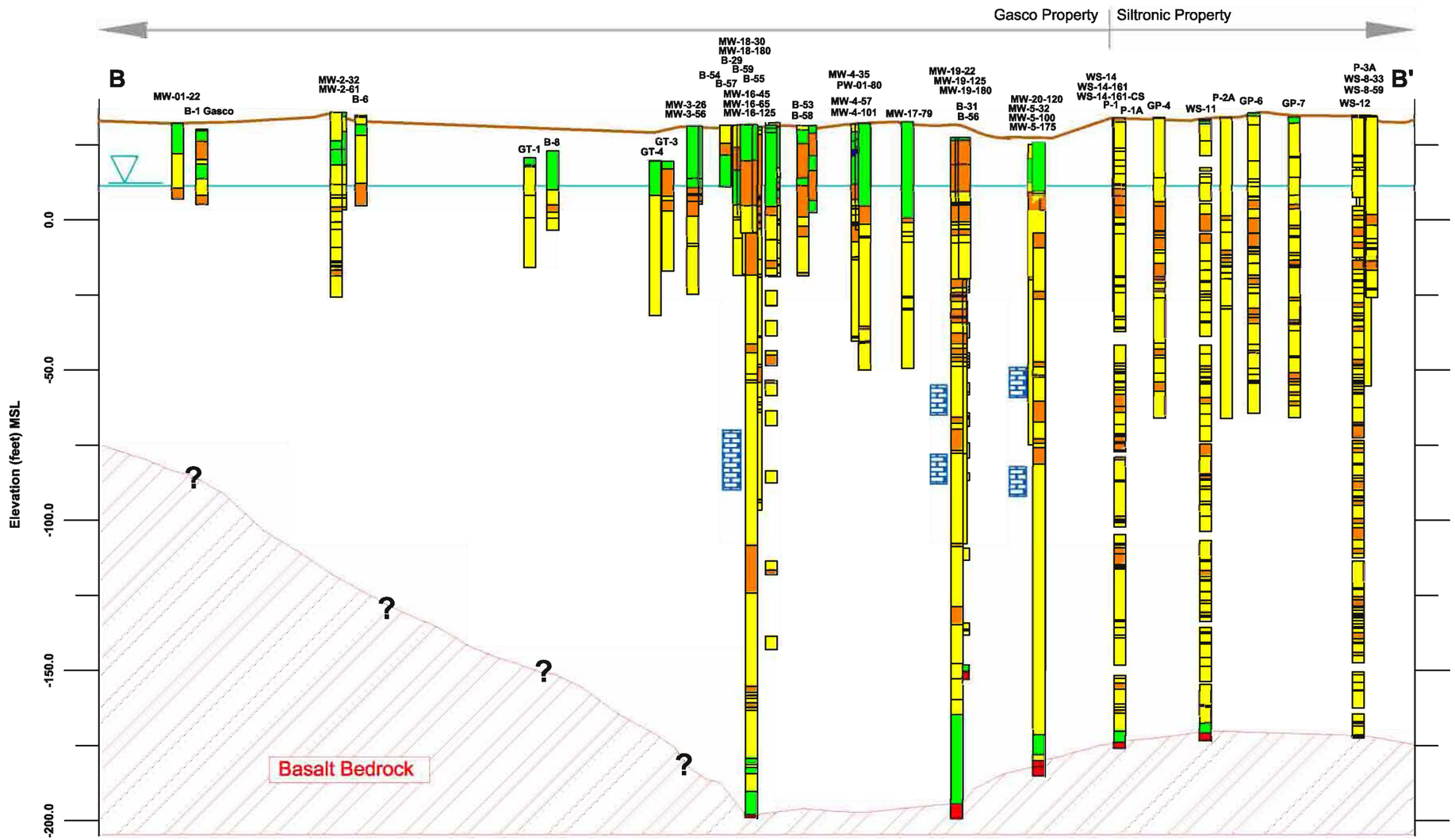
ANCHOR ENVIRONMENTAL, L.L.C.

0 45 90 180
Scale in Feet

Horizontal Datum: Oregon State Plane North, Feet
Vertical Datum: City of Portland

Figure 2
Boring and Cross Section Location Map
NW Natural-Gasco Site
Portland, Oregon



Notes:
1. Vertical Datum: City of Portland
2. Horizontal Datum: Oregon State Plane NAD(83)
3. See Boring Logs for Sample Details

0 200
Scale in Feet

5x Vertical Exaggeration

Apr 30, 2007 7:49am jpelc C:□Documents and Settings□jpelc□My Documents□Gasco□CADstuff□ForReport□XSB.dwg Geology

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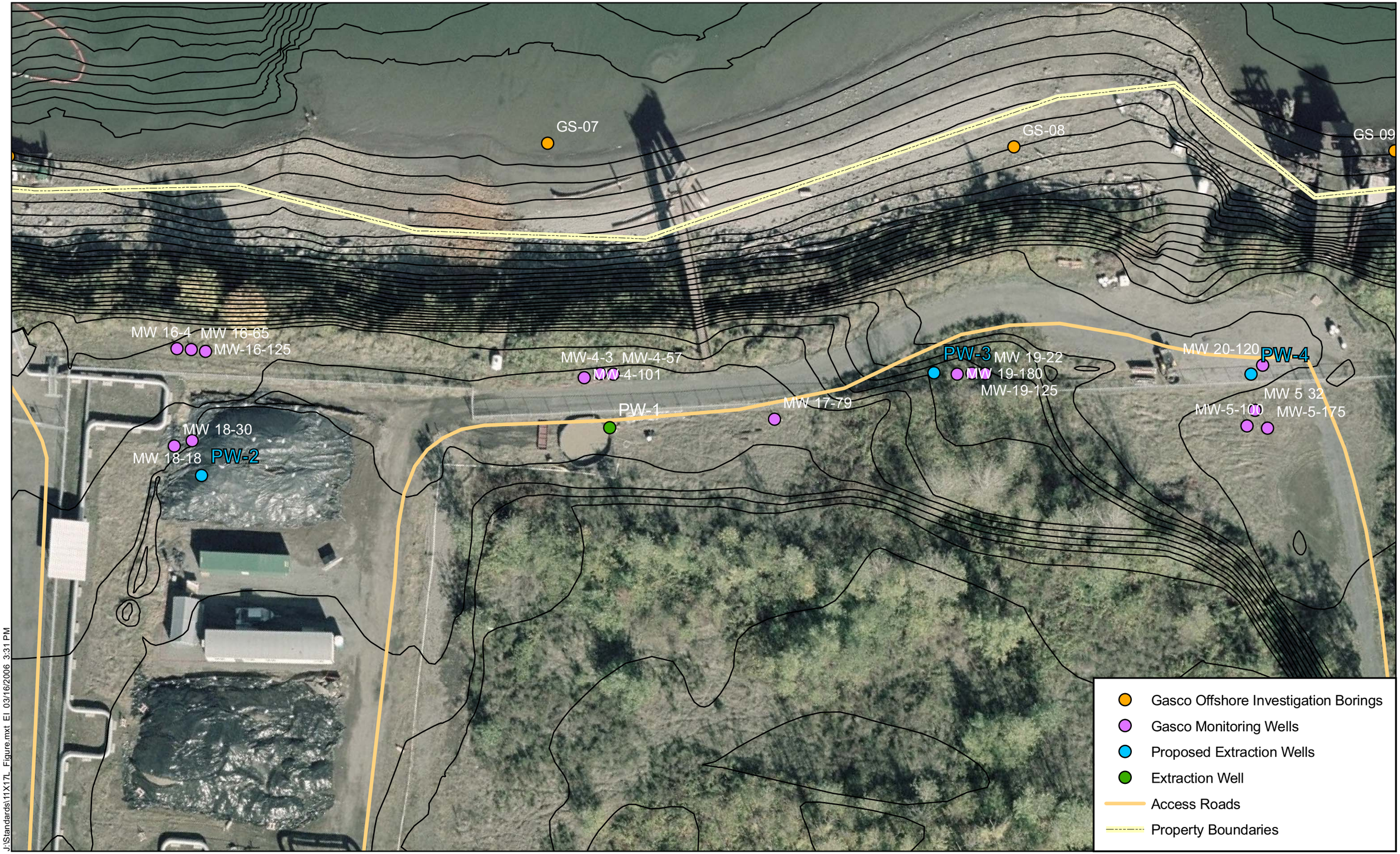
Figure 3
Geologic Cross Section B-B'
Gasco/Siltronic Site
NW Natural, Portland, Oregon



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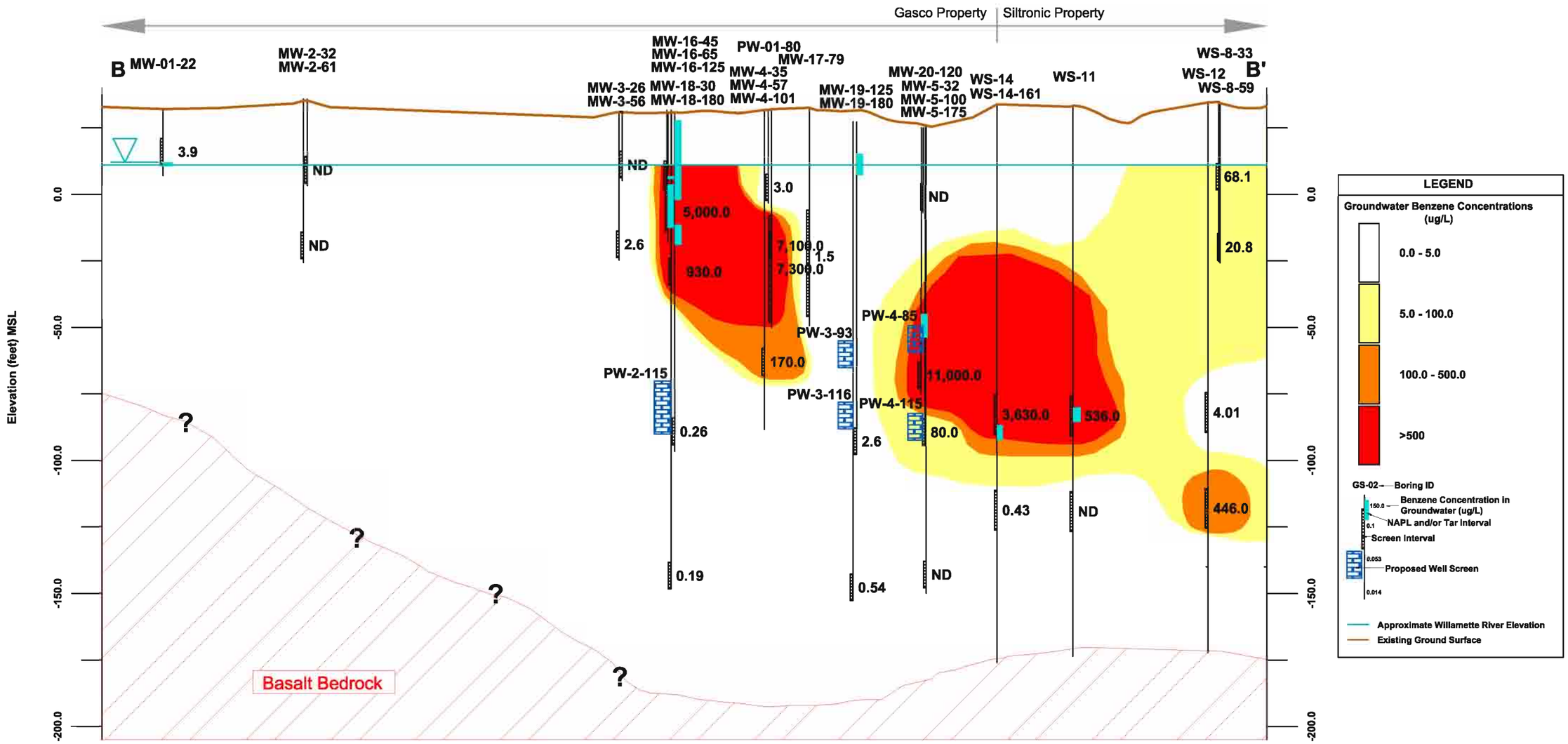
ANCHOR ENVIRONMENTAL, L.L.C.

0 12.5 25 50
Scale in Feet

Horizontal Datum: Oregon State Plane North, Feet
Vertical Datum: City of Portland

Figure 4
Extraction Well Location
NW Natural-Gasco Site
Portland, Oregon



Notes:
1. Vertical Datum: City of Portland
2. Horizontal Datum: Oregon State Plane NAD(83)
3. See Boring Logs for Sample Details

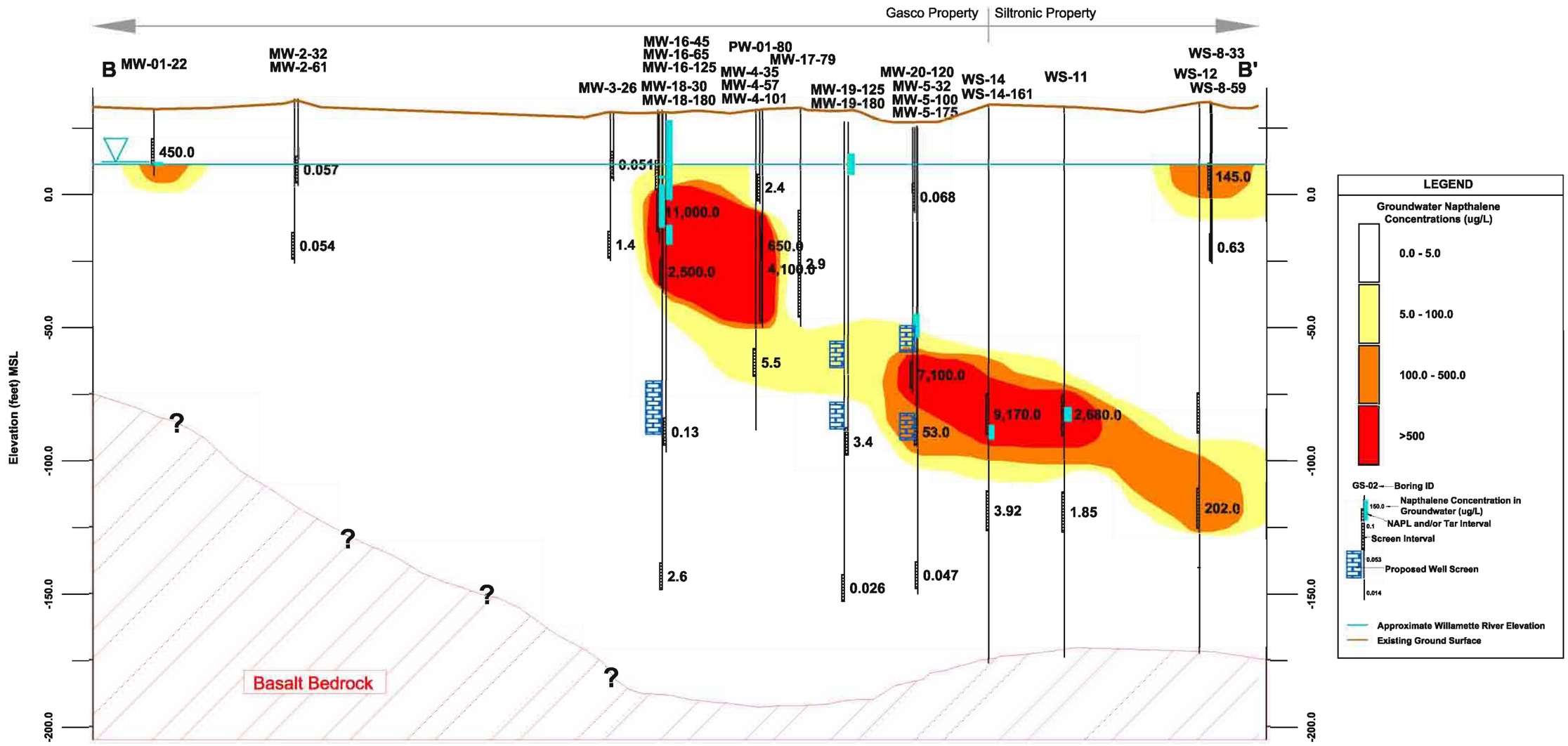
0 200
Scale in Feet

5x Vertical Exaggeration

Apr 30, 2007 7:48am jpelc C:□Documents and Settings□jpelc□My Documents□Gasco□CADstuff□ForReport□XSB.dwg Benzene

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5a
Cross Section B-B'
Benzene Groundwater Concentrations (ppb), Gasco/Siltronic Site
NW Natural, Portland, Oregon



Notes:
1. Vertical Datum: City of Portland
2. Horizontal Datum: Oregon State Plane NAD(83)
3. See Boring Logs for Sample Details

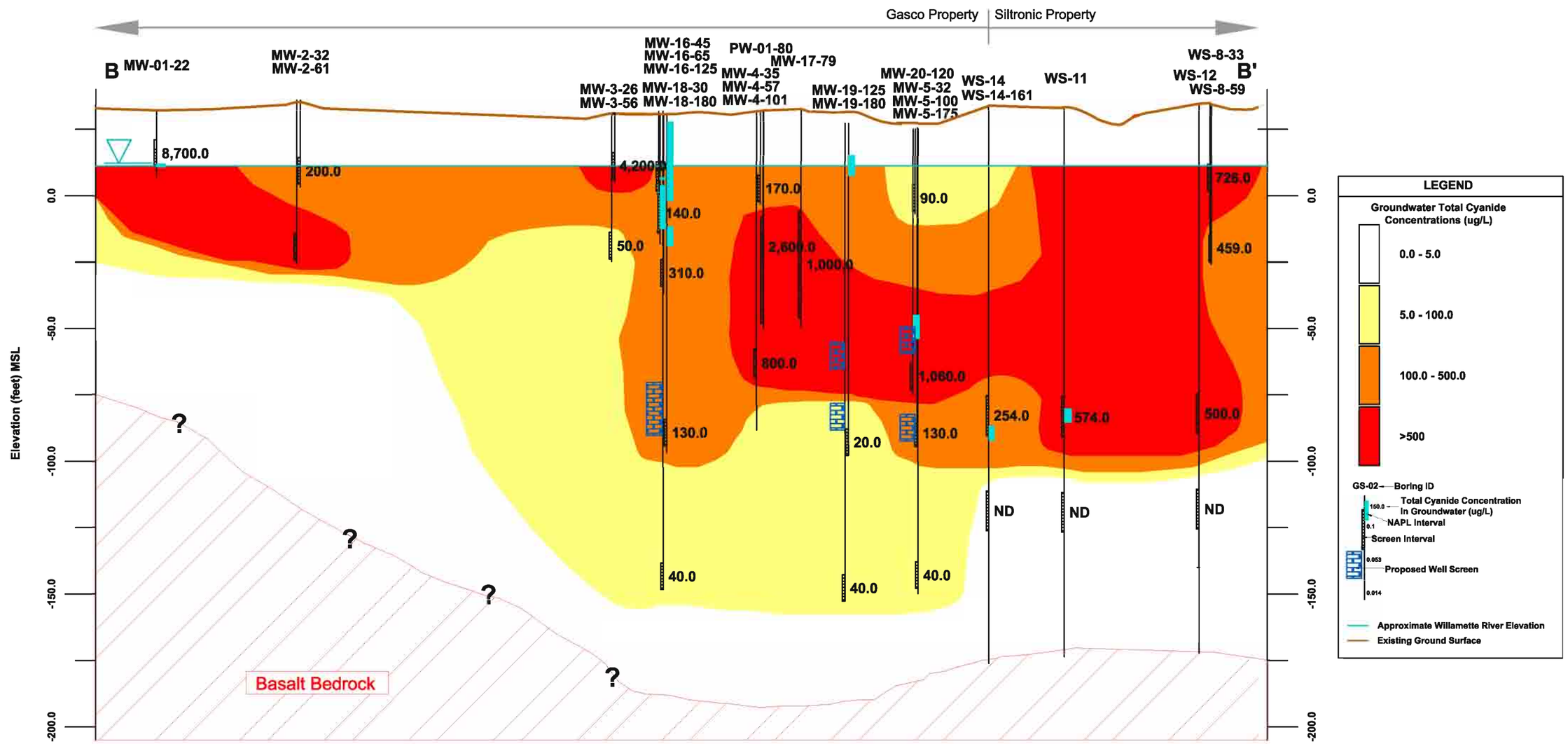
0 200
Scale in Feet

5x Vertical Exaggeration

Apr 30, 2007 7:48am jpelc C:\Documents and Settings\jpelc\My Documents\Gasco\CADstuff\ForReport\XSB.dwg Napthalene

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5b
Cross Section B-B'
Napthalene Groundwater Concentrations (ppb), Gasco/Siltronic Site
NW Natural, Portland, Oregon



Notes:
1. Vertical Datum: City of Portland
2. Horizontal Datum: Oregon State Plane NAD(83)
3. See Boring Logs for Sample Details

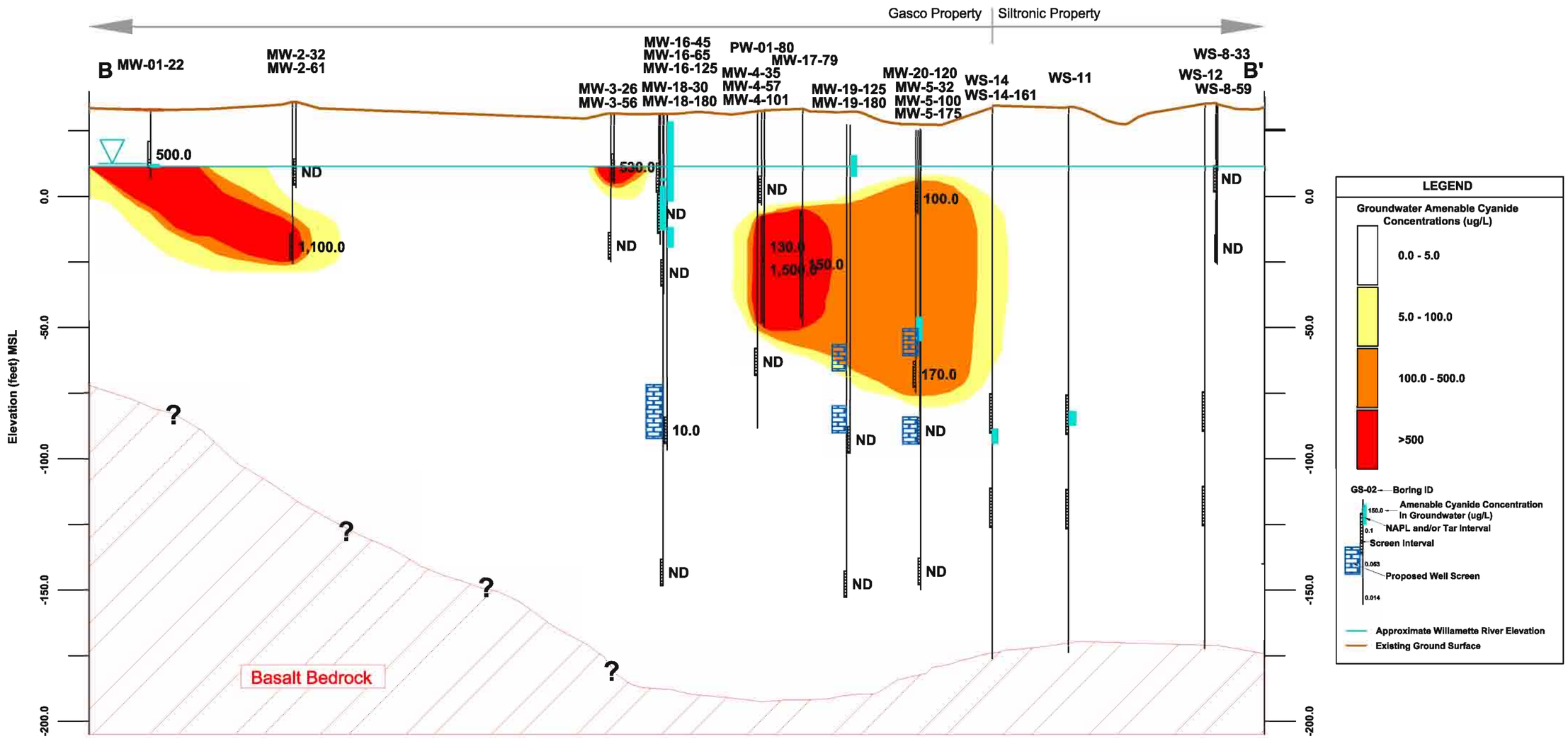
0 200
Scale in Feet

5x Vertical Exaggeration

Apr 30, 2007 7:48am jpelc C:□Documents and Settings□jpelc□My Documents□Gasco□CADstuff□ForReport□XSB.dwg Cyanide

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5c
Cross Section B-B'
Total Cyanide Groundwater Concentrations (ppb), Gasco/Siltronic Site
NW Natural, Portland, Oregon



Notes:
1. Vertical Datum: City of Portland
2. Horizontal Datum: Oregon State Plane NAD(83)
3. See Boring Logs for Sample Details

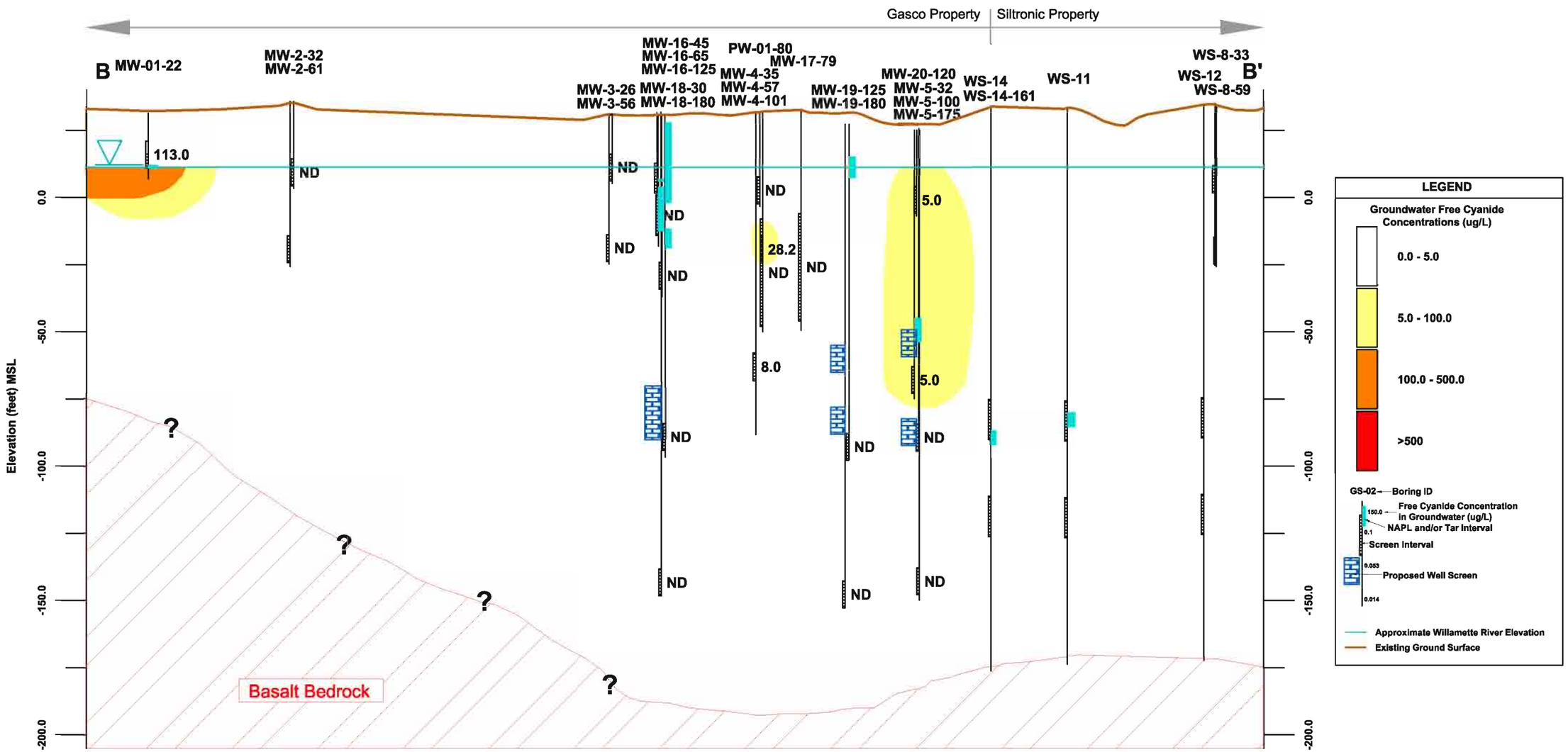
0 200
Scale in Feet

5x Vertical Exaggeration

Apr 30, 2007 7:48am jpelc C:□Documents and Settings□jpelc□My Documents□Gasco□CADstuff□ForReport□XSB.dwg Amenable Cyanide

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5d
Cross Section B-B'
Amenable Cyanide Groundwater Concentrations (ppb), Gasco/Siltronic Site
NW Natural, Portland, Oregon



Notes:
1. Vertical Datum: City of Portland
2. Horizontal Datum: Oregon State Plane NAD(83)
3. See Boring Logs for Sample Details

0 200
Scale in Feet

5x Vertical Exaggeration

Apr 30, 2007 7:49am jpelc C:□Documents and Settings□jpelc□My Documents□Gasco□CADstuff□ForReport□XSB.dwg Free Cyanide

ANCHOR ENVIRONMENTAL, L.L.C.

Figure 5e
Cross Section B-B'
Free Cyanide Groundwater Concentrations (ppb), Gasco/Siltronic Site
NW Natural, Portland, Oregon

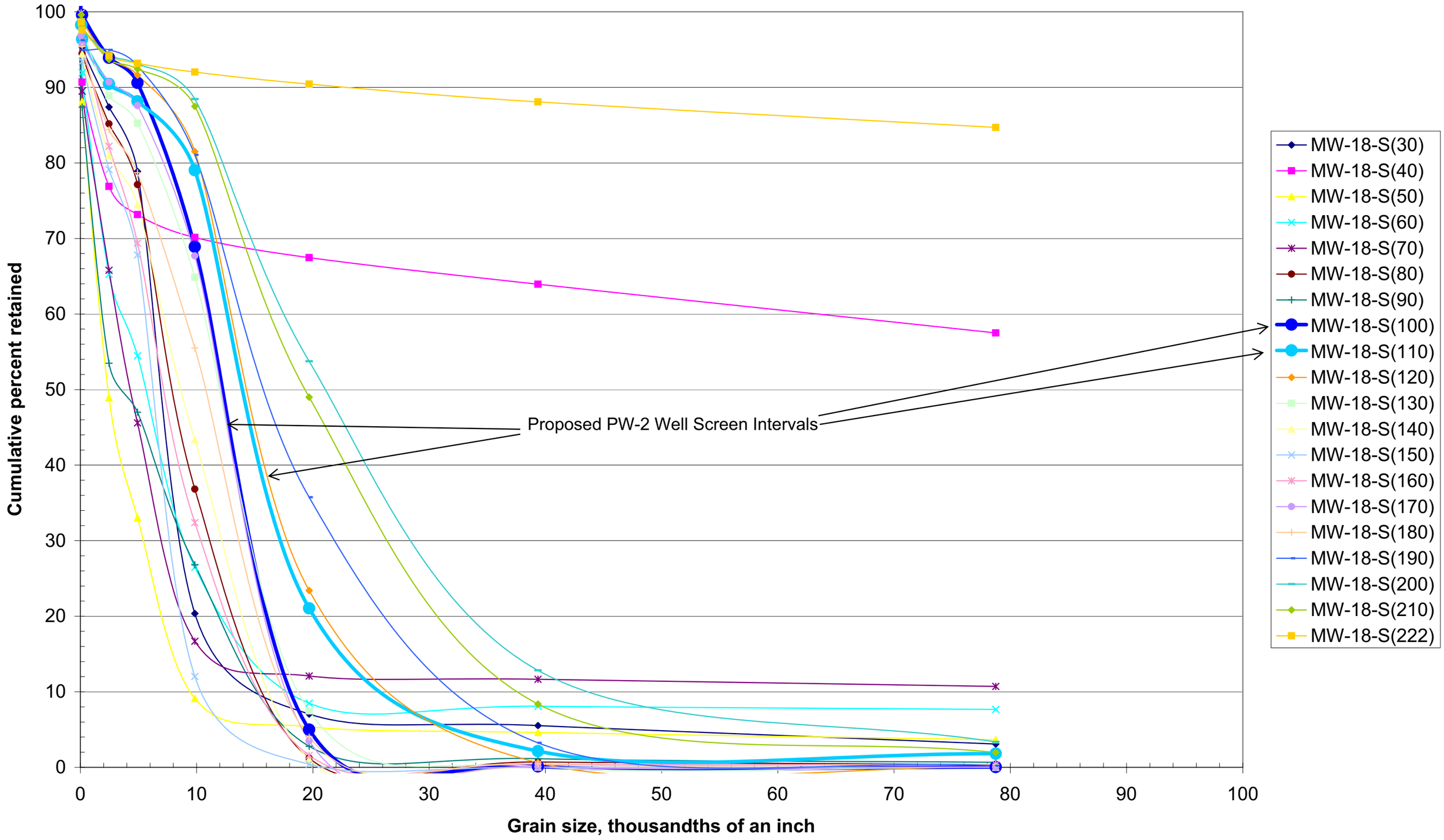


Figure 6a
MW-18 Grain Size Curves
Proposed Screen Depth
GASCO/Siltronic SIte
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.

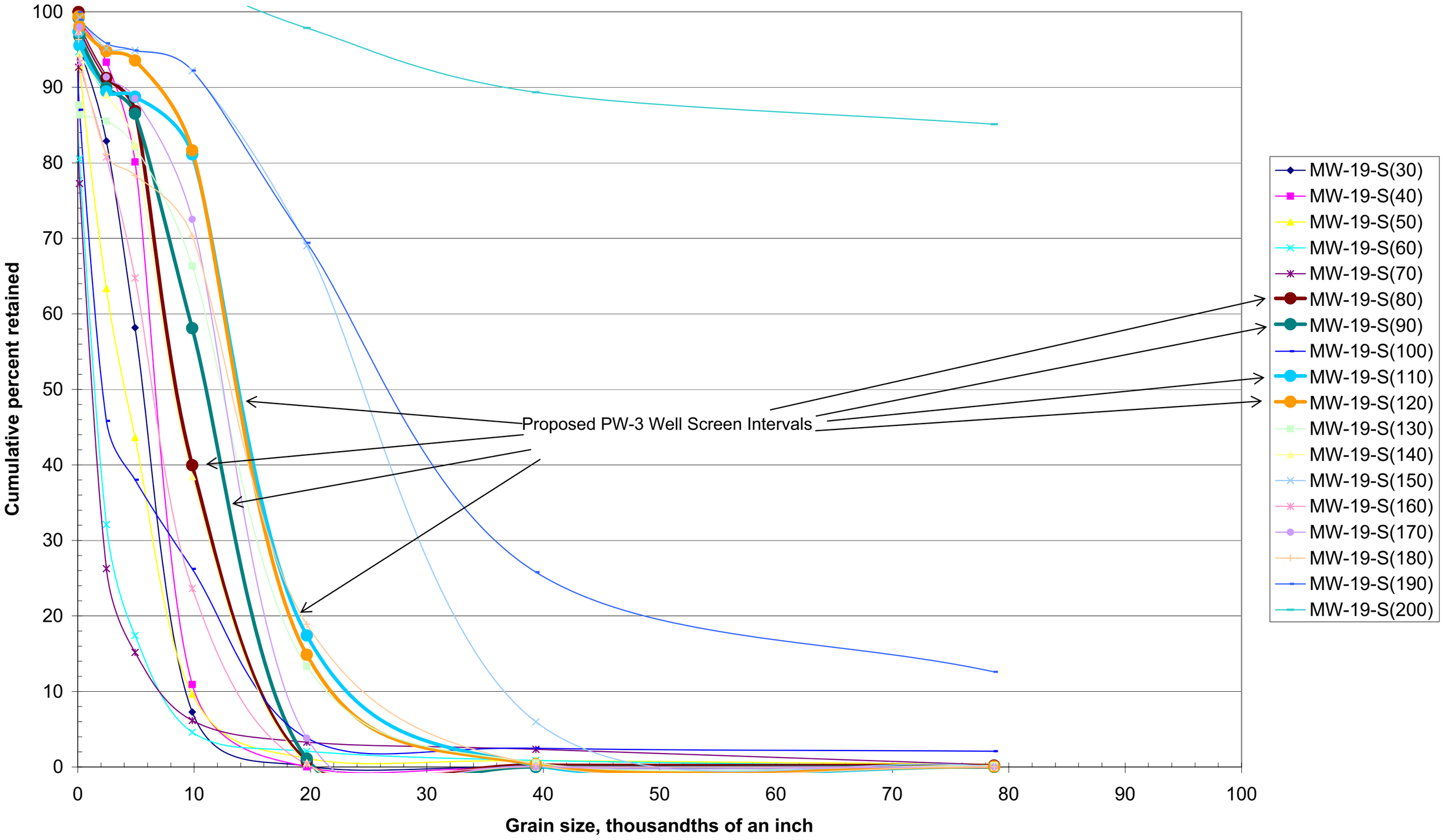


Figure 6b
MW-19 Grain Size Curves
Proposed Screen Depth
GASCO/Siltronic Site
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.

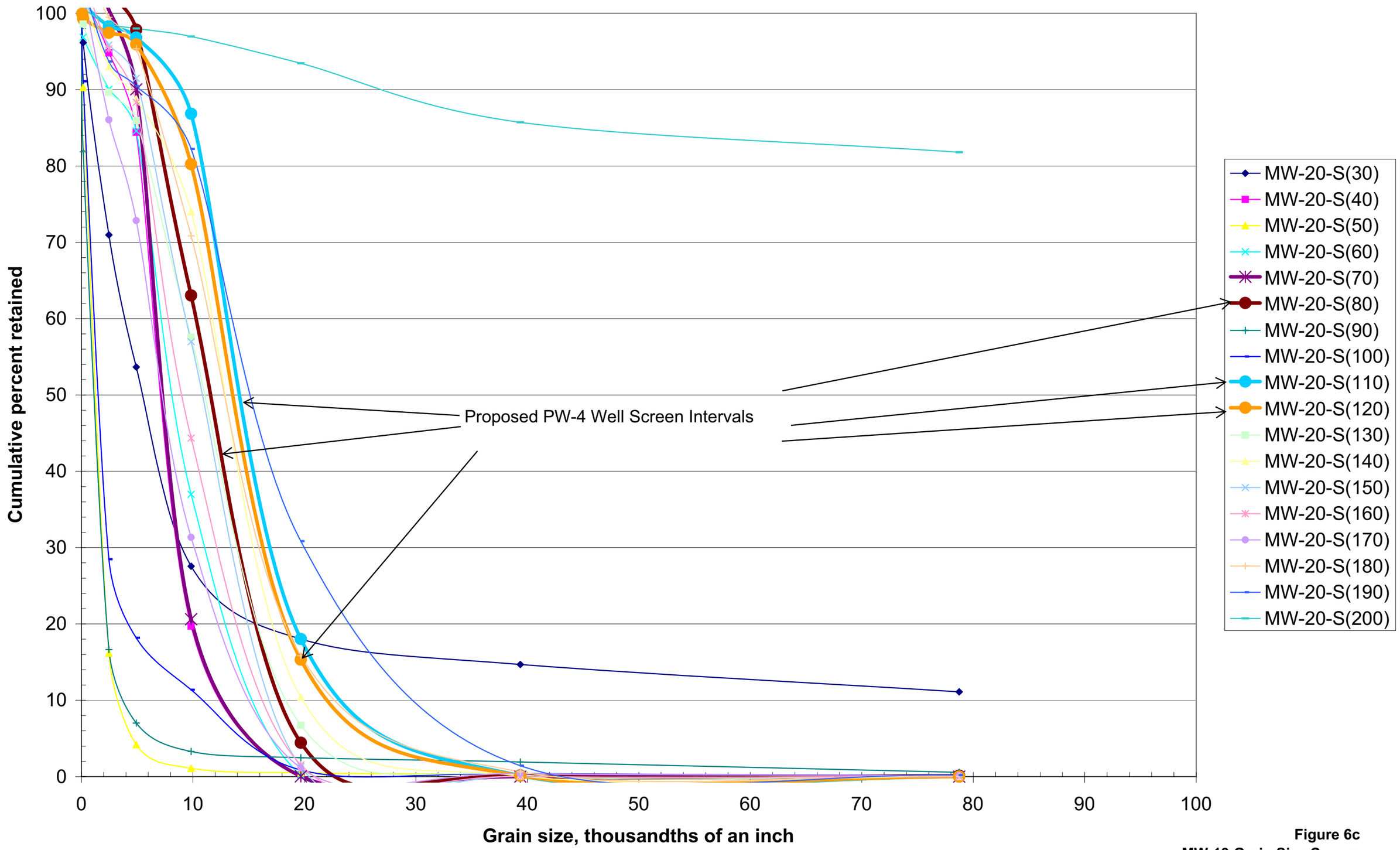
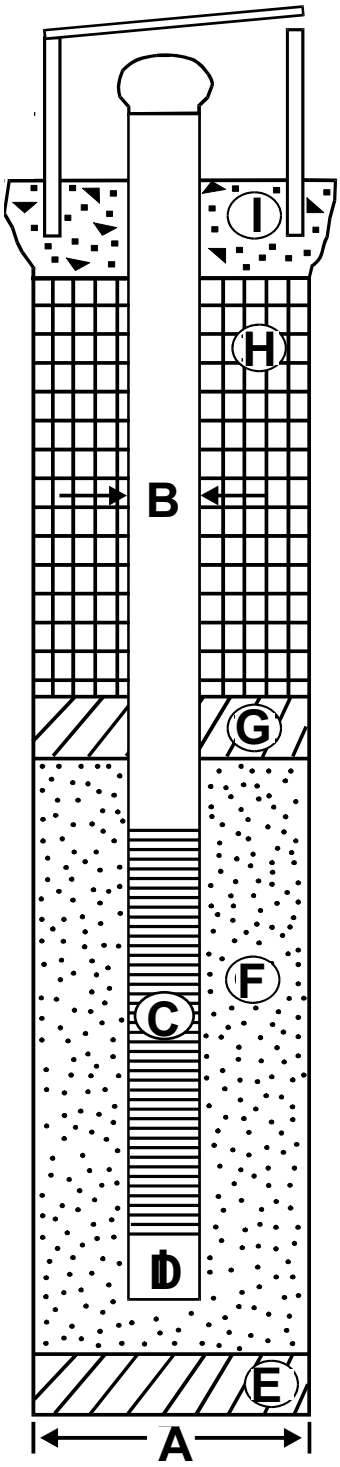


Figure 6c
MW-19 Grain Size Curves
Proposed Screen Depth
GASCO/Siltronic SIte
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.



Boring Details

A: 16" diameter temporary upper casing with step down to 12" diameter lower casing

Well Construction

B: 8" diameter Steel Riser Pipe

C: 8" diameter Stainless Steel wire-wrap screen

D: 8" diameter, 10-foot-long steel sump

E: Cement Grout

F: Silica Sand Filter Pack

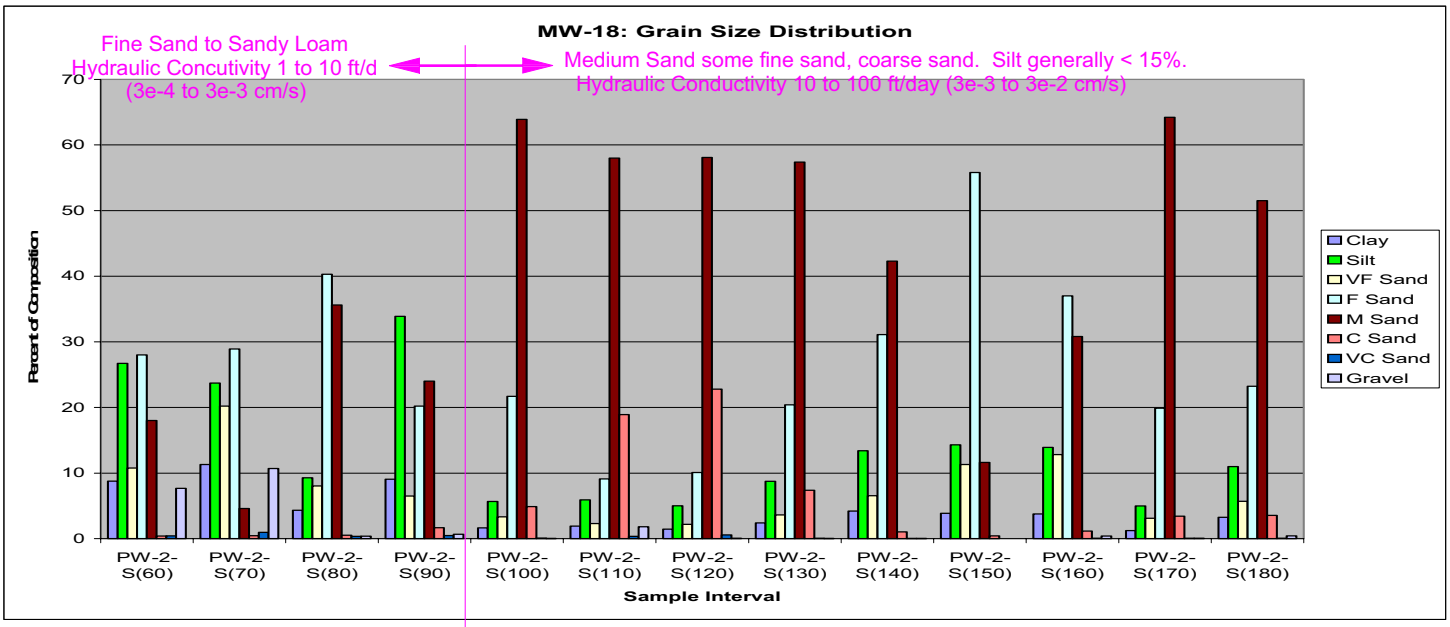
G: Fine Sand Filter Pack Seal

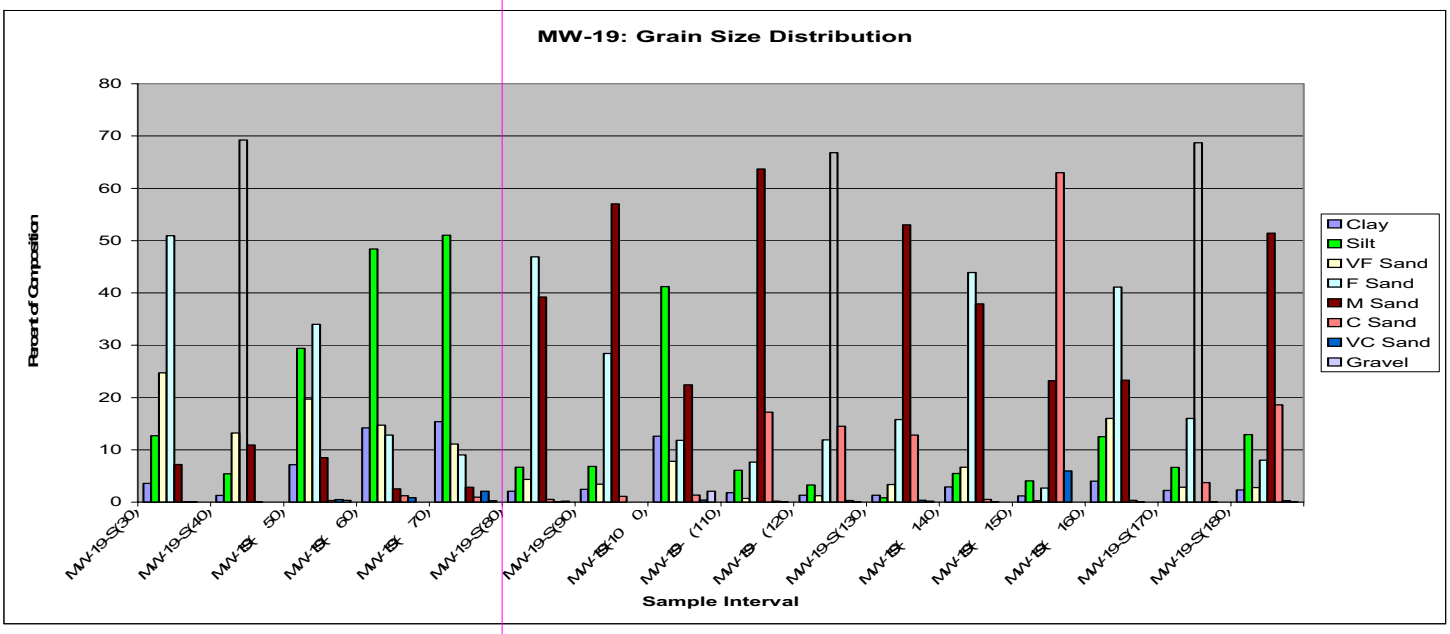
H: Cement Grout Annular Seal

I: Cement Grout Surface Seal

Figure 7
Extraction Well Construction Detail
NW Natural, Gasco Site
Portland, Oregon

ANCHOR ENVIRONMENTAL, L.L.C.





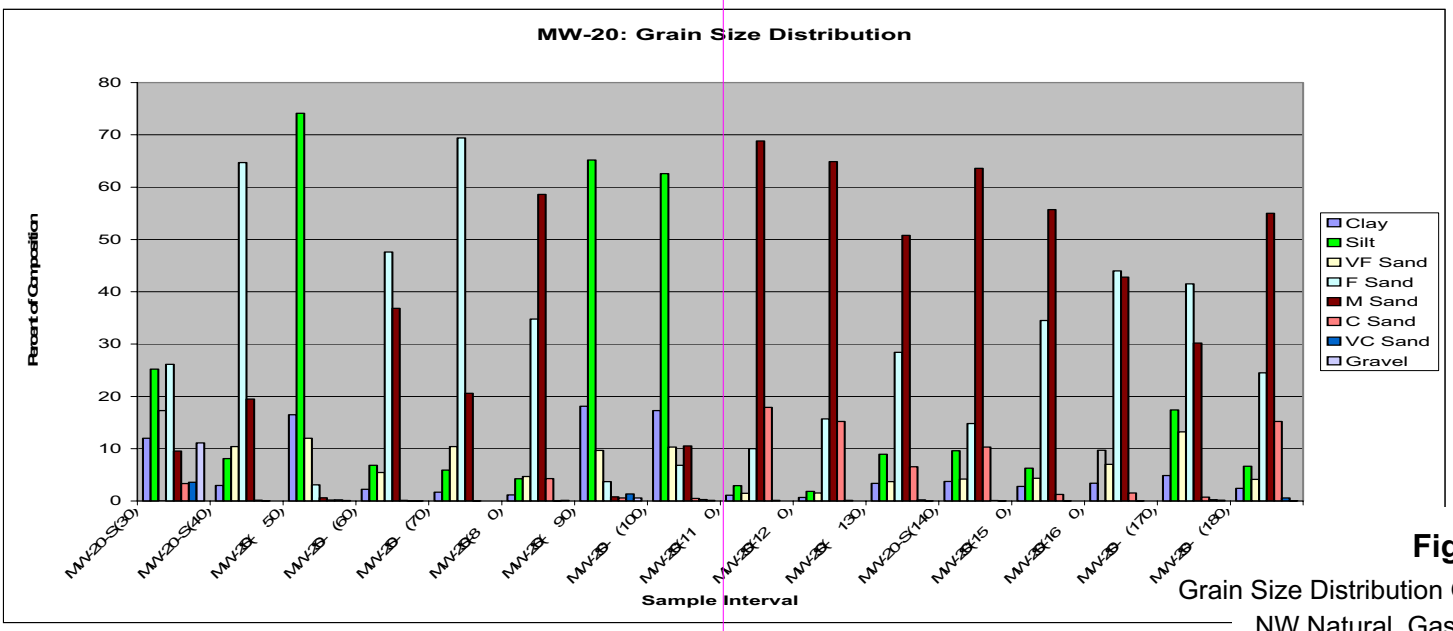
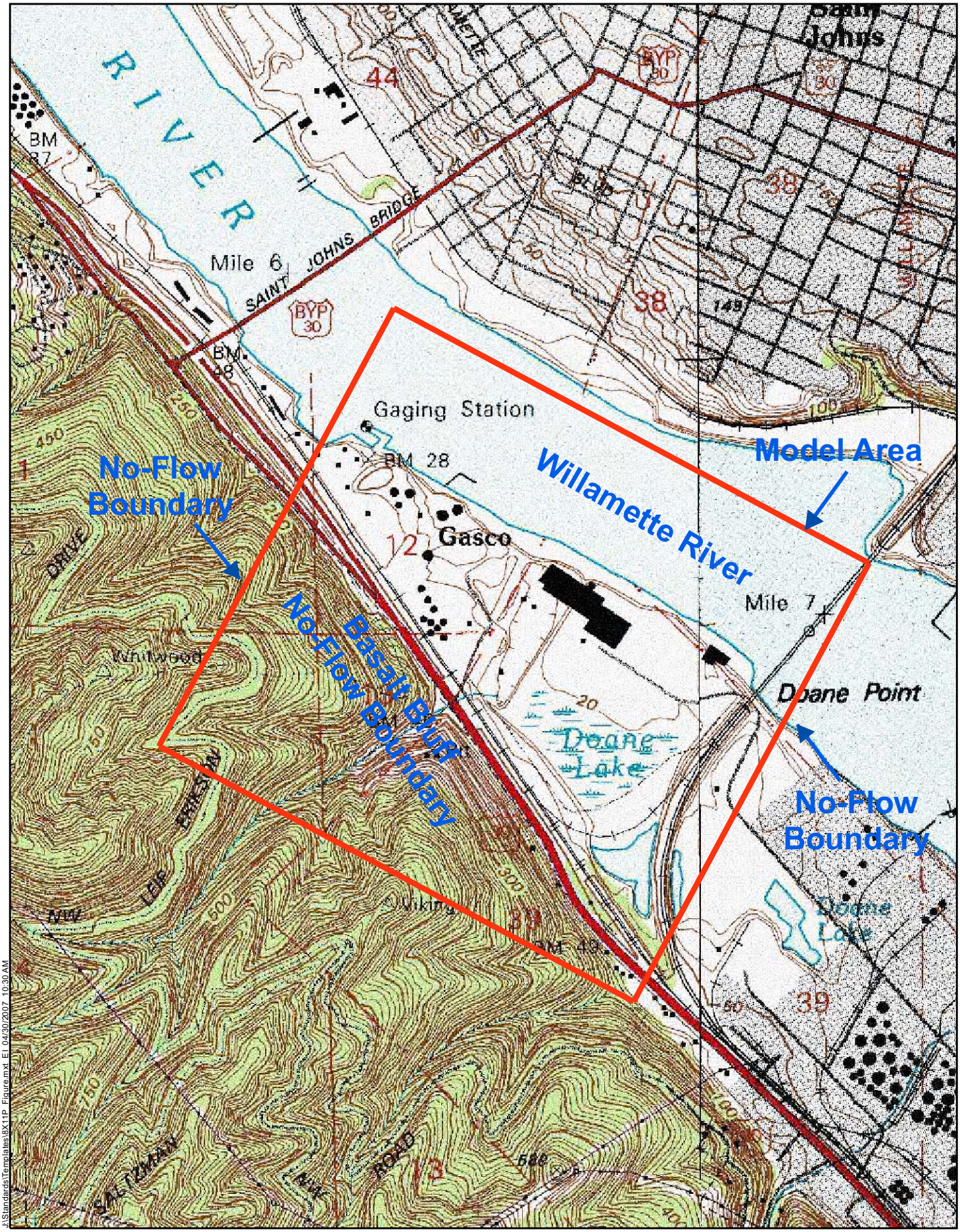


Figure 8

Grain Size Distribution Graphs
NW Natural, Gasco Site
Portland, Oregon

(Adapted from SSPA, May 2007)



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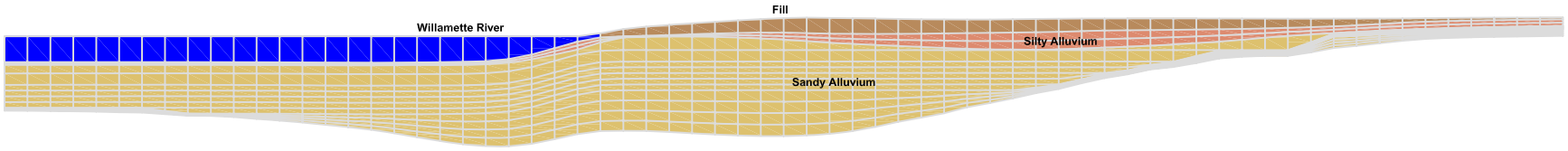
ANCHOR ENVIRONMENTAL, L.L.C.

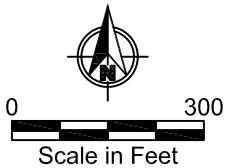
0 250 500 1,000 1,500 Feet

(Adapted from SSPA, May 2007)

Figure 9
Groundwater Model Boundaries
NW Natural, Gasco Site
Portland, Oregon

May 01, 2007 2:47pm jpelc C:□Documents and Settings□jpelc□My Documents□Gasco□CADstuff□fromMicheaelRiley□F10_typicalsection.dwg Anc-A-Land





ANCHOR ENVIRONMENTAL, L.L.C.

$\Sigma^2\Pi$

Figure 10
Typical Model Section
NW Natural, Gasco Site
Portland, Oregon

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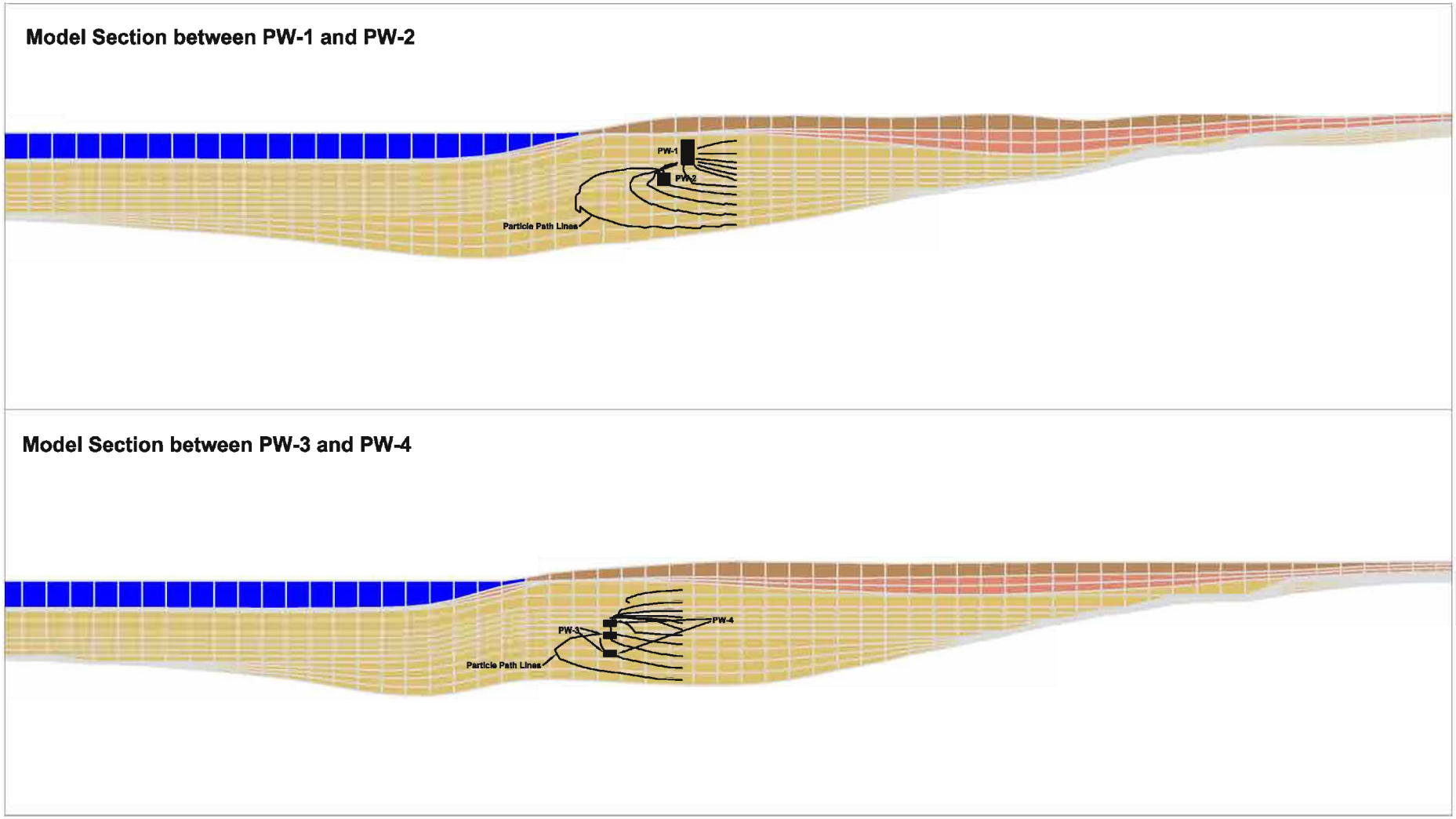
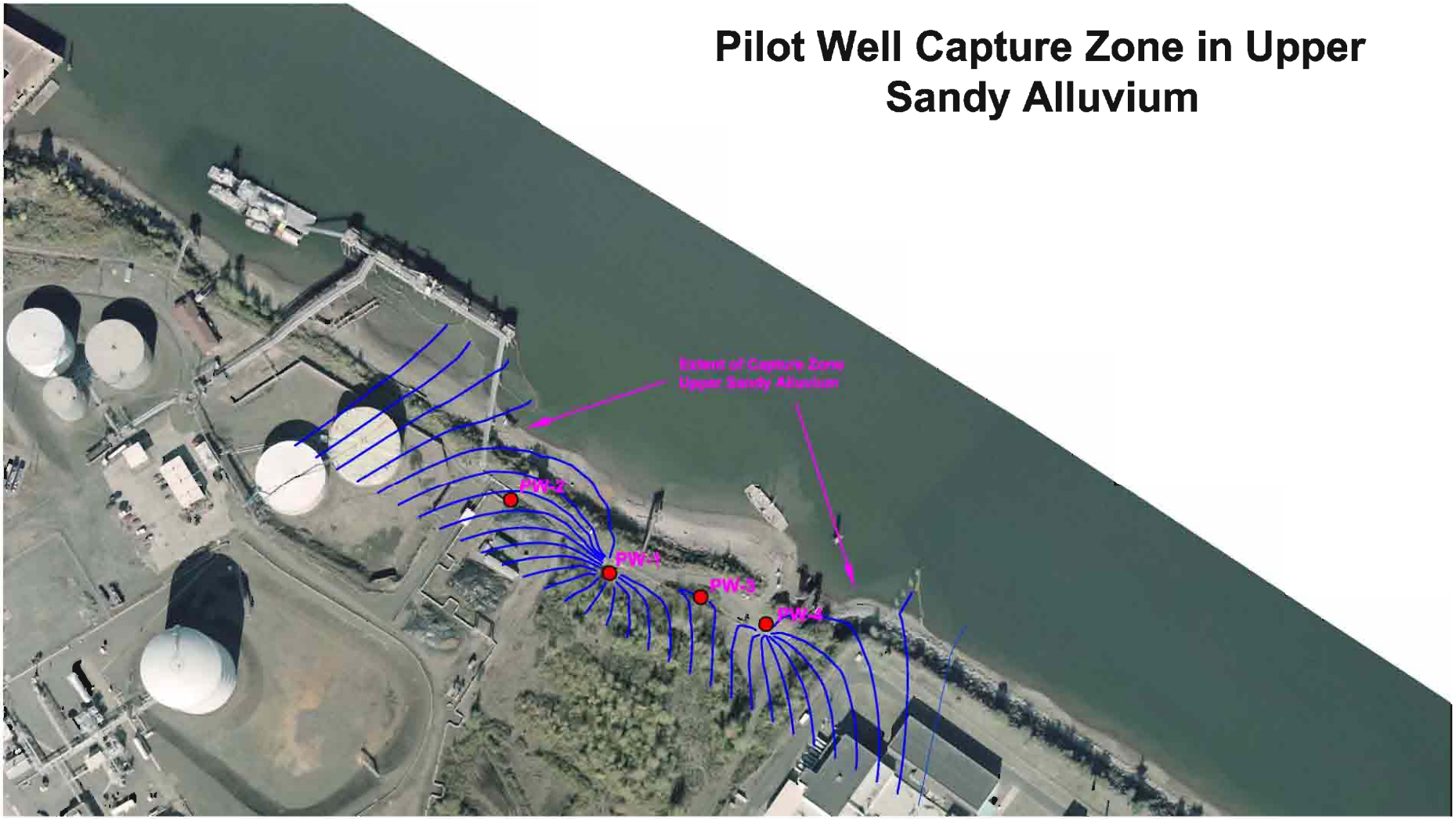


0 250
Scale in Feet

ANCHOR ENVIRONMENTAL, L.L.C.

$\Sigma^2\Pi$

Figure 11
Particle Tracking Profiles
NW Natural, Gasco Site
Portland, Oregon



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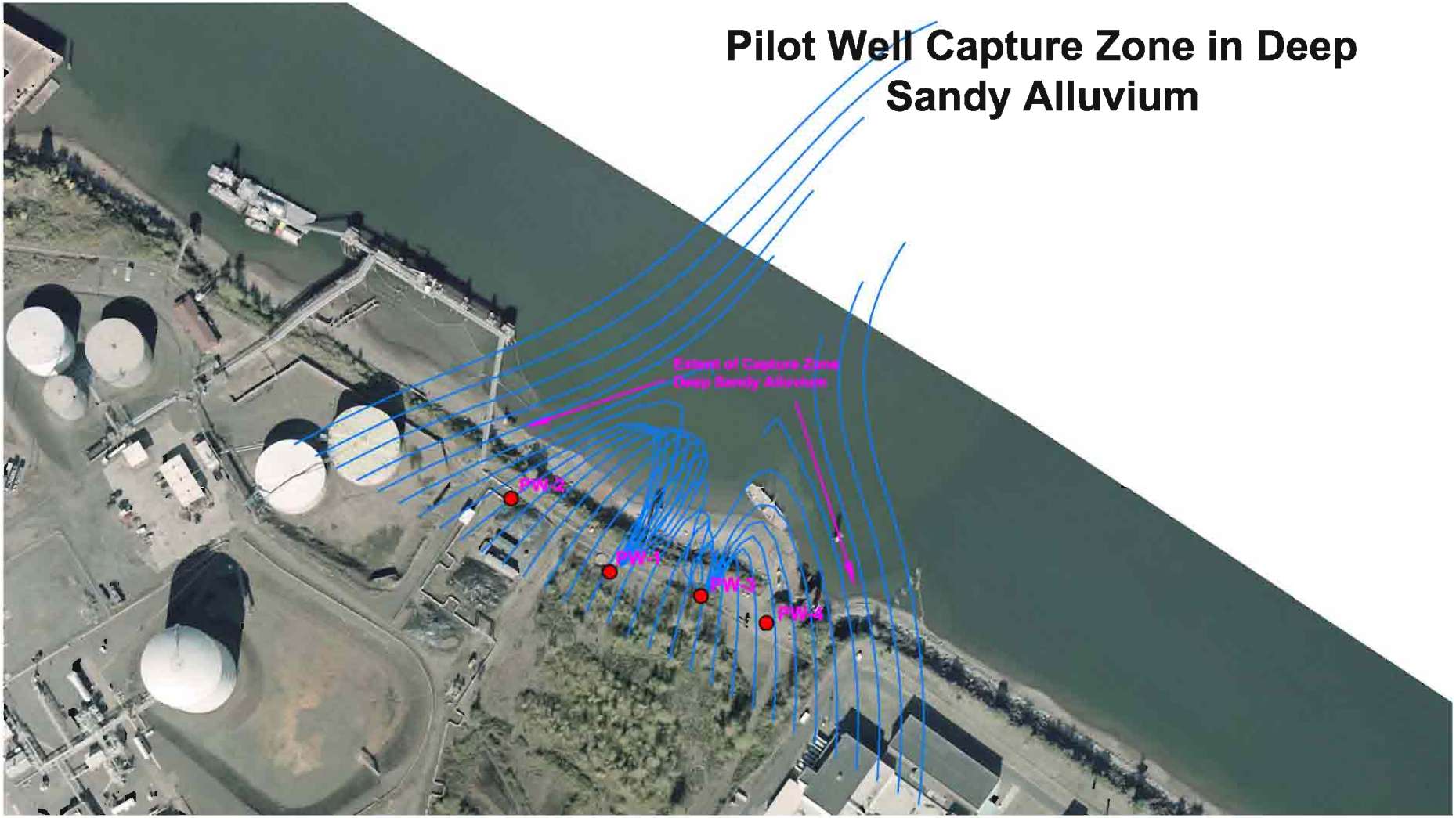
Scale in Feet

May 14, 2007 3:46pm jpelc C:\Documents and Settings\jpelc\My Documents\Gasco\CADstuff\fromMicheaelRiley\F12.dwg 12a

ANCHOR ENVIRONMENTAL, L.L.C.

$\Sigma^2\Pi$

Figure 12a
Particle Tracking Plan View
NW Natural, Gasco Site
Portland, Oregon



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Scale in Feet

May 14, 2007 3:47pm jpelc C:\Documents and Settings\jpelc\My Documents\Gasco\CADstuff\fromMicheaelRiley\F12.dwg 12b

ANCHOR ENVIRONMENTAL, L.L.C.

$\Sigma^2\Pi$

Figure 12b
Particle Tracking Plan View
NW Natural, Gasco Site
Portland, Oregon

APPENDIX A

BORING LOGS AND MONITORING WELL DETAILS

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-30**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**30.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/27/07**
		SURFACE ELEVATION	**31.66 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		5 10 15 20					See MW-18-180 for Lithologic Description. **WELL COMPLETION DETAILS** 0 to 19.0 feet: 2-inch-diameter, flush-threaded, Schedule 80 PVC blank riser pipe. 19.0 to 29.0 feet: 2-inch-diameter, flush-threaded, stainless steel wire wrap well screen with 0.020-inch slots. 29.0 to 30.0 feet: 2-inch-diameter, stainless steel threaded end cap. NAPL funnel at 29.0 feet. 0 to 12.0 feet: Cement grout. 12.0 to 15.0 feet: Bentonite chips hydrated with potable water. 15.0 to 30.0 feet: 10-20 Colorado Silica Sand.

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-30**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**30.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/27/07**
		SURFACE ELEVATION	**31.66 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		25					
		30					
		35					
		40					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**1 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	5 (0-6)	5					**0 to 12.0 feet: SILTY GRAVEL (GM)**; dark gray to black; 70 to 80 percent medium to coarse gravel and cobbles; 20 to 30 percent high plasticity fines, dense, strong petroleum hydrocarbon-like odor.
		10					@ 7.0 feet: wet.
	26 (6-26)	15					**12.0 to 27.0 feet: GRAVELLY SILT (ML)**; rusty brown with black seams; 60 to 70 percent medium to high plasticity fines; 30 to 40 percent fine to coarse gravel and cobbles; <5 percent fine to coarse sand, trace wood fragments, strong petroleum hydrocarbon-like odor.
							@ 15.0 to 19.0 feet: color change to black; oily with tar seams.
		20					@ 19.0 to 26.0 feet: color change to rust brown to yellowish brown; trace brick and wood fragments.

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**2 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							12.0 to 27.0 feet: GRAVELLY SILT (ML); continued.
							@ 22.0 feet: oily lens.
							@ 24.0 to 25.0 feet: oily.
		25					
							@ 26.0 to 27.0 feet: color change to black; oily.
							@ 27.0 feet: trace reeds and grasses; fill/native interface.
							27.0 to 36.0 feet: SILTY SAND (SM); black grading to grayish brown; 70 to 80 percent fine to medium sand; 20 to 30 percent low plasticity fines; trace fine gravel; oil saturated.
							@ 29.0 to 30.0 feet: SANDY SILT lens; greenish brown; laminated.
		30					
	10 (26-36)						@ 31.0 to 31.5 feet: SANDY SILT lens.
							@ 33.0 to 33.5 feet: SANDY SILT lens.
							@ 34.0 to 34.5 feet: SANDY SILT lens.
		35					
							@ 35.5 to 36.0 feet: SANDY SILT lens.
							36.0 to 50.0 feet: GRAVELLY SILT with SAND (ML); brownish gray to black; low to medium plasticity fines; 30 to 40 percent fine to coarse gravel with cobbles; 15 to 20 percent fine to coarse sand; oily, wet.
							Note: material at 36.0 to 50.0 feet appears to be sluff from the upper 17.0 feet of the boring; this material is not consistent with other borings in the area.
		40					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**3 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							36.0 to 50.0 feet: GRAVELLY SILT with SAND (ML); continued.
		45					
	16 (36-56)						@ 47.0 feet: brick chunk.
		50					**50.0 to 73.0 feet: SILTY SAND (SM)**; grayish brown; fine sand; 20 to 30 percent low to medium plasticity fines; trace organic laminations (leaf mats); loose, soupy, wet, light sheen to 61.0 feet. @ 50.0 to 55.0 feet: oily laminations.
		55					
		60					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**4 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	10 (56-76)	65 70 75 80					**50.0 to 73.0 feet: SILTY SAND (SM)**; continued. @ 70.0 feet: 6-inch cobble. **73.0 to 76.0 feet: SANDY SILT (ML)**; grayish brown; medium plasticity fines; 30 percent fine sand; trace organic laminations. **76.0 to 83.0 feet: SAND (SP)**; grayish brown; fine sand; 10 to 15 percent nonplastic to low plasticity fines.

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**5 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							76.0 to 83.0 feet: SAND (SP); continued.
							@ 80.0 to 83.0 feet: light sheen and petroleum hydrocarbon-like odor.
							@ 83.0 feet: cobble, vesicular basalt, >4-inch diameter.
							83.0 to 85.0 feet: SILTY SAND (SM); grayish brown; fine to medium sand; 20 to 30 percent fines; trace organics.
		85					**85.0 to 86.0 feet: SILT (ML)**; grayish brown; medium to high plasticity fines.
							86.0 to 140.0 feet: SAND (SP); grayish brown; fine to medium sand; <10 percent fines.
	20 (76-96)						
		90					@ 90.0 feet: 0.3-foot silt lens.
							@ 92.0 feet: 0.5-foot silt lens.
							@ 93.0 feet: 0.3-foot sile lens.
		95					
		100					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**6 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							86.0 to 140.0 feet: SAND (SP); continued.
		105					
	20 (96-116)						
		110					@ 110.0 feet: 0.4-foot silt lens.
		115					
							@ 117.0 to 120.0 feet: 4 to 6 medium gravel-sized nodules, well rounded, firm to hard.
		120					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**7 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							86.0 to 140.0 feet: SAND (SP); continued.
							@ 123.0 to 126.0 feet: increase in fines to 20 to 30 percent.
		125					
	20 (116-136)						
		130					@ 130.0 feet: 0.3-foot SILT lens.
		135					@ 135.0 feet: 0.3-foot SILT lens.
		140					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**8 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	20 (136-156)	145 150 155 160					**140.0 to 156.0 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; <10 percent fine sand. @ 141.0 to 141.5 feet: SAND lens; fine to medium sand. @ 143.0 to 144.0 feet: SILTY SAND lens; fine to medium sand; medium to high plasticity fines. @ 146.0 to 146.5 feet: SAND lens; fine to medium sand. @ 147.0 to 148.0 feet: SAND lens; fine sand. @ 149.0 to 151.0 feet: SAND lens; fine sand. @ 152.0 feet: 0.3-foot SAND lens; fine to medium sand. @ 153.0 to 153.5 feet: SAND lens; fine to medium sand. @ 155.0 feet: 0.1-foot SAND lens; fine sand. @ 155.5 feet: 0.1-foot SAND lens; fine sand. **156.0 to 187.0 feet: SAND (SP)**; grayish brown; fine to medium sand; <10 percent fines.

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**9 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	19 (156-176)	165 170 175 180					**156.0 to 187.0 feet: SAND (SP)**; continued. @ 160.5 to 161.5 feet: SILT lens; trace organic laminations. @ 162.0 to 170.0 feet: trace pumice; coarse sand sized.

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**10 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							156.0 to 187.0 feet: SAND (SP); continued.
							@ 183.0 feet: trace twigs.
		185					
	20 (176-196)						**187.0 to 189.0 feet: SILT (ML)**; grayish brown; medium to high plasticity fines.
							189.0 to 190.0 feet: SAND (SP); brown; fine to medium sand.
		190					**190.0 to 191.0 feet: SILT (ML)**; grayish brown; medium to high plasticity fines.
							191.0 to 192.5 feet: SAND (SP); grayish brown; fine to medium sand.
							192.5 to 194.0 feet: SILT (ML); grayish brown; medium to high plasticity fines; 10 to 15 percent fine sand.
							194.0 to 195.0 feet: SAND (SP); grayish brown; fine to medium sand; trace fines.
		195					**195.0 to 211.0 feet: SAND (SP)**; brown; fine to coarse sand; trace fines; trace fine gravel.
		200					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**11 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							195.0 to 211.0 feet: SAND (SP); continued.
		205					
	20 (196-216)						@ 208.0 feet: 0.1-foot SILT lens; brown; medium plasticity. @ 208.5 feet: 0.1-foot SILT lens; brown; medium plasticity.
		210					
							211.0 to 213.0 feet: SANDY GRAVEL (GP); brown; fine to coarse; trace quartzite gravels; 15 to 20 percent SAND; <5 percent nonplastic fines.
							213.0 to 214.0 feet: SAND (SP); brown; fine to medium.
		215					**214.0 to 216.0 feet: SANDY GRAVEL (GP)**; brown; fine to coarse; trace quartzite gravels; 15 to 20 percent SAND; <5 percent nonplastic fines.
							216.0 to 222.0 feet: SAND (SP); brown; fine to medium sand.
		220					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-18-180**
LOCATION	**Portland, Oregon**	PAGE	**12 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**230.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**2/26/07**
		SURFACE ELEVATION	**31.70 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							216.0 to 222.0 feet: SAND (SP); continued.
	14 (216-230)	225					**222.0 to 230.0 feet: SANDY GRAVEL (GP)**; grayish brown; fine to coarse; subrounded to well rounded gravel; 20 to 30 percent fine to coarse sand; 10 to 15 percent nonplastic to low plasticity fines.
		230					@ 230.0 feet: bedrock.
		235					Bottom of boring = 230.0 feet.
		240					

WELL COMPLETION DETAILS

0 to 170.0 feet: 2-inch-diameter, flush-threaded, Schedule 80 PVC blank riser pipe.
170.0 to 180.0 feet: 2-inch-diameter, flush-threaded, stainless steel wire wrap well screen with 0.020-inch slots.
180.0 to 181.0 feet: 2-inch-diameter, stainless steel threaded end cap.
Cenralizers at 40.0, 70.0, 120.0, 170.0 and 180.0 feet.
NAPL funnel at 180.0 feet.

0 to 161.0 foot: Cement grout.
161.0 to 166.0 feet: Bentonite chips hydrated with potable water.
166.0 to 189.0 feet: 10-20 Colorado Silica Sand.
189.0 to 230.0 feet: Cement grout.

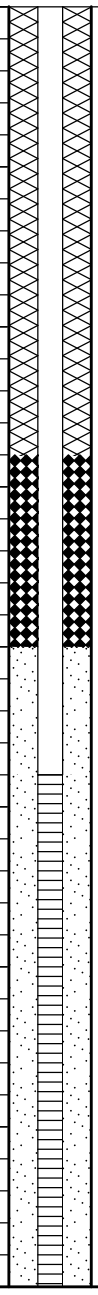
REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 76.0 feet, 6" 76.0 to 230.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-22**
LOCATION	**Portland, Oregon**	PAGE	**1 of 2**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**23.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/6/07**
		SURFACE ELEVATION	**27.40 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		5 10 15 20					See MW-19-180 for Lithologic Description. **WELL COMPLETION DETAILS** 0 to 12.0 feet: 2-inch-diameter, flush-threaded, Schedule 80 PVC blank riser pipe. 12.0 to 22.0 feet: 2-inch-diameter, flush-threaded, stainless steel wire wrap well screen with 0.020-inch slots. 22.0 to 23.0 feet: 2-inch-diameter, stainless steel threaded end cap. Centralizers at 11.0 and 21.0 feet. NAPL funnel at 22.0 feet. 0 to 7.0 feet: Cement grout. 7.0 to 10.0 feet: Bentonite chips hydrated with potable water. 10.0 to 23.0 feet: 10-20 Colorado Silica Sand.

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-22**
LOCATION	**Portland, Oregon**	PAGE	**2 of 2**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**23.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/6/07**
		SURFACE ELEVATION	**27.40 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		25					
		30					
		35					
		40					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**1 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		5 10 15 20					See MW-19-180 for Lithologic Description. **WELL COMPLETION DETAILS** 0 to 115.0 feet: 2-inch-diameter, flush-threaded, Schedule 80 PVC blank riser pipe. 115.0 to 125.0 feet: 2-inch-diameter, flush-threaded, stainless steel wire wrap well screen with 0.020-inch slots. 125.0 to 126.0 feet: 2-inch-diameter, stainless steel threaded end cap. Centralizers at 25.0, 75.0, 115.0 and 124.0 feet. NAPL funnel at 125.0 feet. 0 to 110.0 foot: Cement grout. 110.0 to 113.0 feet: Bentonite chips hydrated with potable water. 113.0 to 126.0 feet: 10-20 Colorado Silica Sand.

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**2 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		25					
		30					
		35					
		40					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**3 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		45					
		50					
		55					
		60					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**4 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		65					
		70					
		75					
		80					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**5 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		85					
		90					
		95					
		100					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**6 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		105					
		110					
		115					
		120					

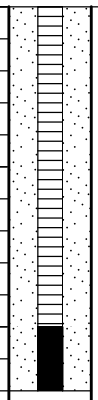
REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-125**
LOCATION	**Portland, Oregon**	PAGE	**7 of 7**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**126.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/12/07**
		SURFACE ELEVATION	**27.20 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		125					
		130					
		135					
		140					

REMARKS

*City of Portland Datum.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**1 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	4 (0-5)	5					**0 to 1.0 foot: SILTY GRAVEL (GP)**; grayish brown; medium to coarse gravel, angular; 20 to 30 percent medium to high plasticity fines; 10 precent organics (blackberry roots, stems, grasses). **1.0 to 9.0 feet: GRAVELLY SILT (ML)**; rust brown; 30 to 40 percent fine to medium gravel, angular to subrounded; 50 to 60 percent medium to high plasticity fines; 5 to 10 percent fine to coarse sand. @ 5.0 to 9.0 feet: wet. @ 5.5 to 6.0 feet: sand layer, fine to medium.
	6 (5-12)	10					**9.0 to 18.0 feet: GRAVELLY SILT (ML)**; gray to brown mottled; medium to high plasticity fines; 10 to 20 percent fine to coarse gravel with oily pockets and tar blebs; trace organics (grasses and roots).
	5 (12-17)	15					
		20					**18.0 to 21.5 feet: SILTY SAND (SM)**; grayish brown to black; 50 to 60 percent fine to medium sand; 30 to 40 percent nonplastic to low plasticity fines; 10 to 15 percent fine to coarse gravel; lampblack; heavy

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**2 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							sheen, oily.
							@ 21.5 feet: contact with native.
							21.5 to 22.0 feet: SILT (ML); grayish brown; medium to high plasticity fines; trace very fine root hairs.
							22.0 to 22.5 feet: SAND (SP); grayish brown to black; fine to medium sand cemented with tar; tar laminations and wood fragments.
	9 (17-27)	25					**22.5 to 28.0 feet: SANDY SILT (ML)**; olive gray; 60 to 70 percent medium to high plasticity fines; 30 to 40 percent very fine sand. @ 25.0 to 28.0 feet: color change to olive gray mottled with rush brown grading to more brown than gray with depth.
							28.0 to 29.0 feet: SAND (SP); rush brown; fine sand; 10 to 15 percent nonplastic to low plasticity fines.
		30					**29.0 to 30.5 feet: SAND (SP)**; grayish brown; fine sand; 10 to 15 percent nonplastic to low plasticity fines.
	10 (27-37)						**30.5 to 32.5 feet: SILT WITH SAND (ML)**; grayish brown; medium to high plasticity fines; 20 to 30 percent fine sand; laminated.
							32.5 to 35.0 feet: SILTY SAND (SM); 70 to 80 percent fine sand; 20 to 30 percent medium plasticity fines with silt laminations.
		35					**35.0 to 47.0 feet: SAND (SP)**; grayish brown; fine sand; 10 to 15 percent low plasticity fines.
							@ 37.0 feet: 0.2-foot SILT lens.
							@ 38.0 feet: 0.4-foot SILT lens.
							@ 39.5 feet: 0.3-foot SILT lens.
		40					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**3 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	9 (37-47)	45					**35.0 to 47.0 feet: SAND (SP)**; continued. @ 41.0 feet: 0.1-foot SILT lens. @ 45.0 to 46.0 feet: SILT lens.
	2.5 (47-50)	50					**47.0 to 50.0 feet: SILT with SAND (ML)**; grayish brown; 20 to 30 percent medium to high plasticity fines. @ 48.0 feet: 0.4-foot fine SAND lens. **50.0 to 51.5 feet: SILTY SAND (SM)**; grayish brown; fine sand; 20 to 30 percent medium to high plasticity fines. **51.5 to 52.5 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; 10 to 15 percent fine sand.
	13 (50-65)	55					**52.5 to 53.0 feet: SAND (SP)**; grayish brown; fine sand; trace fines. **53.0 to 54.5 feet: SANDY SILT (ML)**; grayish brown; medium to high plasticity fines; 30 to 40 percent fine sand. **54.5 to 57.0 feet: SAND (SP)**; grayish brown; fine sand; trace fines. **57.0 to 59.5 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; 10 to 15 percent fine sand. **59.5 to 60.0 feet: SAND (SP)**; grayish brown; fine sand;
		60					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**4 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							trace fines.
							60.0 to 61.5 feet: SILT (ML); grayish brown; medium to high plasticity fines; 10 to 15 percent fine sand.
							61.5 to 65.0 feet: SAND (SP); grayish brown; fine sand; <10 percent fines. @ 63.5 feet: 0.4-foot SILT lens.
		65					**65.0 to 68.5 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; <10 percent fine sand.
	10 (65-75)						**68.5 to 70.0 feet: SILTY SAND (SM)**; grayish brown; fine sand; 20 to 30 percent medium to high plasticity fines. @ 69.0 to 69.5 feet: <5 percent organics (wood, fibers).
		70					**70.0 to 72.0 feet: SILT with SAND (ML)**; grayish brown; high plasticity fines; 10 to 20 percent fine sand. @ 71.5 to 73.0 feet: light brown mottles.
							72.0 to 73.0 feet: SILTY SAND (SM); grayish brown; fine sand; 20 to 30 percent medium to high plasticity fines.
							73.0 to 74.5 feet: SILT (ML); grayish brown; medium to high plasticity fines; trace organics (wood fibers).
		75					**74.5 to 76.0 feet: SILTY SAND (SM)**; grayish brown; fine sand; 20 to 30 percent medium to high plasticity fines.
							76.0 to 97.0 feet: SAND (SP); grayish brown; fine sand layered with silt nodules and sand fissures; sand coarsening with depth to fine to medium. @ 77.0 to 78.0 feet: 30 to 40 percent silt. @ 79.0 to 80.0 feet: 20 to 30 percent silt.
		80					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**5 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	12.5 (75-90)	85					**76.0 to 97.0 feet: SAND (SP)**; continued. @ 80.5 feet: medium gravel-sized silt nodule (hard). @ 82.0 to 83.0 feet: 30 to 40 percent silt. @ 85.0 feet: light gray silt lens 0.5-inches thick. Volcanic ash? @ 86.5 to 87.0 feet: 20 to 30 percent fines. @ 87.5 to 90.0 feet: 20 to 30 percent fines. @ 89.5 feet: fine gravel-sized silt nodule (hard). @ 93.0 to 95.0 feet: SILT with sand lenses.
	14 (90-105)	90 95 100					**97.0 to 104.0 feet: SANDY SILT (ML)**; grayish brown; 50 to 60 percent low to medium plasticity fines; 40 to 50 percent fine to medium sand. @ 97.0 to 104.0 feet: 50 percent SILT.

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**6 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							97.0 to 104.0 feet: SANDY SILT (ML); continued.
		105					**104.0 to 105.0 feet: SAND (SP)**; fine to medium sand with fine to medium gravel-sized firm SILTY SAND nodules. @ 104.0 to 105.0 feet: sand with fine to medium gravel-sized SILTY SAND nodules (firm). **105.0 to 135.0 feet: SAND (SP)**; brownish gray; fine to medium sand; <10 percent low to medium plasticity fines.
		110					@ 109.0 to 110.5 feet: 1- to 2-inch silt nodules, firm, high plasticity.
	14 (105-120)						@ 112.5 feet: 2-inch silt nodule, firm, high plasticity.
		115					
		120					@ 119.0 feet: trace organics (twig). @ 119.5 to 120.0 feet: 20 to 30 percent fines.

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**7 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	5 (120-125)	125					**105.0 to 135.0 feet: SAND (SP)**; continued. @ 121.0 feet: 0.1-foot SILT lens. @ 123.0 feet: SILT nodules <1-inch diameter; medium to high plasticity. @ 124.5 feet: SILT nodules <1-inch diameter; medium to high plasticity. @ 126.5 feet: 0.1-foot SILT lens; medium to high plasticity.
	5 (125-130)	130					@ 129.0 to 130.0 feet: SILT lens <0.5-inch thick, approximately 15 in 1-foot section, "tiger stripe appearance." @ 131.0 feet: 0.1-foot SILT lens. @ 131.5 feet: 0.1-foot SILT lens. @ 132.0 feet: 0.1-foot SILT lens. @ 132.5 feet: 0.1-foot SILT lens. @ 134.0 feet: fine to medium gravel-sized SILT nodules, hard.
	15 (130-145)	135					**135.0 to 136.0 feet: SILT with SAND (ML)**; grayish brown, medium to high plasticity fines; 20 to 30 percent fine sand; wood fiber layer at base. **136.0 to 156.0 feet: SAND (SP)**; brownish gray; fine to medium sand; <10 percent fines. @ 138.5 feet: 0.4-foot SILT lens with ¼-inch diameter twig.
		140					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**8 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							136.0 to 156.0 feet: SAND (SP); continued.
		145					
		150					
	14 (145-165)						@ 153.0 to 154.0 feet: SILT to SANDY SILT lens, laminated, firm, light brown.
		155					**156.0 to 158.0 feet: SANDY SILT (ML)**; grayish brown; medium to high plasticity fines; 30 to 40 percent fine sand.
							158.0 to 162.0 feet: SILTY SAND (SM); grayish brown; fine sand; 10 to 20 percent medium plasticity fines.
		160					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**9 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							158.0 to 162.0 feet: SILTY SAND (SM); continued. @ 161.0 feet: 0.2-foot SILT lens.
		165					**162.0 to 173.0 feet: SAND (SP)**; grayish brown; fine to medium sand; <10 percent fines. @ 167.0 to 168.0 feet: increase in silt to 20-30 percent.
	10 (165-175)	170					@ 171.0 to 171.5 feet: three SILT lenses. @ 171.5 to 173.0 feet: trace decomposed shell fragments.
		175					**173.0 to 180.0 feet: SILTY SAND (SM)**; fine sand; 20 percent low to medium plasticity fines. @ 174.0 to 174.5 feet: SILT lens with trace organic laminations; firm.
		180					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 45.0 feet, 6" 45.0 to 227.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**10 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		185					**180.0 to 187.0 feet: SAND (SP)**; grayish brown; fine to medium sand; <10 percent fines.
	14 (175-195)	190					**187.0 to 192.0 feet: GRAVELLY SAND (SP)**; fine to medium sand; 20 to 30 percent fine to medium gravel; subrounded to well rounded; some quartzite.
		195					**192.0 to 222.0 feet: SANDY GRAVEL (GP)**; greenish gray; fine to coarse gravel, subangular to well rounded; 20 to 30 percent fine to coarse sand. @ 194.0 feet: color change to brown.
		200					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**11 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							192.0 to 222.0 feet: SANDY GRAVEL (GP); continued.
							@ 203.0 to 215.0 feet: increase in gravel size to fine to coarse.
		205					
	15 (195-215)						
							@ 209.0 to 222.0 feet: 10 to 20 percent fines.
		210					
		215					
	6 (215-222)						
		220					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-19-180**
LOCATION	**Portland, Oregon**	PAGE	**12 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**227.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/2/07**
		SURFACE ELEVATION	**27.28 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							192.0 to 222.0 feet: SANDY GRAVEL (GP); continued.
	5 (222-227)	225					**222.0 to 227.0 feet: BASALT**; rust brown to gray; heavily weathered to coarse gravel; angular and SILT; hard.
		230					Bottom of boring = 227.0 feet. **WELL COMPLETION DETAILS** 0 to 170.0 feet: 2-inch-diameter, flush-threaded, Schedule 80 PVC blank riser pipe. 170.0 to 180.0 feet: 2-inch-diameter, flush-threaded, stainless steel wire wrap well screen with 0.020-inch slots. 180.0 to 181.0 feet: 2-inch-diameter, stainless steel threaded end cap. Centralizers at 20.0, 70.0, 120.0, 170.0 and 180.5 feet. NAPL funnel at 180.0 feet. 0 to 164.7 feet: Cement grout. 164.7 to 167.5 feet: Bentonite chips hydrated with potable water. 167.5 to 182.0 feet: 10-20 Colorado Silica Sand. 182.0 to 227.0 feet: Cement grout.
		235					
		240					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**1 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	15 (0-15)	5, 10, 15					**0 to 16.0 feet: SANDY GRAVEL with SILT (GP-GM)**; brown; 60 to 70 percent fine to coarse gravel, angular to subrounded; 20 to 30 percent fine to coarse sand; 10 to 20 percent medium plasticity fines. @ 0 to 3.0 feet: cobbles. @ 4.0 to 5.5 feet: cobbles. @ 6.5 to 7.0 feet: cobbles. @ 9.5 to 10.0 feet: cobbles. @ 10.0 to 16.0 feet: fine to medium gravel.
	5 (15-20)	20					**16.0 to 17.0 feet: SILTY SAND (SM)**; black; 50 to 60 percent fine to medium sand; 30 to 40 percent nonplastic to low plasticity fines; 10 to 15 percent fine gravel to cobble-sized coal-like material (lampblack); oily petroleum-like odor. **17.0 to 17.3 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; trace fine sand; fine rootlets. @ 17.0 feet: contact with native. **17.3 to 17.5 feet: SAND (SP)**; grayish brown; fine to

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 96.0 feet, 6" 96.0 to 213.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**2 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	0 (20-30)	25					medium sand; <5 percent fines; trace organics (wood). **17.5 to 20.0 feet: SAND with SILT (SW-SM)**; gray, grading to brown, black to gray, then gray and brown mottled; fine sand; 10 to 20 percent medium plasticity fines; wet. **20.0 to 30.0 feet: NO RECOVERY**
	3 (30-35)	30 35					**30.0 to 35.0 feet: SILT with SAND (ML)**; grayish brown; low plasticity fines; 20 to 30 percent fine to coarse sand; trace fine gravel; loose; soupy; wet. @ 30.0 feet: trace spotty sheen. @ 34.0 feet: color change to brown. **35.0 to 49.5 feet: SAND (SP)**; brownish gray; fine sand; 5 to 10 percent fines; trace organics; trace fine gravel; trace decomposed shell fragments. @ 37.5 to 38.0 feet: SILT lens; medium to high plasticity; <10 percent fine sand. @ 39.0 feet: 0.2-foot SILT lens; medium to high plasticity; <5 percent organics.
		40					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 96.0 feet, 6" 96.0 to 213.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**3 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	10 (35-46)	45					@ 39.0 to 40.0 feet: 5 to 10 percent organics (wood chips and wood fibers).
							@ 47.5 feet: 0.3-foot SANDY SILT lens; medium to high plasticity.
		50					**49.5 to 52.0 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; <5 percent fine sand.
	10 (46-56)						**52.0 to 73.0 feet: SAND (SP)**; grayish brown; fine sand; trace organics; <5 percent fines.
		55					@ 54.0 feet: 0.3-foot SILT lens.
		60					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**4 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
	18 (56-76)	65 70 75 80					**52.0 to 73.0 feet: SAND (SP)**; continued. @ 62.0 feet: 0.3-foot SILT lens. @ 68.0 feet: thin organic (wood fiber) lamination; 0.3-foot SILT lens, medium to high plasticity. @ 70.0 to 73.0 feet: light sheen and strong odor. @ 71.0 feet: heavy sheen/saturated lens of sheen. @ 72.5 feet: DNAPL lens; brown oil. **73.0 to 74.5 feet: SILT (ML)**; grayish brown; medium to high plasticity; trace organics; odor; no sheen. **74.5 to 77.3 feet: SAND (SP)**; grayish brown; fine sand; <10 percent fines; trace spotty sheen. @ 75.8 feet: 0.2-foot SILT lens, medium to high plasticity. @ 77.0 feet: 0.3-foot-thick DNAPL lens, brown oil, strong odor. **77.3 to 78.0 feet: SILT (ML)**; grayish brown; <10 percent fine sand, trace decomposed shell; trace organics. **78.0 to 87.0 feet: SAND (SP)**; grayish brown; fine sand; <10 percent fines.

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**5 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
		85					**78.0 to 87.0 feet: SAND (SP)**; continued.
	20 (76-96)	90					**87.0 to 93.0 feet: SILT with SAND (ML)**; grayish brown; 80 to 90 percent medium to high plasticity fines; 10 to 20 percent fine sand.
		95					**93.0 to 101.5 feet: SAND (SP)**; grayish brown; fine sand; with 10 to 15 percent SILT clumps and nodules.
		100					@ 98.5 to 100.0 feet: SILT lens; medium to high plasticity fines; trace organics.

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**6 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							93.0 to 101.5 feet: SAND (SP); continued.
		105					**101.5 to 107.0 feet: SILT (ML)**; grayish brown; medium to high plasticity fines; trace fine sand; trace organics; sand lenses and laminations <0.2-foot thick.
	18 (96-117)						**107.0 to 197.0 feet: SAND (SP)**; grayish brown; fine to medium sand; <5 percent fines; trace organics. @ 107.0 to 117.0 feet: SILT lenses and laminations <0.2-foot thick.
		110					
		115					
							@ 118.0 to 119.0 feet: increase in SILT to 20 percent; low plasticity fines.
		120					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**7 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							107.0 to 197.0 feet: SAND (SP); continued.
		125					
	18 (117-137)						@ 128.0 to 130.0 feet: laminations, fissures and lenses up to 0.3-foot thick.
		130					@ 131.0 feet: SILT nodules 0.1-foot diameter; hard.
							@ 132.5 feet: sticks ¼- to ½-inch diameter.
							@ 133.5 feet: 0.3-foot SILT lens; medium to high plasticity.
							@ 134.0 to 136.0 feet: SILT content increases to 20 to 30 percent.
		135					
		140					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**8 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							107.0 to 197.0 feet: SAND (SP); continued.
	10 (137-148)						@ 143.0 to 143.5 feet: SILT increase to 30 percent.
		145					@ 144.5 feet: 0.2-foot SILT lens.
							@ 146.0 feet: 0.2-foot SILT lens. @ 146.0 to 148.0 feet: SILT content increases to 20 percent.
		150					
							@ 151.5 feet: 0.4-foot SILTY SAND lens; 30 to 40 percent fines.
							@ 153.0 feet: 0.2-foot SILT lens.
	18 (148-169)	155					
		160					

REMARKS

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ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**9 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							107.0 to 197.0 feet: SAND (SP); continued.
		165					@ 165.5 feet: 0.1-foot SILT lens.
							@ 166.5 feet: 0.4-foot SILT lens.
							@ 168.0 to 169.0 feet: SILT increase to 20 to 30 percent; trace organics with sand/silt laminations.
							@ 168.5 feet: 0.2-foot SILT lens.
		170					
	13 (169-186)	175					
		180					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 96.0 feet, 6" 96.0 to 213.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**10 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							107.0 to 197.0 feet: SAND (SP); continued.
							@ 183.0 to 186.0 feet: slight coarsening of sand grains; trace medium to coarse sand-sized pumice.
		185					
							@ 186.0 to 189.5 feet: increase in SILT to 20 to 30 percent.
							@ 189.0 to 196.0 feet: trace pumice; coarse sand to fine gravel-sized.
		190					@ 190.0 feet: 0.1-foot-diameter SILT nodules; firm.
	10 (186-196)						
		195					@ 195.0 feet: SILT nodules; 0.1-foot diameter.
							197.0 to 204.0 feet: SANDY GRAVEL (GP); grayish brown; 70 to 80 percent fine to coarse gravel, subangular to well rounded; 20 to 30 percent fine to coarse sand; <5 percent fines.
							@ 198.0 to 203.5 feet: color change to grayish green.
		200					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 96.0 feet, 6" 96.0 to 213.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**11 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							197.0 to 204.0 feet: SANDY GRAVEL (GP); continued.
							@ 203.5 to 204.0 feet: color change to brown.
	10 (198-208)	205					**204.0 to 206.0 feet: SAND (SP)**; brown; fine to medium sand.
							206.0 to 206.5 feet: COBBLES
							206.5 to 208.0 feet: BASALT fragments; lightly weathered, mostly fresh angular surfaces. 5 to 10 percent fines. Bedrock. Gray.
							208.0 to 211.0 feet: BASALT fragments, heavily weathered, rust brown.
	3 (208-211)	210					
	0 (211-213)						**211.0 to 213.0 feet: NO RECOVERY**
							Bottom of boring = 213.0 feet.
							WELL COMPLETION DETAILS
							0 to 110.0 feet: 2-inch-diameter, flush-threaded, Schedule 80 PVC blank riser pipe.
		215					110.0 to 120.0 feet: 2-inch-diameter, flush-threaded, stainless steel wire wrap well screen with 0.020-inch slots.
							120.0 to 121.0 feet: 2-inch-diameter, stainless steel threaded end cap.
							Centralizers at 18.0, 50.0, 110.5 and 119.5 feet.
							NAPL funnel at 120.0 feet.
							0 to 105.0 feet: Cement grout.
							105.0 to 108.0 feet: Bentonite chips hydrated with potable water.
		220					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 96.0 feet, 6" 96.0 to 213.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

LOG OF EXPLORATORY BORING

PROJECT NAME	**Gasco**	BORING NO.	**MW-20-120**
LOCATION	**Portland, Oregon**	PAGE	**12 of 12**
DRILLED BY	**Boart Longyear - E & I Division**	HOLE DIAMETER	**9-inch, 6-inch**
DRILL METHOD	**Sonic**	TOTAL DEPTH	**213.0'**
LOGGED BY	**John Renda**	DATE COMPLETED	**3/8/07**
		SURFACE ELEVATION	**25.63 feet***

SAMPLE NUMBER	RECOVERY IN FEET (CORE INTERVAL)	DEPTH IN FEET	WATER SAMPLE	CORE INTERVAL	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION
							108.0 to 122.0 feet: 10-20 Colorado Silica Sand. 122.0 to 213.0 feet: Cement grout.
		225					
		230					
		235					
		240					

REMARKS

*City of Portland Datum. Hole diameter: 9" 0 to 96.0 feet, 6" 96.0 to 213.0 feet.

ANCHOR ENVIRONMENTAL, L.L.C.

APPENDIX B

FIELD DATA SHEETS

WELL DEVELOPMENT FORM
Anchor Environmental

Project No. 000029-02	Date: 3/19/07	Well: MW-18-30	
Site Location: Gasco	Initial DTB: 32.8		Final DTB:
Name: Steph Harnyak	Initial DTW: 24.17		Final DTW:
Development Method: Bailer/P-Pump	Pore Volume:		
Total Water Removed:	Casing Diameter: 2"		
Water Contained ? Yes	Meter #:		
Estimate of specific capacity or recharge to well:	PV= 1.4		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1400							Start Surging with Bailor
1430							Bail
1448	3	~300/1000	NR	NR	NR		Black, Thick, Sheen (NR)
1450		~200/1000					Start P-Pump
							Black, oily, Sheen
1510	6	~200/1000	NR	NR	NR		Black, cloudy, oily
							* P-Pump had a hard time getting fluid to surface
							* The bailer was making a mess of the well area

Page 1 of 1

WELL DEVELOPMENT FORM
Anchor Environmental

Project No. 600029-02		Date: 3/5/07 Well: MW-28-180	
Site Location: Gasco		Initial DTB: 175.05	Final DTB: 184.10
Name: Stephen Hargusani		Initial DTW: 25.07	Final DTW: 29.83
Development Method: Bailor/ P-Pump Inertia Pump		Pore Volume:	
Total Water Removed:		Casing Diameter: 2"	
Water Contained ?		Meter #: 300' Sinco	
Estimate of specific capacity or recharge to well:		PV= 24.45	

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1130							Organize Drums / Tag Annulus
							Put sand in Annulus
1230							Start Pumping / Top of screen (10')
1240	10	750/1000	17.9	1950	13.5		Cloudy, Grey / lowered tubing 3'
							lowered tubing 3'
1310	15	250/1000	15.9	600	12.1	30.80	Slt Cloudy, Lt grey
1320	20		15.4	488	11.36		Slt Cloudy, Lt grey / Tan
1330	25.0	200/1000	15.4	458	10.24		Slt Cloudy, Lt Tan
1340	30.0	90/1000	15.2	408	9.38		Slt Cloudy, clearing (Lt tan)
							* moved tubing just off bottom
1350	35.0	0/1000	15.0	406	9.17		Slt Cloudy, Lt Lt Tan
1410	55.	0/1000	14.9	376	8.01	30.71	Slt Cloudy, Colorless (next Drum)
							moved tubing up 3'
1425	70	0/1000	15.1	385	7.49		Slt Cloudy, Colorless
1450	80	0/1000	14.9	366	7.36		Clear, Colorless
1500	110	0/1000	14.8	360	7.26	31.3	Clear, Colorless
							Start 3rd Drum
1520	135	0/1000	14.7	542	10.73		Shortened tubing 80' (60)
							* Jump in pH
1535	165	0/1000	14.7	425	10.10		Clear, Colorless (4th Drum)
1550	~~185~~ 196	0/1000	14.7	379	7.88		Clear, Colorless
1610	220	0/1000	14.7	350	7.34	29.9	Clear, Colorless (5th Drum started)
1635	245	0/1000	14.6	349	7.20		Clear, Colorless
1700	275	0/1000	14.6	347	7.12		Clear, Colorless
1720	300	0/1000	14.5	345	7.11		Clear, Colorless
1740	330	0/1000	14.5	347	7.09		Clear, Colorless

WELL DEVELOPMENT FORM
Anchor Environmental

Project No. 0000029.02		Date: 3/13/08 Well: MW 19-22	
Site Location: Gasco		Initial DTB: 25.55	Final DTB: 25.60
Name: Stephn Hargua		Initial DTW: 19.55	Final DTW: 19.60
Development Method: Bailer/P-Pump		Pore Volume:	
Total Water Removed:		Casing Diameter: 2"	
Water Contained ? Yes		Meter #:	
Estimate of specific capacity or recharge to well:		PV= 0.97	

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1000	0						Start Surging with a bailer
1040							Start bailing
1116	2	500/1000	12.6	164	10.59		Cloudy Black slt sheen
1125	4	100/1000	12.7	173	9.88		cloudy, Black
1145	6	80/1000	12.4	167	8.34		Cloudy Black
1155	8	20/1000	12.5	165	8.07		Cloudy Blk
1200							Start P-pumping
1220	10.0	0/1000	13.2	166	7.66		Slt Cloudy Color lt (lt gray)
1240	12.0	0/1000	13.2	168	7.53	19.27	slt cloudy, clearing / almost colorless
1255	14.0	0/1000	13.2	164	7.34		"

WELL DEVELOPMENT FORM
Anchor Environmental

Project No. 000029-02		Date: 3/13/07 Well: MW-19-125	
Site Location: Gasco		Initial DTB: 127.70	Final DTB: 129.75
Name: S Haraya		Initial DTW: 20.13	Final DTW:
Development Method: Bailor/ P-Pump Inertia Pump		Pore Volume:	
Total Water Removed:		Casing Diameter: 2"	
Water Contained ? Yes		Meter #:	
Estimate of specific capacity or recharge to well:		PV= 17.53	

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1340							Start pumping 5' off bottom
1350	5	450/1000	14.2	183	7.48		Cloudy, Grey (DK)
1400	10.0	200/1000	14.1	182	7.13		Cloudy, lt tan + pumping near bottom
1412	20.0	0/1000	13.9	346	6.86		Slt Cloudy, lt tan
1425	40.0	0/1000	14.0	353	6.88		Clear, colorless raised tubing ↑ 5'
1438	50.0	0/1000	13.8	355	6.84		Clear, Colorless
1450	60.0	0/1000	13.8	355 357	6.85		" "
1501	70.0	0/1000	13.7	355	6.83		Clear, colorless raised tubing ↑ 10'
1524	90.0	0/1000	13.8	358	6.84	20.60	
1586	110.0	0/1000	13.7	354	6.83		Clear, colorless
1617	135.	0/1000	13.4	353	6.82		Clear, colorless
1650	165	0/1000	13.6	351	6.80		Clear, colorless
1710	190	0/1000	13.7	350	6.82	20.96	Clear, Colorless

WELL DEVELOPMENT FORM
Anchor Environmental

Project No. 000029-02		Date: 3/13/07	Well: MW-19-180
Site Location: Gasco		Initial DTB: 178	Final DTB: 185.02
Name: Steve Hargvani		Initial DTW: 21.37	Final DTW:
Development Method: Bailor/ P-Pump		Pore Volume:	
Total Water Removed:		Casing Diameter: 2"	
Water Contained ? Yes		Meter #:	
Estimate of specific capacity or recharge to well:		PV= 25.53	

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
0845							Set-up Pump
0855							Start Pumping from 2' from bottom
905	10	200/1000	13.8	1306	13.5		Cloudy Grey, silty
930	20	110/1000	13.9	587	12.57		Cloudy Lt tan
	30	0/1000	13.9	456	10.83		Cloudy Lt tan
1035	40	0/1000	13.8	401	9.93		Clear, colorless
							Raised tubing up 15'
1050	55.	0/1000	13.9	378	9.3		Clear, colorless
1146	110	0/1000	13.6	353	7.98	29.38	Clear colorless
1220	165	0/1000	13.7	355	7.67		Clear, colorless
							raised tubing 15' ↑
1300	220	0/1000	13.5	350	7.21		Clear, colorless
							raised tubing up 15'
1330	275	0/1000	13.6	351	7.20	26.93	Clear col orless

* using 200' tubing

WELL DEVELOPMENT FORM
Anchor Environmental

Project No. 000029.02		Date: 3/14/07 Well: MW-20-120	
Site Location: Gasco		Initial DTB: 111.60	Final DTB: 121.40
Name: S Hargrave		Initial DTW: 7.63	Final DTW: 18.90
Development Method: Bailor/ P-Pump Inertia Pump		Pore Volume:	
Total Water Removed:		Casing Diameter: 2"	
Water Contained ? Y/S		Meter #:	
Estimate of specific capacity or recharge to well:		PV= 16.94	

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
0900							Setup pumps
915		0					Start pumping
925	5	800/1000	14.6	1599	OR		Cloudy, Gray, milky (like Bentonite)
940	10	450/1000	14.5	1089	OR		Cloudy, Gray
							moved tubing to new bottom @ 5'
955	15.	300/1000	14.3	788	OR		Cloudy, Gray
1010	20.	200/1000	14.2	459	12.53		Cloudy Lt Gray
1025	30	100/1000	14.2	335	11.6		Cloudy, Lt Gray
							moved tubing to 2' ↑ bottom
1035	40.	20/1000	14.3	352	11.7		Cloudy, Gray
1045	50.	0/1000	14.3	358	10.8		Cloudy Lt Gray
							Pumping from top of Screen
1100	60	20/1000	14.2	355	10.01		Slt Cloudy, Lt Tan
						40.35	
1112	70.	0/1000	14.1	337	9.38		Slt Cloudy Clearing
1140	110.	0/1000	14.3	303	8.78		Clear colorless
1206	135.	0/1000	14.3	231	8.17		Clr, colorless
							* needed Gasoline oil
1330	155	0/1000	14.2	183	7.84		Clr, colorless
1340	165	0/1000	14.2	184	7.88		" "
1350	175	0/1000	14.2	183	7.91		" "
						18.90	

FIELD SAMPLING DATA SHEET

ANCHOR ENVIRONMENTAL, L.L.C.
6650 SW Redwood Lane, Suite 110
Portland, OR 97224
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: GASCO - Pilot Wells **WELL ID:** MW-18-180
SITE ADDRESS: Portland, Oregon **BLIND ID:** GS-070309-1
DUP ID: NA

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

WEATHER:	SUNNY	CLOUDY	RAIN	?	**TEMPERATURE:**	°F 40. °C

[Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW [Product Thickness]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
3 19 07	7 :35	184.10	.	24.37	.	159.73	X 1	26.
/ /	:	.	.	.	.		X 3	78.

Gal/ft = (dia./2)^2 x 0.163	1" = 0.041	2" = 0.163	3" = 0.367	4" = 0.653	6" = 1.469	10" = 4.080	12" = 5.875

§ METHODS: (A) Submersible Pump (B) Peristaltic Pump (C) Disposable Bailer (D) PVC/Teflon Bailer (E) Dedicated Bailer (F) Dedicated Pump (G) Other = Inertia Pump

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth: [√ if used]

Bottle Type	Date	Time	Method §	Amount & Volume mL		Preservative [circle]	Ice	Filter	pH	√
VOA Glass	3 19 07	10 :30	G	4	40 ml	HCl	YES	NO		✓
Amber Glass	/ /	:		2	250, 500, 1L	(None) (HCl) (H_2SO_4)	YES	NO		
White Poly	/ /	:			250, 500, 1L	None	YES	NO	NA	
Yellow Poly	/ /	:			250, 500, 1L	H_2SO_4	YES	NO		
Green Poly	/ /	:		1	250, 500, 1L	NaOH	YES	NO		
Red Total Poly	/ /	:		1	250, 500, 1L	HNO_3	YES	NO		
Red Diss. Poly	/ /	:			250, 500, 1L	HNO_3	YES	YES		
	/ /	:			250, 500, 1L		YES			

Total Bottles (include duplicate count): 8

Analysis Allowed per Bottle Type

BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
VOA - Glass	(8021) (8260B) (BTEX) (NWTPH-Gx)
AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil &Grease) (8081A) 8270 SIM
WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO_3/CO_3) (Cl) (SO_4) (NO_3) (NO_2) (F)
YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
GREEN - Poly	(Cyanide) Amenable cyanide Free cyanide
RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 6 :00 Pump/Bailer Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O_2 (mg/l)	Water Quality
4		.	.		.		.	
3	IP/G	100. -	7.16	354	13.5		.	Clear, colorless
2		54. -	7.20	350	13.4		.	Clear, colorless
1		27. -	7.48	346	14.1		.	
0		0.00	7.44	345	14.2		.	Clear colorless

[Casing] [Select A-G] [Cumulative Totals] [Circle units] [Clarity, Color]

SAMPLER: Stephen Harquail (PRINTED NAME) (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR ENVIRONMENTAL, L.L.C.
6650 SW Redwood Lane, Suite 110
Portland, OR 97224
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: GASCO - Pilot Wells **WELL ID:** MW-19-180
SITE ADDRESS: Portland, Oregon **BLIND ID:** GS-070315-2
DUP ID: NA

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY	CLOUDY	RAIN	?	**TEMPERATURE:**	°F 40 . °C					

[Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW [Product Thickness]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
3/15/07	8:00	185.02	.	20.31	.	164.71	X 1	20.84
/ /	:	.	.	.	.		X 3	80.54

Gal/ft = (dia./2)^2 x 0.163	1" = 0.041	2" = 0.163	3" = 0.367	4" = 0.653	6" = 1.469	10" = 4.080	12" = 5.875

§ METHODS: (A) Submersible Pump (B) Peristaltic Pump (C) Disposable Bailer (D) PVC/Teflon Bailer (E) Dedicated Bailer (F) Dedicated Pump (G) Other = Iwaki Pump

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth:

Bottle Type	Date	Time	Method §	Amount	Volume mL	Preservative [circle]	Ice	Filter	pH	√ [√ if used]
VOA Glass	3/15/07	10:25	IP	3	40 ml	HCl	YES	NO		✓
Amber Glass	/ /	:		2	250, 500, 1L	None (HCl) (H_2SO_4)	YES	NO		✓
White Poly	/ /	:			250, 500, 1L	None	YES	NO	NA	
Yellow Poly	/ /	:			250, 500, 1L	H_2SO_4	YES	NO		
Green Poly	/ /	:		1	250, 500, 1L	NaOH	YES	NO		✓
Red Total Poly	/ /	:		1	250, 500, 1L	HNO_3	YES	NO		✓
Red Diss. Poly	/ /	:			250, 500, 1L	HNO_3	YES	YES		
	/ /	:			250, 500, 1L		YES			

Total Bottles (include duplicate count): 7

Analysis Allowed per Bottle Type	BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
	VOA - Glass	(8021) (8260B) (BTEX) (NWTPH-Gx)
	AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil &Grease) (8081A) 8270 SIM
	WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO_3/CO_3) (Cl) (SO_4) (NO_3) (NO_2) (F)
	YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
	GREEN - Poly	(Cyanide)
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 8:20 Pump/Bailer Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O_2 (mg/l)	Water Quality
4		100 .	7.32	171	13.3		.	
3	IP	81 .	7.39	170	13.4		.	Clear, colorless
2		54 .	7.92	174	13.5		.	"
1		27 .	8.31	167	13.6		.	"
0		0.00	10.6	411	13.3		.	

[Casing] [Select A-G] [Cumulative Totals] [Circle units] [Clarity, Color]

SAMPLER: S Haraguri (PRINTED NAME) (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR ENVIRONMENTAL, L.L.C.
6650 SW Redwood Lane, Suite 110
Portland, OR 97224
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: GASCO - Pilot Wells **WELL ID:** mw-19-125
SITE ADDRESS: Portland, Oregon **BLIND ID:** GS-070315-3
DUP ID: NA

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

WEATHER: SUNNY | CLOUDY | RAIN | ? **TEMPERATURE:** °F 45 . °C [Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW [Product Thickness]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
3/15/07	10:35	129.75	.	20.13	.	109.62	X 1	17.86
/ /	:	.	.	.	.		X 3	53.60

Gal/ft = (dia./2)^2 x 0.163	1" =	0.041	2" =	0.163	3" =	0.367	4" =	0.653	6" =	1.469	10" =	4.080	12" =	5.875

§ METHODS: (A) Submersible Pump (B) Peristaltic Pump (C) Disposable Bailer (D) PVC/Teflon Bailer (E) Dedicated Bailer (F) Dedicated Pump (G) Other = Inertia Pump

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth: [√ if used]

Bottle Type	Date	Time	Method §	Amount	Volume mL	Preservative [circle]	Ice	Filter	pH	√
VOA Glass	3/15/07	12:00	IP	3	40 ml	HCl	YES	NO		✓
Amber Glass	/ /	:		2	250, 500, 1L	None (HCl) (H_2SO_4)	YES	NO		✓
White Poly	/ /	:			250, 500, 1L	None	YES	NO	NA	
Yellow Poly	/ /	:			250, 500, 1L	H_2SO_4	YES	NO		
Green Poly	/ /	:		1	250, 500, 1L	NaOH	YES	NO		✓
Red Total Poly	/ /	:		1	250, 500, 1L	HNO_3	YES	NO		✓
Red Diss. Poly	/ /	:			250, 500, 1L	HNO_3	YES	YES		
	/ /	:			250, 500, 1L		YES			

Total Bottles (include duplicate count): 7

Analysis Allowed per Bottle Type	BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
	VOA - Glass	(8021) (8260B) (BTEX) (NWTPH-Gx)
	AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil &Grease) (8081A) 8270 Sim
	WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO_3/CO_3) (Cl) (SO_4) (NO_3) (NO_2) (F)
	YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
	GREEN - Poly	(Cyanide)
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 10:50 Pump/Bailer Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O_2 (mg/l)	Water Quality
4		.	.		.		.	
3	IP	60.-	6.89	180.	13.4		.	Clear, colorless
2		40.-	7.00	178	13.3		.	"
1		20.-	7.47	169.	13.8		.	Clear, colorless
0		0.00	8.87	59	13.8		.	

[Casing] [Select A-G] [Cumulative Totals] [Circle units] [Clarity, Color]

SAMPLER: S Hargraves (PRINTED NAME) (SIGNATURE)

FIELD SAMPLING DATA SHEET

ANCHOR ENVIRONMENTAL, L.L.C.
6650 SW Redwood Lane, Suite 110
Portland, OR 97224
Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: GASCO - Pilot Wells **WELL ID:** mw-20-120
SITE ADDRESS: Portland, Oregon **BLIND ID:** GS-070315-4
DUP ID: NA

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY

WEATHER:	SUNNY	CLOUDY	RAIN	?	**TEMPERATURE:**	°F 45 . °C

[Circle appropriate units]

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW [Product Thickness]	DTB-DTW [Water Column]		Volume (gal) [Water Column x Gal/ft]
3/15/07	12:35	121.40	.	7.91	.	113.49	X 1	18.49
/ /	:	.	.	.	.		X 3	55.5

Gal/ft = (dia./2)^2 x 0.163	1" = 0.041	2" 0.163	3" = 0.367	4" = 0.653	6" = 1.469	10" = 4.080	12" = 5.875

§ METHODS: (A) Submersible Pump (B) Peristaltic Pump (C) Disposable Bailer (D) PVC/Teflon Bailer (E) Dedicated Bailer (F) Dedicated Pump (G) Other = Inertia Pump

GROUNDWATER SAMPLING DATA (if product is detected, do NOT sample) Sample Depth:

Bottle Type	Date	Time	Method §	Amount	Volume mL	Preservative [circle]	Ice	Filter	pH	√ [√ if used]
VOA Glass	3/15/07	13:50	G	3	40 ml	HCl	YES	NO		✓
Amber Glass	/ /	:		2	250, 500, 1L	None (HCl) (H_2SO_4)	YES	NO		✓
White Poly	/ /	:			250, 500, 1L	None	YES	NO	NA	
Yellow Poly	/ /	:			250, 500, 1L	H_2SO_4	YES	NO		
Green Poly	/ /	:		1	250, 500, 1L	NaOH	YES	NO		✓
Red Total Poly	/ /	:		1	250, 500, 1L	HNO_3	YES	NO		✓
Red Diss. Poly	/ /	:			250, 500, 1L	HNO_3	YES	YES		
	/ /	:			250, 500, 1L		YES			

Total Bottles (include duplicate count): 7

Analysis Allowed per Bottle Type	BOTTLE TYPE	TYPICAL ANALYSIS ALLOWED PER BOTTLE TYPE (Circle applicable or write non-standard analysis below)
	VOA - Glass	(8021) (8260B) (BTEX) (NWTPH-Gx)
	AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil &Grease) (8081A) (8270SIM)
	WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO_3/CO_3) (Cl) (SO_4) (NO_3) (NO_2) (F)
	YELLOW - Poly	(COD) (TOC) (Total PO_4) (Total Keldahl Nitrogen) (NH_3) (NO_3/NO_2)
	GREEN - Poly	(Cyanide)
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Tl) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 12:50 Pump/Bailer Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O_2 (mg/l)	Water Quality
4		80.	7.34	173	14.4		.	
3	G	60.	7.46	175.	14.5		.	Clear, colorless
2		40.	7.99	330	14.7		.	
1		20.	10.29	440	14.5		.	
0		0.00	10.98	425	15.9		.	Clear, colorless

[Casing] [Select A-G] [Cumulative Totals] [Circle units] [Clarity, Color]

SAMPLER: S Hargrave
(PRINTED NAME) (SIGNATURE)

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CHAIN OF CUSTODY

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SR#: _____

PAGE 1 OF 2 COC # _____

PROJECT NAME: GASCO
PROJECT NUMBER: 00002.9.02
PROJECT MANAGER: John Renda
COMPANY/ADDRESS: Anchor Env
6650 SW Redwood Lane Suite 110
CITY/STATE/ZIP: Portland OR 97224
E-MAIL ADDRESS: jrenda@anchorenv.com
PHONE #: 503-670 1108 FAX#: 503-670 1126
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 SGT ☐ 1664 HEM ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐ Hex-Chrom ☐	pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle)	NH3-N, COD, Total-P, TKN, TOC, DOC (circle) NO2+NO3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	X Grab Sample				REMARKS
PW-2-S (30)	2/22/07	1520		Soil	1															X					
PW-2-S (40)		1530			1															X					
PW-2-S (50)		1540			1															X					
PW-2-S (60)		1545			1															X					
PW-2-S (70)		1550			1															X					
PW 2-S (80)		1650			1															X					
PW-2-S (90)		1655			1															X					
PW-2-S (100)		1720			1															X					
PW 2-S (110)		1730			1															X					
PW-2-S (120)	↓	1740		↓	1															X					

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
X II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

_____
Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 2/27/07 1000	Signature: Date/Time:	Signature: Date/Time:	Signature: Date/Time:
Printed Name: John Renda Firm: Anchor	Printed Name: Firm:	Printed Name: Firm:	Printed Name: Firm:

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SR#: _____

PAGE 2 OF 7 COC # _____

PROJECT NAME: GASCO
PROJECT NUMBER: 000029-02
PROJECT MANAGER: John Renda - Anchor
COMPANY/ADDRESS: 6650 SW Redwood Lane Suite 110
CITY/STATE/ZIP: Portland, OR 97224
E-MAIL ADDRESS: jrenda@anchorenv.com
PHONE #: 503-670-1108 FAX#: 503-670-1128
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐ ☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☐ 8141A☐ 8151A☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	PAHS 8310☐ SIM☐	Metals, Total or Dissolved (See list below)	Cyanide☐ Hex-Chrom☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020☐ AOX 1650☐ 506☐	Clean Size				REMARKS
PW-2-S(130)	2/22/07	1745		Soil	1														X							
(140)	2/23/07	0915			1														X							
(150)		0925			1														X							
(160)		0930			1														X							
(170)		0940			1														X							
(180)		1000			1														X							
(190)		1010			1														X							
(200)	2/26/07	0900			1														X							
(210)		0930			1														X							
(222)		0940			1														X							

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
X II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

_____
Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 2/27/07 1000	Signature: Date/Time:	Signature: Date/Time:	Signature: Date/Time:
Printed Name: John Renda Firm: Anchor	Printed Name: Firm:	Printed Name: Firm:	Printed Name: Firm:

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SR#: _____

PAGE 1 OF 2 COC # _____

PROJECT NAME: GASCO
PROJECT NUMBER: 200029-02
PROJECT MANAGER: Jonas Renda
COMPANY/ADDRESS: Anchor
6650 SW Redwood Lane Suite 110
CITY/STATE/ZIP: Portland, OR 97224
E-MAIL ADDRESS: lrenda@anchorenv.com
PHONE #: 503-670-1158 FAX#: 503-670-1129
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐ ☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☐ 8141A☐ 8151A☐	Chlorophenolics - 8151M Tri☐ Tetra☐ PCP☐	PAHS 8310☐ SIM☐	Metals, Total or Dissolved (See list below)	Cyanide☐ Hex-Chrom☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020☐ AOX 1650☐ 506☐	Grab or Size				REMARKS
MW 14-5 (3')	2/28/07	1415		Soil	1														X				
	(6')	1430			1														X				
	(5')	1550			1														X				
	(6')	1615			1														X				
	(7')	1645			1														X				
	(10')	1700			1														X				
	(10')	1730			1														X				
	(10')	1800			1														X				
	(10')	3/01/07	0940		1														X				
	(12')		1000		1														X				

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
X III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
X 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results

_____ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
[signature]	3/5/07 0900						
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Jonas Renda	Anchor						
Printed Name	Firm	Printed Name	Firm	Printed Name	Firm	Printed Name	Firm

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SR#: _____

PAGE 2 OF 2 COC # _____

PROJECT NAME: GASCO
PROJECT NUMBER: 000029-07
PROJECT MANAGER: Jon Renda
COMPANY/ADDRESS: Anchor
6650 SW Redwood Lane, Suite 110
CITY/STATE/ZIP: Portland, OR 97224
E-MAIL ADDRESS: jrenda@anchorenv.com
PHONE #: 503-670-1109 FAX#: 503-670-1124
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐ Hex-Chrom ☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	GRAIN SIZE				REMARKS
MW-19-S (12)	3/01/07	1400		Soil	1															X					
(170)		1430			1															X					
(150)		1500			1															X					
(160)		1530			1															X					
(170)		1600			1															X					
(150)		1630			1															X					
(190)		1700			1															X					
(200)		1730			1															X					

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
X III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
X 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results

_____
Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 3/5/07 0900	Signature: Date/Time:	Signature: Date/Time:	Signature: Date/Time:
Printed Name: Jon Renda Firm: Anchor	Printed Name: Firm:	Printed Name: Firm:	Printed Name: Firm:

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SR#: _____

PAGE 1 OF 2 COC # _____

PROJECT NAME: GASCO
PROJECT NUMBER: 000029-02
PROJECT MANAGER: JOHN RENDA
COMPANY/ADDRESS: ANCHOR ENVIRONMENTAL, LLC
6650 SW REDWOOD LN, #110
CITY/STATE/ZIP: PORTLAND, OR 97224
E-MAIL ADDRESS: jrenda@anchorenv.com
PHONE #: 503-670-1108 FAX#: 503-670-1128
SAMPLER'S SIGNATURE: Kelly R Tittemeier

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	GRAIN SIZE				REMARKS
MW-20-S(30)	3/7/07	1400		SOIL																X				
(40)		1430																		X				
(50)		1515																		X				
(60)		1530																		X				
(70)		1550																		X				
(80)		1600																		X				
(90)		1630																		X				
(100)	3/8/07	0910																		X				
(110)		0930																		X				
(120)		1000																		X				

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
✓ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
✓ 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results

_____ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Kelly R Tittemeier 3-9-07/1100 (Signature / Date/Time)	Signature / Date/Time	Signature / Date/Time	Signature / Date/Time
Kelly R Tittemeier Anchor Env (Printed Name / Firm)	Printed Name / Firm	Printed Name / Firm	Printed Name / Firm

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PAGE 2 OF 2 SR#: _____ COC #: _____

PROJECT NAME: GASCO
PROJECT NUMBER: 000029-02
PROJECT MANAGER: JOHN KENDA
COMPANY/ADDRESS: ANCHOR ENV.
CITY/STATE/ZIP:
E-MAIL ADDRESS:
PHONE #: FAX#:
SAMPLER'S SIGNATURE: Kelly C Titkemeier

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐	☐ Fuel Fingerprint (FIQ) ☐ NW-HCID Screen	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐ Hex-Chrom ☐	pH, Cond., Cl, SO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	GRAIN SIZE				REMARKS
MW-20-S(130)	3/8/07	1015		SOIL	1														X				
(140)		1045																	X				
(150)		1255																	X				
(160)		1300																	X				
(170)		1330																	X				
(180)		1335																	X				
(190)		1505																	X				
(200)		1530																	X				

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
✓ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
✓ 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results

_____
Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Kelly C Titkemeier 3-9-07/1100			
Signature / Date/Time	Signature / Date/Time	Signature / Date/Time	Signature / Date/Time
Kelly R. Titkemeier Anchor Env.			
Printed Name / Firm	Printed Name / Firm	Printed Name / Firm	Printed Name / Firm

Columbia Analytical Services INC.
An Employee - Owned Company

CHAIN OF CUSTODY

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR#: _____

PAGE 1 OF 1 COC # _____

PROJECT NAME: Gasco Groundwater Sampling
PROJECT NUMBER: 000029.02 New wells
PROJECT MANAGER: John Renda
COMPANY/ADDRESS: 6650 SW Redwood Ln Suite 110
CITY/STATE/ZIP: Portland OR 97224
E-MAIL ADDRESS:
PHONE #: 503-670-1108
FAX#:
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐ SIM	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐	Fuel Fingerprint (FIQ) NW-HCID Screen	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	Hex-Chrom ☐	pH, Cond., Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	Total Cyanide	Amenable Cyanide	Free Cyanide		REMARKS
GS-070309-1	3/9/07	1030		W	8	X	X								X						X	X	X		

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
X II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
X 5 Day - 10 Day VOC's cyanide
X Standard (10-15 working days) metals, PAHs
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:		RECEIVED BY:		RELINQUISHED BY:		RECEIVED BY:	
[signature]	3/9/07 1050						
Signature	Date/Time	Signature	Date/Time	Signature	Date/Time	Signature	Date/Time
Stacy Vail	Anchor						
Printed Name	Firm	Printed Name	Firm	Printed Name	Firm	Printed Name	Firm

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SR#: _____

PAGE 1 OF 1 COC # _____

PROJECT NAME: Gasco Inv Natural
PROJECT NUMBER: 000029-02
PROJECT MANAGER: John Renda
COMPANY/ADDRESS: 6650 SW Redwood Ln Suite 110
Portland, OR 97224
CITY/STATE/ZIP:
E-MAIL ADDRESS:
PHONE #: 503-670-4008 FAX#:
SAMPLER'S SIGNATURE:

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐ SIM	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (*see below) Gas ☐ 8021 ☐ BTEX ☐ Diesel ☐ Oil ☐	Fuel Fingerprint (FIQ) NW-HCID Screen	Oil & Grease/TRPH 1664 SGT ☐ 1664 HEM ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics - 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	Hex-Chrom ☐	pH, Cond, Cl, SO_4, PO_4, F, NO_2, NO_3, BOD, TSS, TDS (circle)	NH_3-N, COD, Total-P, TKN, TOC, DOC (circle) NO_2+NO_3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐	Total Cyanide	Amenable Cyanide	Free Cyanide		REMARKS
GS-010315-2	3/15/01	1025		W	7	X	X							X						X	X	X		
3		1200		W	7	X	X							X						X	X	X		
4		1350		W	7	X	X							X						X	X	X		

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
X II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # _____
Bill To: _____

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
X 5 Day - 10 day for VOC's + cyanide metals, PAH's
X Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba (Be) B Ca (Cd) Co (Cr) (Cu) Fe (Pb) Mg Mn Mo (Ni) K (Ag) Na (Se) Sr (Tl) Sn V (Zn) (Hg)

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER:_____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 3/15/01 1615	Signature: Date/Time:	Signature: Date/Time:	Signature: Date/Time:
Printed Name: Shannon L Firm: Anchor	Printed Name: Firm:	Printed Name: Firm:	Printed Name: Firm:

APPENDIX C

DATA VALIDATION REPORTS

LABORATORY DATA CONSULTANTS, INC.
7750 El Camino Real, Suite 2L Carlsbad, CA 92009 Phone: 760/634-0437 Fax: 760/634-0439

Anchor Environmental, LLC
1423 3rd Avenue, Suite 300
Seattle, WA 98101-2226
ATTN: Ms. Lisa Allen

April 25, 2007

SUBJECT: NW Natural Gasco, Data Validation

Dear Ms. Allen,

Enclosed are the final validation reports for the fractions listed below. These SDGs were received on April 6, 2007. Attachment 1 is a summary of the samples that were reviewed for each analysis.

LDC Project # 16563:

SDG #	Fraction
K0701557, K0701748, K0701987, K0701989, K0702193	Volatiles, Polynuclear Aromatic Hydrocarbons, Metals, Wet Chemistry

The data validation was performed under EPA Level III guidelines. The analyses were validated using the following documents, as applicable to each method:

- USEPA, Contract Laboratory Program National Functional Guidelines for Organic Data Review, October 1999
- USEPA, Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, October 2004
- EPA SW 846, Third Edition, Test Methods for Evaluating Solid Waste, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998

Please feel free to contact us if you have any questions.

Sincerely,

Stella Cuenco

Stella S. Cuenco
Project Manager/Senior Chemist

V:\LOGIN\Anchor\Gasco\16563COV.wpd

1,495 Pages

LDC #16563 (Anchor Environmental-Seattle WA / NW Natural - Gasco, Project #000029-02)

LDC	SDG#	DATE REC'D	(3) DATE DUE	VOA (8260B)		PAHs (8270C -SIM)		Metals (SW846)		T. CN- (335.1 /9012A)		CN- by Microf. (D4282)		Amen. CN- (335.1)		Part. Size (PSEP)																					
Matrix:	Water/Sediment			W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S	W	S
A	K0701557	04/06/07	04/27/07	-	-	-	-	-	-	-	-	-	-	-	-	0	20																				
B	K0701748	04/06/07	04/27/07	-	-	-	-	-	-	-	-	-	-	-	-	0	18																				
C	K0701987	04/06/07	04/27/07	1	0	1	0	1	0	1	0	1	0	1	0	-	-																				
D	K0701989	04/06/07	04/27/07	-	-	-	-	-	-	-	-	-	-	-	-	0	18																				
E	K0702193	04/06/07	04/27/07	3	0	3	0	3	0	3	0	3	0	3	0	-	-																				
Total	B/SC			4	0	4	0	4	0	4	0	4	0	4	0	0	56	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80

Shaded cells indicate Level IV validation (all other cells are Level III validation). These sample counts do not include MS, MSD, or DUP's.

NW Natural Gasco Site
Data Validation Reports
LDC# 16563

Volatiles

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 9, 2007
LDC Report Date:	April 19, 2007
Matrix:	Water
Parameters:	Volatiles
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0701987

Sample Identification

GS-070309-1

Introduction

This data review covers one water sample listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8260B for Volatiles.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (October 1999) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

For the purposes of technical evaluation, all compounds were evaluated against the 30.0% (%RSD) National Functional Guideline criteria. Unless noted above, all compounds were within the validation criteria.

Average relative response factors (RRF) for all volatile target compounds and system performance check compounds (SPCCs) were within method and validation criteria with the following exceptions:

Date	Compound	RRF (Limits)	Associated Samples	Flag	A or P
2/13/07	Acrolein Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	0.0213 (≥0.05) 0.0340 (≥0.05) 0.0398 (≥0.05) 0.0136 (≥0.05) 0.0319 (≥0.05) 0.0437 (≥0.05)	All samples in SDG K0701987	J (all detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

Percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were within the method criteria of less than or equal to 20.0% for calibration check compounds (CCCs).

For the purposes of technical evaluation, all compounds were evaluated against the 25.0% (%D) National Functional Guideline criteria. Unless noted above, all compounds were within the validation criteria with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
3/14/07	Bromomethane	30	All samples in SDG K0701987	J (all detects) UJ (all non-detects)	A

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds.

All of the continuing calibration RRF values were within method and validation criteria with the following exceptions:

Date	Compound	RRF (Limits)	Associated Samples	Flag	A or P
3/14/07	Acrolein Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	0.0184 (≥0.05) 0.0356 (≥0.05) 0.0321 (≥0.05) 0.0117 (≥0.05) 0.0315 (≥0.05) 0.0403 (≥0.05)	All samples in SDG K0701987	J (all detects) UJ (all non-detects)	A

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard areas and retention times were within QC limits.

XI. Target Compound Identifications

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and CRQLs

Raw data were not reviewed for this SDG.

XIII. Tentatively Identified Compounds (TICs)

Raw data were not reviewed for this SDG.

XIV. System Performance

Raw data were not reviewed for this SDG.

XV. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

No field duplicates were identified in this SDG.

XVII. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Volatiles - Data Qualification Summary - SDG K0701987

SDG	Sample	Compound	Flag	A or P	Reason
K0701987	GS-070315-2	Acrolein Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	J (all detects) UJ (all non-detects)	A	Initial calibration (RRF)
K0701987	GS-070315-2	Bromomethane	J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
K0701987	GS-070315-2	Acrolein Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	J (all detects) UJ (all non-detects)	A	Continuing calibration (RRF)

NW Natural Gasco Site
Volatiles - Laboratory Blank Data Qualification Summary - SDG K0701987

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0701987
Project:	Gasco Groundwater Sampling/000029-02 New Wells	**Date Collected:**	03/09/2007
Sample Matrix:	Water	**Date Received:**	03/09/2007

Volatile Organic Compounds

Sample Name:	GS-070309-1	**Units:**	ug/L
Lab Code:	K0701987-001	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Acrolein	ND	U UJ	20	6.7	1	03/15/07	03/15/07	KWG0703706	
Iodomethane	ND	U	5.0	0.38	1	03/15/07	03/15/07	KWG0703706	
Acrylonitrile	ND	U	5.0	0.54	1	03/15/07	03/15/07	KWG0703706	
1,1-Dichloroethane	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
Vinyl Acetate	ND	U UJ	5.0	0.67	1	03/15/07	03/15/07	KWG0703706	
cis-1,2-Dichloroethene	ND	U	0.50	0.12	1	03/15/07	03/15/07	KWG0703706	
Dibromomethane	ND	U	0.50	0.12	1	03/15/07	03/15/07	KWG0703706	
2-Chloroethyl Vinyl Ether	ND	U	5.0	0.34	1	03/15/07	03/15/07	KWG0703706	
1,2-Dibromoethane (EDB)	ND	U	2.0	0.099	1	03/15/07	03/15/07	KWG0703706	
1,1,1,2-Tetrachloroethane	ND	U	0.50	0.12	1	03/15/07	03/15/07	KWG0703706	
1,2,3-Trichloropropane	ND	U	0.50	0.22	1	03/15/07	03/15/07	KWG0703706	
trans-1,4-Dichloro-2-butene	ND	U	10	0.60	1	03/15/07	03/15/07	KWG0703706	
1,3-Dichlorobenzene	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
1,2-Dichlorobenzene	**2.2**		0.50	0.12	1	03/15/07	03/15/07	KWG0703706	
1,2,4-Trichlorobenzene	ND	U	2.0	0.22	1	03/15/07	03/15/07	KWG0703706	
Hexachlorobutadiene	ND	U	2.0	0.28	1	03/15/07	03/15/07	KWG0703706	
Naphthalene	**2.8**		2.0	0.29	1	03/15/07	03/15/07	KWG0703706	
Dichlorodifluoromethane	ND	U	0.50	0.17	1	03/15/07	03/15/07	KWG0703706	
Chloromethane	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
Vinyl Chloride	ND	U	0.50	0.042	1	03/15/07	03/15/07	KWG0703706	
Bromomethane	ND	U UJ	0.50	0.22	1	03/15/07	03/15/07	KWG0703706	
Chloroethane	ND	U	0.50	0.23	1	03/15/07	03/15/07	KWG0703706	
Trichlorofluoromethane	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
Acetone	ND	U UJ	20	4.1	1	03/15/07	03/15/07	KWG0703706	
1,1-Dichloroethene	ND	U	0.50	0.13	1	03/15/07	03/15/07	KWG0703706	
Carbon Disulfide	ND	U	0.50	0.16	1	03/15/07	03/15/07	KWG0703706	
Methylene Chloride	ND	U	2.0	0.20	1	03/15/07	03/15/07	KWG0703706	
Methyl tert-Butyl Ether	ND	U	0.50	0.20	1	03/15/07	03/15/07	KWG0703706	
trans-1,2-Dichloroethene	ND	U	0.50	0.15	1	03/15/07	03/15/07	KWG0703706	
2-Butanone (MEK)	ND	U UJ	20	2.3	1	03/15/07	03/15/07	KWG0703706	
Chloroform	**0.27**	J	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
1,1,1-Trichloroethane (TCA)	ND	U	0.50	0.12	1	03/15/07	03/15/07	KWG0703706	
Carbon Tetrachloride	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	

Comments: 4/25/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0701987
Project:	Gasco Groundwater Sampling/000029-02 New Wells	**Date Collected:**	03/09/2007
Sample Matrix:	Water	**Date Received:**	03/09/2007

Volatile Organic Compounds

Sample Name:	GS-070309-1	**Units:**	ug/L
Lab Code:	K0701987-001	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,2-Dichloroethane (EDC)	ND	U	0.50	0.12	1	03/15/07	03/15/07	KWG0703706	
Benzene	**0.19**	J	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
Trichloroethene (TCE)	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
1,2-Dichloropropane	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
Bromodichloromethane	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
2-Hexanone	ND	U UJ	20	4.0	1	03/15/07	03/15/07	KWG0703706	
cis-1,3-Dichloropropene	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
Toluene	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
trans-1,3-Dichloropropene	ND	U	0.50	0.090	1	03/15/07	03/15/07	KWG0703706	
1,1,2-Trichloroethane	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
4-Methyl-2-pentanone (MIBK)	ND	U UJ	20	2.7	1	03/15/07	03/15/07	KWG0703706	
Bromochloromethane	ND	U	0.50	0.17	1	03/15/07	03/15/07	KWG0703706	
Tetrachloroethene (PCE)	ND	U	0.50	0.13	1	03/15/07	03/15/07	KWG0703706	
Dibromochloromethane	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
Chlorobenzene	**0.43**	J	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
Ethylbenzene	ND	U	0.50	0.13	1	03/15/07	03/15/07	KWG0703706	
m,p-Xylenes	ND	U	0.50	0.22	1	03/15/07	03/15/07	KWG0703706	
o-Xylene	ND	U	0.50	0.11	1	03/15/07	03/15/07	KWG0703706	
Styrene	ND	U	0.50	0.095	1	03/15/07	03/15/07	KWG0703706	
Bromoform	ND	U	0.50	0.28	1	03/15/07	03/15/07	KWG0703706	
Isopropylbenzene	ND	U	2.0	0.11	1	03/15/07	03/15/07	KWG0703706	
1,1,2,2-Tetrachloroethane	ND	U	0.50	0.14	1	03/15/07	03/15/07	KWG0703706	
1,4-Dichlorobenzene	**0.38**	J	0.50	0.12	1	03/15/07	03/15/07	KWG0703706	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	92	80-120	03/15/07	Acceptable
Toluene-d8	92	80-122	03/15/07	Acceptable
4-Bromofluorobenzene	86	73-116	03/15/07	Acceptable

Comments: 03/15/07

LDC #: 16563C1

SDG #: K0701987

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/18/07

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/9/07
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	
IV.	Continuing calibration / ICV	SW	
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
VIII.	Laboratory control samples	A	LCS
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/CRQLs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	GS-070309-1 W	11	HWEF070306-4	21		31	
2		12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

TARGET COMPOUND WORKSHEET

METHOD: VOA (EPA SW 846 Method 8260B)

A. Chloromethane*	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride**	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform*	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene**	BB. 1,1,2,2-Tetrachloroethane*	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane*	CC. Toluene**	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene*	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform**	EE. Ethylbenzene**	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN.
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ.
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane**	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

*** = System performance check compounds (SPCC) for RRF ; ** = Calibration check compounds (CCC) for %RSD.**

LDC #: 16563e1
SDG #: K0701987

VALIDATION FINDINGS WORKSHEET
Initial Calibration

Page: 1 of 1
Reviewer: 9
2nd Reviewer:

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?
Y N N/A Were percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?
Y N N/A Was a curve fit used for evaluation? If yes, what was the acceptance criteria used for evaluation?_____
Y N N/A Did the initial calibration meet the acceptance criteria?
Y N N/A Were all %RSDs and RRFs within the validation criteria of ≤30 %RSD and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤30.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	2/13/07	ICAL	FFFF		0.0213	M+Bk	J/UJ/A
			HH		0.0340		
			F		0.0398		
			M		0.0136		
			Z		0.0319		
			Y		0.0437		

INICAL1SB

LDC #: 16563C1
SDG #: K0701987

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260)
Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?
Y N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?
Y N N/A Were all %D and RRFs within the validation criteria of ≤25 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤25.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	~~3/14/07~~						
	3/14/07	0314F002	B	30		all + Blk	J/UJ/A
			FFFF		0.0184		
			HH		0.0356		
			F		0.0321		
			M		0.0117		
			Z		0.0315		
			Y		0.0403		

CONCAL1S

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 15, 2007
LDC Report Date:	April 19, 2007
Matrix:	Water
Parameters:	Volatiles
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0702193

Sample Identification

GS-070315-2
GS-070315-3
GS-070315-4

Introduction

This data review covers 3 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Method 8260B for Volatiles.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (October 1999) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals.

All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 15.0% for each individual compound and less than or equal to 30.0% for calibration check compounds (CCCs).

For the purposes of technical evaluation, all compounds were evaluated against the 30.0% (%RSD) National Functional Guideline criteria. Unless noted above, all compounds were within the validation criteria.

Average relative response factors (RRF) for all volatile target compounds and system performance check compounds (SPCCs) were within method and validation criteria with the following exceptions:

Date	Compound	RRF (Limits)	Associated Samples	Flag	A or P
2/26/07	Acrolein Acrylonitrile Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	0.00518 (≥0.05) 0.0368 (≥0.05) 0.0285 (≥0.05) 0.0283 (≥0.05) 0.00949 (≥0.05) 0.0294 (≥0.05) 0.0370 (≥0.05)	All samples in SDG K0702193	J (all detects) UJ (all non-detects)	A

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

Percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were within the method criteria of less than or equal to 20.0% for calibration check compounds (CCCs).

For the purposes of technical evaluation, all compounds were evaluated against the 25.0% (%D) National Functional Guideline criteria. Unless noted above, all compounds were within the validation criteria with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
3/26/07	Acrolein Dichlorodifluoromethane	145 29	All samples in SDG K0702193	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds with the following exceptions:

Date	Compound	%D	Associated Samples	Flag	A or P
2/26/07	Acrolein Iodomethane trans-1,4-Dichloro-2-butene	38 30 27	All samples in SDG K0702193	J (all detects) UJ (all non-detects)	A

All of the continuing calibration RRF values were within method and validation criteria with the following exceptions:

Date	Compound	RRF (Limits)	Associated Samples	Flag	A or P
3/26/07	Acrolein Acrylonitrile Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	0.0127 (≥0.05) 0.0376 (≥0.05) 0.0299 (≥0.05) 0.0245 (≥0.05) 0.00912 (≥0.05) 0.0272 (≥0.05) 0.0347 (≥0.05)	All samples in SDG K0702193	J (all detects) UJ (all non-detects)	A

V. Blanks

Method blanks were reviewed for each matrix as applicable. No volatile contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

The laboratory has indicated that there were no matrix spike (MS) and matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike and matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits with the following exceptions:

LCS ID	Compound	%R (Limits)	Associated Samples	Flag	A or P
KWG0703973-3	Acrolein	235 (16-178)	All samples in SDG K0702193	J (all detects)	P

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard areas and retention times were within QC limits.

XI. Target Compound Identifications

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and CRQLs

Raw data were not reviewed for this SDG.

XIII. Tentatively Identified Compounds (TICs)

Raw data were not reviewed for this SDG.

XIV. System Performance

Raw data were not reviewed for this SDG.

XV. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

No field duplicates were identified in this SDG.

XVII. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Volatiles - Data Qualification Summary - SDG K0702193

SDG	Sample	Compound	Flag	A or P	Reason
K0702193	GS-070315-2 GS-070315-3 GS-070315-4	Acrolein Acrylonitrile Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	J (all detects) UJ (all non-detects)	A	Initial calibration (RRF)
K0702193	GS-070315-2 GS-070315-3 GS-070315-4	Acrolein Dichlorodifluoromethane	J (all detects) UJ (all non-detects) J (all detects) UJ (all non-detects)	A	Continuing calibration (%D)
K0702193	GS-070315-2 GS-070315-3 GS-070315-4	Acrolein Iodomethane trans-1,4-Dichloro-2-butene	J (all detects) UJ (all non-detects)	A	Continuing calibration (ICV %D)
K0702193	GS-070315-2 GS-070315-3 GS-070315-4	Acrolein Acrylonitrile Vinyl acetate Acetone 2-Butanone 2-Hexanone 4-Methyl-2-pentanone	J (all detects) UJ (all non-detects)	A	Continuing calibration (RRF)
K0702193	GS-070315-2 GS-070315-3 GS-070315-4	Acrolein	J (all detects)	P	Laboratory control samples (%R)

NW Natural Gasco Site
Volatiles - Laboratory Blank Data Qualification Summary - SDG K0702193

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Volatile Organic Compounds

Sample Name:	GS-070315-2	**Units:**	ug/L
Lab Code:	K0702193-001	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Acrolein	ND	U UJ	20	6.7	1	03/26/07	03/26/07	KWG0703973	*
Iodomethane	ND	U	5.0	0.38	1	03/26/07	03/26/07	KWG0703973	
Acrylonitrile	ND	U	5.0	0.54	1	03/26/07	03/26/07	KWG0703973	
1,1-Dichloroethane	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Vinyl Acetate	ND	U UJ	5.0	0.67	1	03/26/07	03/26/07	KWG0703973	
cis-1,2-Dichloroethene	**0.18**	J	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Dibromomethane	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
2-Chloroethyl Vinyl Ether	ND	U	5.0	0.34	1	03/26/07	03/26/07	KWG0703973	
1,2-Dibromoethane (EDB)	ND	U	2.0	0.099	1	03/26/07	03/26/07	KWG0703973	
1,1,1,2-Tetrachloroethane	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
1,2,3-Trichloropropane	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
trans-1,4-Dichloro-2-butene	ND	U UJ	10	0.60	1	03/26/07	03/26/07	KWG0703973	
1,3-Dichlorobenzene	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
1,2-Dichlorobenzene	**0.24**	J	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
1,2,4-Trichlorobenzene	ND	U	2.0	0.22	1	03/26/07	03/26/07	KWG0703973	
Hexachlorobutadiene	ND	U	2.0	0.28	1	03/26/07	03/26/07	KWG0703973	
Naphthalene	ND	U	2.0	0.29	1	03/26/07	03/26/07	KWG0703973	
Dichlorodifluoromethane	ND	U UJ	0.50	0.17	1	03/26/07	03/26/07	KWG0703973	
Chloromethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Vinyl Chloride	ND	U	0.50	0.042	1	03/26/07	03/26/07	KWG0703973	
Bromomethane	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
Chloroethane	ND	U	0.50	0.23	1	03/26/07	03/26/07	KWG0703973	
Trichlorofluoromethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Acetone	ND	U UJ	20	4.1	1	03/26/07	03/26/07	KWG0703973	
1,1-Dichloroethene	ND	U	0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
Carbon Disulfide	ND	U	0.50	0.16	1	03/26/07	03/26/07	KWG0703973	
Methylene Chloride	ND	U	2.0	0.20	1	03/26/07	03/26/07	KWG0703973	
Methyl tert-Butyl Ether	ND	U	0.50	0.20	1	03/26/07	03/26/07	KWG0703973	
trans-1,2-Dichloroethene	ND	U	0.50	0.15	1	03/26/07	03/26/07	KWG0703973	
2-Butanone (MEK)	ND	U UJ	20	2.3	1	03/26/07	03/26/07	KWG0703973	*
Chloroform	**0.22**	J	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,1,1-Trichloroethane (TCA)	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Carbon Tetrachloride	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	

Comments: 11/04/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Volatile Organic Compounds

Sample Name:	GS-070315-2	**Units:**	ug/L
Lab Code:	K0702193-001	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,2-Dichloroethane (EDC)	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Benzene	**0.54**		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Trichloroethene (TCE)	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,2-Dichloropropane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Bromodichloromethane	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
2-Hexanone	ND	U UJ	20	4.0	1	03/26/07	03/26/07	KWG0703973	
cis-1,3-Dichloropropene	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Toluene	**0.36**	J	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
trans-1,3-Dichloropropene	ND	U	0.50	0.090	1	03/26/07	03/26/07	KWG0703973	
1,1,2-Trichloroethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
4-Methyl-2-pentanone (MIBK)	ND	U UJ	20	2.7	1	03/26/07	03/26/07	KWG0703973	
Bromochloromethane	ND	U	0.50	0.17	1	03/26/07	03/26/07	KWG0703973	
Tetrachloroethene (PCE)	ND	U	0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
Dibromochloromethane	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Chlorobenzene	**0.19**	J	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Ethylbenzene	ND	U	0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
m,p-Xylenes	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
o-Xylene	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Styrene	ND	U	0.50	0.095	1	03/26/07	03/26/07	KWG0703973	
Bromoform	ND	U	0.50	0.28	1	03/26/07	03/26/07	KWG0703973	
Isopropylbenzene	ND	U	2.0	0.11	1	03/26/07	03/26/07	KWG0703973	
1,1,2,2-Tetrachloroethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,4-Dichlorobenzene	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	

* See Case Narrative

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	101	80-120	03/26/07	Acceptable
Toluene-d8	107	80-122	03/26/07	Acceptable
4-Bromofluorobenzene	96	73-116	03/26/07	Acceptable

Comments: 4/04/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Volatile Organic Compounds

Sample Name:	GS-070315-3	**Units:**	ug/L
Lab Code:	K0702193-002	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Acrolein	ND	U UJ	20	6.7	1	03/26/07	03/26/07	KWG0703973	*
Iodomethane	ND	U	5.0	0.38	1	03/26/07	03/26/07	KWG0703973	
Acrylonitrile	ND	U	5.0	0.54	1	03/26/07	03/26/07	KWG0703973	
1,1-Dichloroethane	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Vinyl Acetate	ND	U UJ	5.0	0.67	1	03/26/07	03/26/07	KWG0703973	
cis-1,2-Dichloroethene	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Dibromomethane	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
2-Chloroethyl Vinyl Ether	ND	U	5.0	0.34	1	03/26/07	03/26/07	KWG0703973	
1,2-Dibromoethane (EDB)	ND	U	2.0	0.099	1	03/26/07	03/26/07	KWG0703973	
1,1,1,2-Tetrachloroethane	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
1,2,3-Trichloropropane	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
trans-1,4-Dichloro-2-butene	ND	U UJ	10	0.60	1	03/26/07	03/26/07	KWG0703973	
1,3-Dichlorobenzene	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
1,2-Dichlorobenzene	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
1,2,4-Trichlorobenzene	ND	U	2.0	0.22	1	03/26/07	03/26/07	KWG0703973	
Hexachlorobutadiene	ND	U	2.0	0.28	1	03/26/07	03/26/07	KWG0703973	
Naphthalene	**4.9**		2.0	0.29	1	03/26/07	03/26/07	KWG0703973	
Dichlorodifluoromethane	ND	U UJ	0.50	0.17	1	03/26/07	03/26/07	KWG0703973	
Chloromethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Vinyl Chloride	ND	U	0.50	0.042	1	03/26/07	03/26/07	KWG0703973	
Bromomethane	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
Chloroethane	ND	U	0.50	0.23	1	03/26/07	03/26/07	KWG0703973	
Trichlorofluoromethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Acetone	ND	U UJ	20	4.1	1	03/26/07	03/26/07	KWG0703973	
1,1-Dichloroethene	ND	U	0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
Carbon Disulfide	ND	U	0.50	0.16	1	03/26/07	03/26/07	KWG0703973	
Methylene Chloride	ND	U	2.0	0.20	1	03/26/07	03/26/07	KWG0703973	
Methyl tert-Butyl Ether	ND	U	0.50	0.20	1	03/26/07	03/26/07	KWG0703973	
trans-1,2-Dichloroethene	ND	U	0.50	0.15	1	03/26/07	03/26/07	KWG0703973	
2-Butanone (MEK)	ND	U UJ	20	2.3	1	03/26/07	03/26/07	KWG0703973	*
Chloroform	**0.31**	J	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,1,1-Trichloroethane (TCA)	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Carbon Tetrachloride	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	

Comments: 4/5/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Volatile Organic Compounds

Sample Name:	GS-070315-3	**Units:**	ug/L
Lab Code:	K0702193-002	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q		MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,2-Dichloroethane (EDC)	ND	U		0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Benzene	**2.6**			0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Trichlorocthene (TCE)	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,2-Dichloropropane	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Bromodichloromethane	ND	U		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
2-Hexanone	ND	U	UJ	20	4.0	1	03/26/07	03/26/07	KWG0703973	
cis-1,3-Dichloropropene	ND	U		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Toluene	**0.45**	J		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
trans-1,3-Dichloropropene	ND	U		0.50	0.090	1	03/26/07	03/26/07	KWG0703973	
1,1,2-Trichloroethane	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
4-Methyl-2-pentanone (MIBK)	ND	U	UJ	20	2.7	1	03/26/07	03/26/07	KWG0703973	
Bromochloromethane	ND	U		0.50	0.17	1	03/26/07	03/26/07	KWG0703973	
Tetrachloroethene (PCE)	ND	U		0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
Dibromochloromethane	ND	U		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Chlorobenzene	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Ethylbenzene	ND	U		0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
m,p-Xylenes	**0.34**	J		0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
o-Xylene	**1.3**			0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Styrene	ND	U		0.50	0.095	1	03/26/07	03/26/07	KWG0703973	
Bromoform	ND	U		0.50	0.28	1	03/26/07	03/26/07	KWG0703973	
Isopropylbenzene	**0.36**	J		2.0	0.11	1	03/26/07	03/26/07	KWG0703973	
1,1,2,2-Tetrachloroethane	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,4-Dichlorobenzene	ND	U		0.50	0.12	1	03/26/07	03/26/07	KWG0703973	

* See Case Narrative

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	96	80-120	03/26/07	Acceptable
Toluene-d8	104	80-122	03/26/07	Acceptable
4-Bromofluorobenzene	95	73-116	03/26/07	Acceptable

Comments: 4/4/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Volatile Organic Compounds

Sample Name:	GS-070315-4	**Units:**	ug/L
Lab Code:	K0702193-003	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Acrolein	ND	U UJ	20	6.7	1	03/26/07	03/26/07	KWG0703973	*
Iodomethane	ND	U	5.0	0.38	1	03/26/07	03/26/07	KWG0703973	
Acrylonitrile	ND	U	5.0	0.54	1	03/26/07	03/26/07	KWG0703973	
1,1-Dichloroethane	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Vinyl Acetate	ND	U UJ	5.0	0.67	1	03/26/07	03/26/07	KWG0703973	
cis-1,2-Dichloroethene	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Dibromomethane	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
2-Chloroethyl Vinyl Ether	ND	U	5.0	0.34	1	03/26/07	03/26/07	KWG0703973	
1,2-Dibromoethane (EDB)	ND	U	2.0	0.099	1	03/26/07	03/26/07	KWG0703973	
1,1,1,2-Tetrachloroethane	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
1,2,3-Trichloropropane	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
trans-1,4-Dichloro-2-butene	ND	U UJ	10	0.60	1	03/26/07	03/26/07	KWG0703973	
1,3-Dichlorobenzene	ND	U	0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
1,2-Dichlorobenzene	**0.20**	J	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
1,2,4-Trichlorobenzene	ND	U	2.0	0.22	1	03/26/07	03/26/07	KWG0703973	
Hexachlorobutadiene	ND	U	2.0	0.28	1	03/26/07	03/26/07	KWG0703973	
Naphthalene	77	D	20	2.9	10	03/26/07	03/26/07	KWG0703973	
Dichlorodifluoromethane	ND	U UJ	0.50	0.17	1	03/26/07	03/26/07	KWG0703973	
Chloromethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Vinyl Chloride	ND	U	0.50	0.042	1	03/26/07	03/26/07	KWG0703973	
Bromomethane	ND	U	0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
Chloroethane	ND	U	0.50	0.23	1	03/26/07	03/26/07	KWG0703973	
Trichlorofluoromethane	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Acetone	ND	U UJ	20	4.1	1	03/26/07	03/26/07	KWG0703973	
1,1-Dichloroethene	ND	U	0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
Carbon Disulfide	ND	U	0.50	0.16	1	03/26/07	03/26/07	KWG0703973	
Methylene Chloride	**0.22**	J	2.0	0.20	1	03/26/07	03/26/07	KWG0703973	
Methyl tert-Butyl Ether	ND	U	0.50	0.20	1	03/26/07	03/26/07	KWG0703973	
trans-1,2-Dichloroethene	ND	U	0.50	0.15	1	03/26/07	03/26/07	KWG0703973	
2-Butanone (MEK)	ND	U UJ	20	2.3	1	03/26/07	03/26/07	KWG0703973	*
Chloroform	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,1,1-Trichloroethane (TCA)	ND	U	0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Carbon Tetrachloride	ND	U	0.50	0.14	1	03/26/07	03/26/07	KWG0703973	

Comments: 11/4/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Volatile Organic Compounds

Sample Name:	GS-070315-4	**Units:**	ug/L
Lab Code:	K0702193-003	**Basis:**	NA
Extraction Method:	EPA 5030B	**Level:**	Low
Analysis Method:	8260B		

Analyte Name	Result	Q		MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
1,2-Dichloroethane (EDC)	ND	U		0.50	0.12	1	03/26/07	03/26/07	KWG0703973	
Benzene	**80**	D		5.0	1.4	10	03/26/07	03/26/07	KWG0703973	
Trichloroethene (TCE)	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,2-Dichloropropane	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Bromodichloromethane	ND	U		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
2-Hexanone	ND	U	UJ	20	4.0	1	03/26/07	03/26/07	KWG0703973	
cis-1,3-Dichloropropene	ND	U		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Toluene	**0.86**			0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
trans-1,3-Dichloropropene	ND	U		0.50	0.090	1	03/26/07	03/26/07	KWG0703973	
1,1,2-Trichloroethane	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
4-Methyl-2-pentanone (MIBK)	ND	U	UJ	20	2.7	1	03/26/07	03/26/07	KWG0703973	
Bromochloromethane	ND	U		0.50	0.17	1	03/26/07	03/26/07	KWG0703973	
Tetrachloroethene (PCE)	ND	U		0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
Dibromochloromethane	ND	U		0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Chlorobenzene	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
Ethylbenzene	**1.6**			0.50	0.13	1	03/26/07	03/26/07	KWG0703973	
m,p-Xylenes	**20**			0.50	0.22	1	03/26/07	03/26/07	KWG0703973	
o-Xylene	**8.8**			0.50	0.11	1	03/26/07	03/26/07	KWG0703973	
Styrene	ND	U		0.50	0.095	1	03/26/07	03/26/07	KWG0703973	
Bromoform	ND	U		0.50	0.28	1	03/26/07	03/26/07	KWG0703973	
Isopropylbenzene	**2.7**			2.0	0.11	1	03/26/07	03/26/07	KWG0703973	
1,1,2,2-Tetrachloroethane	ND	U		0.50	0.14	1	03/26/07	03/26/07	KWG0703973	
1,4-Dichlorobenzene	ND	U		0.50	0.12	1	03/26/07	03/26/07	KWG0703973	

* See Case Narrative

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Dibromofluoromethane	94	80-120	03/26/07	Acceptable
Toluene-d8	104	80-122	03/26/07	Acceptable
4-Bromofluorobenzene	97	73-116	03/26/07	Acceptable

Comments:

LDC #: 16563E1

SDG #: K0702193

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/18/07

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Volatiles (EPA SW 846 Method 8260B)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/15/07
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	SW	
IV.	Continuing calibration ICV	SW	
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	N	client specified
VIII.	Laboratory control samples	SW	LCS
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/CRQLs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	GS-070315-2 W	11	KWE070397 3-4	21		31	
2	GS-070315-3 ↓	12		22		32	
3	GS-070315-4 ↓	13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

TARGET COMPOUND WORKSHEET

METHOD: VOA (EPA SW 846 Method 8260B)

A. Chloromethane*	U. 1,1,2-Trichloroethane	OO. 2,2-Dichloropropane	III. n-Butylbenzene	CCCC.1-Chlorohexane
B. Bromomethane	V. Benzene	PP. Bromochloromethane	JJJ. 1,2-Dichlorobenzene	DDDD. Isopropyl alcohol
C. Vinyl choride**	W. trans-1,3-Dichloropropene	QQ. 1,1-Dichloropropene	KKK. 1,2,4-Trichlorobenzene	EEEE. Acetonitrile
D. Chloroethane	X. Bromoform*	RR. Dibromomethane	LLL. Hexachlorobutadiene	FFFF. Acrolein
E. Methylene chloride	Y. 4-Methyl-2-pentanone	SS. 1,3-Dichloropropane	MMM. Naphthalene	GGGG. Acrylonitrile
F. Acetone	Z. 2-Hexanone	TT. 1,2-Dibromoethane	NNN. 1,2,3-Trichlorobenzene	HHHH. 1,4-Dioxane
G. Carbon disulfide	AA. Tetrachloroethene	UU. 1,1,1,2-Tetrachloroethane	OOO. 1,3,5-Trichlorobenzene	IIII. Isobutyl alcohol
H. 1,1-Dichloroethene**	BB. 1,1,2,2-Tetrachloroethane*	VV. Isopropylbenzene	PPP. trans-1,2-Dichloroethene	JJJJ. Methacrylonitrile
I. 1,1-Dichloroethane*	CC. Toluene**	WW. Bromobenzene	QQQ. cis-1,2-Dichloroethene	KKKK. Propionitrile
J. 1,2-Dichloroethene, total	DD. Chlorobenzene*	XX. 1,2,3-Trichloropropane	RRR. m,p-Xylenes	LLLL. Ethyl ether
K. Chloroform**	EE. Ethylbenzene**	YY. n-Propylbenzene	SSS. o-Xylene	MMMM. Benzyl chloride
L. 1,2-Dichloroethane	FF. Styrene	ZZ. 2-Chlorotoluene	TTT. 1,1,2-Trichloro-1,2,2-trifluoroethane	NNNN. trans-1.4-Dichloro-2-butene
M. 2-Butanone	GG. Xylenes, total	AAA. 1,3,5-Trimethylbenzene	UUU. 1,2-Dichlorotetrafluoroethane	OOOO.
N. 1,1,1-Trichloroethane	HH. Vinyl acetate	BBB. 4-Chlorotoluene	VVV. 4-Ethyltoluene	PPPP.
O. Carbon tetrachloride	II. 2-Chloroethylvinyl ether	CCC. tert-Butylbenzene	WWW. Ethanol	QQQQ.
P. Bromodichloromethane	JJ. Dichlorodifluoromethane	DDD. 1,2,4-Trimethylbenzene	XXX. Di-isopropyl ether	RRRR.
Q. 1,2-Dichloropropane**	KK. Trichlorofluoromethane	EEE. sec-Butylbenzene	YYY. tert-Butanol	SSSS.
R. cis-1,3-Dichloropropene	LL. Methyl-tert-butyl ether	FFF. 1,3-Dichlorobenzene	ZZZ. tert-Butyl alcohol	TTTT.
S. Trichloroethene	MM. 1,2-Dibromo-3-chloropropane	GGG. p-Isopropyltoluene	AAAA. Ethyl tert-butyl ether	UUUU.
T. Dibromochloromethane	NN. Methyl ethyl ketone	HHH. 1,4-Dichlorobenzene	BBBB. tert-Amyl methyl ether	VVVV.

*** = System performance check compounds (SPCC) for RRF ; ** = Calibration check compounds (CCC) for %RSD.**

LDC #: 165361
SDG #: K0702193

VALIDATION FINDINGS WORKSHEET
Initial Calibration

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Did the laboratory perform a 5 point calibration prior to sample analysis?
Y N N/A Were percent relative standard deviations (%RSD) and relative response factors (RRF) within method criteria for all CCC's and SPCC's?
Y N N/A Was a curve fit used for evaluation? If yes, what was the acceptance criteria used for evaluation?_____
Y N N/A Did the initial calibration meet the acceptance criteria?
Y N N/A Were all %RSDs and RRFs within the validation criteria of ≤30 %RSD and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %RSD (Limit: ≤30.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	2/26/07	1CA2	FFFF		0.00578	All+BK	J/UJ/A
			GGGG		0.0368		
			HH		0.0285		
			F		0.0283		
			M		0.00949		
			Z		0.0294		
			Y		0.0370		

INICAL.1SB

LDC #: 165632

SDG #: K0702193

VALIDATION FINDINGS WORKSHEET
Continuing Calibration

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS VOA (EPA SW 846 Method 8260)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

(Y) N N/A Was a continuing calibration standard analyzed at least once every 12 hours for each instrument?

(Y) N N/A Were percent differences (%D) and relative response factors (RRF) within method criteria for all CCC's and SPCC's ?

Y (N) N/A Were all %D and RRFs within the validation criteria of ≤25 %D and ≥0.05 RRF ?

#	Date	Standard ID	Compound	Finding %D (Limit: ≤25.0%)	Finding RRF (Limit: ≥0.05)	Associated Samples	Qualifications
	2/26/07	0226F074	FFFF	38		M+B~~A~~	J/UN/A
		(ICV)	Iodomethane	30			
			NNNN	27			
	3/26/07	0326F004	FFFF	145		M+B~~A~~	J/UN/A
			NN	29			
			FFFF		0.0127		
			GGGG		0.0376		
			HH		0.0299		
			F		0.0245		
			M		0.00912		
			Z		0.0272		
			Y		0.0347		

CONCAL.1S

LDC #: 16638I
SDG #: K0702193

VALIDATION FINDINGS WORKSHEET
Laboratory Control Samples (LCS)

Page: 1 of 1
Reviewer: a
2nd Reviewer: a

METHOD: GC/MS VOA (EPA SW 846 Method 8260B)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Was a LCS required?
Y N N/A Were the LCS percent recoveries (%R) and relative percent difference (RPD) within the QC limits?

#	Date	LCS/LCSD ID	Compound	LCS %R (Limits)	LCSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		KWG0703973 3	FFFF	23516-178	( )	( )	all + Blk	Volets/P
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

NW Natural Gasco Site
Data Validation Reports
LDC# 16563

Polynuclear Aromatic Hydrocarbons

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 9, 2007
LDC Report Date:	April 19, 2007
Matrix:	Water
Parameters:	Polynuclear Aromatic Hydrocarbons
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0701987

Sample Identification

GS-070309-1
GS-070309-1MS

Introduction

This data review covers 2 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per a modification of EPA SW 846 Method 8270C using Selected Ion Monitoring (SIM) for Polynuclear Aromatic Hydrocarbons.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (October 1999) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 30.0% for all compounds.

Average relative response factors (RRF) for all target compounds were within validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 25.0% .

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds.

All of the continuing calibration RRF values were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polynuclear aromatic hydrocarbon contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

The laboratory has indicated that there were no matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard areas and retention times were within QC limits.

XI. Target Compound Identifications

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and CRQLs

Raw data were not reviewed for this SDG.

XIII. Tentatively Identified Compounds (TICs)

Raw data were not reviewed for this SDG.

XIV. System Performance

Raw data were not reviewed for this SDG.

XV. Overall Assessment

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

No field duplicates were identified in this SDG.

XVII. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG K0701987

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG K0701987

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0701987
Project:	Gasco Groundwater Sampling/000029-02 New Wells	**Date Collected:**	03/09/2007
Sample Matrix:	Water	**Date Received:**	03/09/2007

Polynuclear Aromatic Hydrocarbons

Sample Name:	GS-070309-1	**Units:**	ug/L
Lab Code:	K0701987-001	**Basis:**	NA
Extraction Method:	EPA 3520C	**Level:**	Low
Analysis Method:	8270C SIM		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	**2.6**		0.020	0.0065	1	03/12/07	03/16/07	KWG0703530	
2-Methylnaphthalene	**0.43**		0.020	0.0042	1	03/12/07	03/16/07	KWG0703530	
Acenaphthylene	**0.027**		0.020	0.0023	1	03/12/07	03/16/07	KWG0703530	
Acenaphthene	**0.14**		0.020	0.0031	1	03/12/07	03/16/07	KWG0703530	
Fluorene	**0.083**		0.020	0.0036	1	03/12/07	03/16/07	KWG0703530	
Phenanthrene	**0.16**		0.020	0.0032	1	03/12/07	03/16/07	KWG0703530	
Anthracene	**0.014**	J	0.020	0.0039	1	03/12/07	03/16/07	KWG0703530	
Fluoranthene	**0.020**		0.020	0.0047	1	03/12/07	03/16/07	KWG0703530	
Pyrene	**0.019**	J	0.020	0.0047	1	03/12/07	03/16/07	KWG0703530	
Benz(a)anthracene	ND	U	0.020	0.0039	1	03/12/07	03/16/07	KWG0703530	
Chrysene	ND	U	0.020	0.0053	1	03/12/07	03/16/07	KWG0703530	
Benzo(b)fluoranthene	ND	U	0.020	0.0046	1	03/12/07	03/16/07	KWG0703530	
Benzo(k)fluoranthene	ND	U	0.020	0.0051	1	03/12/07	03/16/07	KWG0703530	
Benzo(a)pyrene	ND	U	0.020	0.0043	1	03/12/07	03/16/07	KWG0703530	
Indeno(1,2,3-cd)pyrene	**0.0061**	J	0.020	0.0033	1	03/12/07	03/16/07	KWG0703530	
Dibenz(a,h)anthracene	**0.0038**	J	0.020	0.0036	1	03/12/07	03/16/07	KWG0703530	
Benzo(g,h,i)perylene	**0.0073**	J	0.020	0.0041	1	03/12/07	03/16/07	KWG0703530	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	83	26-131	03/16/07	Acceptable
Fluoranthene-d10	86	28-150	03/16/07	Acceptable
Terphenyl-d14	102	32-157	03/16/07	Acceptable

Comments:

LDC #: 16563C2b

SDG #: K0701987

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/18/07

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW 846 Method 8270C-SIM)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/9/07
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	no spec
IV.	Continuing calibration ICV	A	
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	A	MS only
VIII.	Laboratory control samples	A	LCS/D
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/CRQLs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	GS-070309-1 W	11	KWG 0703530-4	21		31	
2	GS-070309-1MS	12		22		32	
3		13		23		33	
4		14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 15, 2007
LDC Report Date:	April 19, 2007
Matrix:	Water
Parameters:	Polynuclear Aromatic Hydrocarbons
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0702193

Sample Identification

GS-070315-2
GS-070315-3
GS-070315-4
GS-070315-4MS

Introduction

This data review covers 4 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per a modification of EPA SW 846 Method 8270C using Selected Ion Monitoring (SIM) for Polynuclear Aromatic Hydrocarbons.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review (October 1999) as there are no current guidelines for the method stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section V.

Field duplicates are summarized in Section XVI.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. GC/MS Instrument Performance Check

Instrument performance was checked at 12 hour intervals. All ion abundance requirements were met.

III. Initial Calibration

Initial calibration was performed using required standard concentrations.

Percent relative standard deviations (%RSD) were less than or equal to 30.0% for all compounds.

Average relative response factors (RRF) for all target compounds were within validation criteria.

IV. Continuing Calibration

Continuing calibration was performed at the required frequencies.

All of the continuing calibration percent differences (%D) between the initial calibration RRF and the continuing calibration RRF were less than or equal to 25.0% .

The percent differences (%D) of the second source calibration standard were less than or equal to 25.0% for all compounds.

All of the continuing calibration RRF values were within validation criteria.

V. Blanks

Method blanks were reviewed for each matrix as applicable. No polynuclear aromatic hydrocarbon contaminants were found in the method blanks.

VI. Surrogate Spikes

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries (%R) were within QC limits.

VII. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits with the following exceptions:

The laboratory has indicated that there were no matrix spike duplicate (MSD) analyses specified for the samples in this SDG, and therefore matrix spike duplicate analyses were not performed for this SDG.

VIII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) and relative percent differences (RPD) were within QC limits.

IX. Regional Quality Assurance and Quality Control

Not applicable.

X. Internal Standards

All internal standard areas and retention times were within QC limits.

XI. Target Compound Identifications

Raw data were not reviewed for this SDG.

XII. Compound Quantitation and CRQLs

Raw data were not reviewed for this SDG.

XIII. Tentatively Identified Compounds (TICs)

Raw data were not reviewed for this SDG.

XIV. System Performance

Raw data were not reviewed for this SDG.

XV. Overall Assessment

Data flags are summarized at the end of this report if data has been qualified.

XVI. Field Duplicates

No field duplicates were identified in this SDG.

XVII. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Polynuclear Aromatic Hydrocarbons - Data Qualification Summary - SDG K0702193

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Polynuclear Aromatic Hydrocarbons - Laboratory Blank Data Qualification Summary - SDG K0702193

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Polynuclear Aromatic Hydrocarbons

Sample Name:	GS-070315-2	**Units:**	ug/L
Lab Code:	K0702193-001	**Basis:**	NA
Extraction Method:	EPA 3520C	**Level:**	Low
Analysis Method:	8270C SIM		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	**0.026**		0.020	0.0065	1	03/19/07	03/27/07	KWG0703766	
2-Methylnaphthalene	ND	U	0.020	0.0042	1	03/19/07	03/27/07	KWG0703766	
Acenaphthylene	**0.0023**	J	0.020	0.0023	1	03/19/07	03/27/07	KWG0703766	
Acenaphthene	**0.0041**	J	0.020	0.0031	1	03/19/07	03/27/07	KWG0703766	
Fluorene	**0.0039**	J	0.020	0.0036	1	03/19/07	03/27/07	KWG0703766	
Phenanthrene	**0.0045**	J	0.020	0.0032	1	03/19/07	03/27/07	KWG0703766	
Anthracene	ND	U	0.020	0.0039	1	03/19/07	03/27/07	KWG0703766	
Fluoranthene	ND	U	0.020	0.0047	1	03/19/07	03/27/07	KWG0703766	
Pyrene	ND	U	0.020	0.0047	1	03/19/07	03/27/07	KWG0703766	
Benz(a)anthracene	ND	U	0.020	0.0039	1	03/19/07	03/27/07	KWG0703766	
Chrysene	ND	U	0.020	0.0053	1	03/19/07	03/27/07	KWG0703766	
Benzo(b)fluoranthene	ND	U	0.020	0.0046	1	03/19/07	03/27/07	KWG0703766	
Benzo(k)fluoranthene	ND	U	0.020	0.0051	1	03/19/07	03/27/07	KWG0703766	
Benzo(a)pyrene	ND	U	0.020	0.0043	1	03/19/07	03/27/07	KWG0703766	
Indeno(1,2,3-cd)pyrene	ND	U	0.020	0.0033	1	03/19/07	03/27/07	KWG0703766	
Dibenz(a,h)anthracene	ND	U	0.020	0.0036	1	03/19/07	03/27/07	KWG0703766	
Benzo(g,h,i)perylene	ND	U	0.020	0.0041	1	03/19/07	03/27/07	KWG0703766	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	82	26-131	03/27/07	Acceptable
Fluoranthene-d10	86	28-150	03/27/07	Acceptable
Terphenyl-d14	85	32-157	03/27/07	Acceptable

Comments: 11/4/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Polynuclear Aromatic Hydrocarbons

Sample Name:	GS-070315-3	**Units:**	ug/L
Lab Code:	K0702193-002	**Basis:**	NA
Extraction Method:	EPA 3520C	**Level:**	Low
Analysis Method:	8270C SIM		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	**3.4**		0.020	0.0065	1	03/19/07	03/27/07	KWG0703766	
2-Methylnaphthalene	**0.080**		0.020	0.0042	1	03/19/07	03/27/07	KWG0703766	
Acenaphthylene	**0.0088**	J	0.020	0.0023	1	03/19/07	03/27/07	KWG0703766	
Acenaphthene	**0.044**		0.020	0.0031	1	03/19/07	03/27/07	KWG0703766	
Fluorene	**0.030**		0.020	0.0036	1	03/19/07	03/27/07	KWG0703766	
Phenanthrene	**0.11**		0.020	0.0032	1	03/19/07	03/27/07	KWG0703766	
Anthracene	**0.014**	J	0.020	0.0039	1	03/19/07	03/27/07	KWG0703766	
Fluoranthene	**0.036**		0.020	0.0047	1	03/19/07	03/27/07	KWG0703766	
Pyrene	**0.035**		0.020	0.0047	1	03/19/07	03/27/07	KWG0703766	
Benz(a)anthracene	**0.0053**	J	0.020	0.0039	1	03/19/07	03/27/07	KWG0703766	
Chrysene	ND	U	0.020	0.0053	1	03/19/07	03/27/07	KWG0703766	
Benzo(b)fluoranthene	ND	U	0.020	0.0046	1	03/19/07	03/27/07	KWG0703766	
Benzo(k)fluoranthene	ND	U	0.020	0.0051	1	03/19/07	03/27/07	KWG0703766	
Benzo(a)pyrene	ND	U	0.020	0.0043	1	03/19/07	03/27/07	KWG0703766	
Indeno(1,2,3-cd)pyrene	ND	U	0.020	0.0033	1	03/19/07	03/27/07	KWG0703766	
Dibenz(a,h)anthracene	ND	U	0.020	0.0036	1	03/19/07	03/27/07	KWG0703766	
Benzo(g,h,i)perylene	ND	U	0.020	0.0041	1	03/19/07	03/27/07	KWG0703766	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	85	26-131	03/27/07	Acceptable
Fluoranthene-d10	93	28-150	03/27/07	Acceptable
Terphenyl-d14	86	32-157	03/27/07	Acceptable

Comments: 4/4/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Results

Client:	Anchor Environmental	**Service Request:**	K0702193
Project:	Gasco NW Natural/000029-02	**Date Collected:**	03/15/2007
Sample Matrix:	Water	**Date Received:**	03/16/2007

Polynuclear Aromatic Hydrocarbons

Sample Name:	GS-070315-4	**Units:**	ug/L
Lab Code:	K0702193-003	**Basis:**	NA
Extraction Method:	EPA 3520C	**Level:**	Low
Analysis Method:	8270C SIM		

Analyte Name	Result	Q	MRL	MDL	Dilution Factor	Date Extracted	Date Analyzed	Extraction Lot	Note
Naphthalene	**53**	D	0.20	0.065	10	03/19/07	03/28/07	KWG0703766	
2-Methylnaphthalene	**0.48**		0.020	0.0042	1	03/19/07	03/27/07	KWG0703766	
Acenaphthylene	**0.034**		0.020	0.0023	1	03/19/07	03/27/07	KWG0703766	
Acenaphthene	**0.22**		0.020	0.0031	1	03/19/07	03/27/07	KWG0703766	
Fluorene	**0.10**		0.020	0.0036	1	03/19/07	03/27/07	KWG0703766	
Phenanthrene	**0.24**		0.020	0.0032	1	03/19/07	03/27/07	KWG0703766	
Anthracene	**0.039**		0.020	0.0039	1	03/19/07	03/27/07	KWG0703766	
Fluoranthene	**0.049**		0.020	0.0047	1	03/19/07	03/27/07	KWG0703766	
Pyrene	**0.046**		0.020	0.0047	1	03/19/07	03/27/07	KWG0703766	
Benz(a)anthracene	**0.0070**	J	0.020	0.0039	1	03/19/07	03/27/07	KWG0703766	
Chrysene	**0.0057**	J	0.020	0.0053	1	03/19/07	03/27/07	KWG0703766	
Benzo(b)fluoranthene	ND	U	0.020	0.0046	1	03/19/07	03/27/07	KWG0703766	
Benzo(k)fluoranthene	ND	U	0.020	0.0051	1	03/19/07	03/27/07	KWG0703766	
Benzo(a)pyrene	ND	U	0.020	0.0043	1	03/19/07	03/27/07	KWG0703766	
Indeno(1,2,3-cd)pyrene	**0.0034**	J	0.020	0.0033	1	03/19/07	03/27/07	KWG0703766	
Dibenz(a,h)anthracene	ND	U	0.020	0.0036	1	03/19/07	03/27/07	KWG0703766	
Benzo(g,h,i)perylene	**0.0051**	J	0.020	0.0041	1	03/19/07	03/27/07	KWG0703766	

Surrogate Name	%Rec	Control Limits	Date Analyzed	Note
Fluorene-d10	79	26-131	03/27/07	Acceptable
Fluoranthene-d10	84	28-150	03/27/07	Acceptable
Terphenyl-d14	81	32-157	03/27/07	Acceptable

Comments: 4/04/07

LDC #: 16563E2b

SDG #: K0702193

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/18/07

Page: 1 of 1

Reviewer: a

2nd Reviewer: v

METHOD: GC/MS Polynuclear Aromatic Hydrocarbons (EPA SW 846 Method 8270C-SIM)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/15/07
II.	GC/MS Instrument performance check	A	
III.	Initial calibration	A	
IV.	Continuing calibration ICV	A	
V.	Blanks	A	
VI.	Surrogate spikes	A	
VII.	Matrix spike/Matrix spike duplicates	SW	
VIII.	Laboratory control samples	A	LCS/D
IX.	Regional Quality Assurance and Quality Control	N	
X.	Internal standards	A	
XI.	Target compound identification	N	
XII.	Compound quantitation/CRQLs	N	
XIII.	Tentatively identified compounds (TICs)	N	
XIV.	System performance	N	
XV.	Overall assessment of data	A	
XVI.	Field duplicates	N	
XVII.	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	GS-070315-2	11	KNF070376-4	21		31	
2	GS-070315-3	12		22		32	
3	GS-070315-4	13		23		33	
4	GS-070315-4MS	14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

VALIDATION FINDINGS WORKSHEET

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

A. Phenol**	P. Bis(2-chloroethoxy)methane	EE. 2,6-Dinitrotoluene	TT. Pentachlorophenol**	III. Benzo(a)pyrene**
B. Bis (2-chloroethyl) ether	Q. 2,4-Dichlorophenol**	FF. 3-Nitroaniline	UU. Phenanthrene	JJJ. Indeno(1,2,3-cd)pyrene
C. 2-Chlorophenol	R. 1,2,4-Trichlorobenzene	GG. Acenaphthene**	VV. Anthracene	KKK. Dibenz(a,h)anthracene
D. 1,3-Dichlorobenzene	S. Naphthalene	HH. 2,4-Dinitrophenol*	WW. Carbazole	LLL. Benzo(g,h,i)perylene
E. 1,4-Dichlorobenzene**	T. 4-Chloroaniline	II. 4-Nitrophenol*	XX. Di-n-butylphthalate	MMM. Bis(2-Chloroisopropyl)ether
F. 1,2-Dichlorobenzene	U. Hexachlorobutadiene**	JJ. Dibenzofuran	YY. Fluoranthene**	NNN. Aniline
G. 2-Methylphenol	V. 4-Chloro-3-methylphenol**	KK. 2,4-Dinitrotoluene	ZZ. Pyrene	OOO. N-Nitrosodimethylamine
H. 2,2'-Oxybis(1-chloropropane)	W. 2-Methylnaphthalene	LL. Diethylphthalate	AAA. Butylbenzylphthalate	PPP. Benzoic Acid
I. 4-Methylphenol	X. Hexachlorocyclopentadiene*	MM. 4-Chlorophenyl-phenyl ether	BBB. 3,3'-Dichlorobenzidine	QQQ. Benzyl alcohol
J. N-Nitroso-di-n-propylamine*	Y. 2,4,6-Trichlorophenol**	NN. Fluorene	CCC. Benzo(a)anthracene	RRR. Pyridine
K. Hexachloroethane	Z. 2,4,5-Trichlorophenol	OO. 4-Nitroaniline	DDD. Chrysene	SSS. Benzidine
L. Nitrobenzene	AA. 2-Chloronaphthalene	PP. 4,6-Dinitro-2-methylphenol	EEE. Bis(2-ethylhexyl)phthalate	TTT.
M. Isophorone	BB. 2-Nitroaniline	QQ. N-Nitrosodiphenylamine (1)**	FFF. Di-n-octylphthalate**	UUU.
N. 2-Nitrophenol**	CC. Dimethylphthalate	RR. 4-Bromophenyl-phenylether	GGG. Benzo(b)fluoranthene	VVV.
O. 2,4-Dimethylphenol	DD. Acenaphthylene	SS. Hexachlorobenzene	HHH. Benzo(k)fluoranthene	WWW.

LDC #: 16563E2b
SDG #: K0T02193

VALIDATION FINDINGS WORKSHEET
Matrix Spike/Matrix Spike Duplicates

Page: 1 of 1
Reviewer: [illegible]
2nd Reviewer: [illegible]

METHOD: GC/MS BNA (EPA SW 846 Method 8270)

Please see qualifications below for all questions answered "N". Not applicable questions are identified as "N/A".

Y N N/A Were a matrix spike (MS) and matrix spike duplicate (MSD) analyzed for each matrix in this SDG? If no, indicate which matrix does not have an associated MS/MSD. Soil / Water.

Y N N/A Was a MS/MSD analyzed every 20 samples of each matrix?

Y N N/A Were the MS/MSD percent recoveries (%R) and the relative percent differences (RPD) within the QC limits?

#	Date	MS/MSD ID	Compound	MS %R (Limits)	MSD %R (Limits)	RPD (Limits)	Associated Samples	Qualifications
		4	5	169 (56-132)	( )	( )	3	no qual ~~detects~~ / ~~A~~ conc > 2x QA
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		
				( )	( )	( )		

	Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)		Compound	QC Limits (Soil)	RPD (Soil)	QC Limits (Water)	RPD (Water)
A.	Phenol	26-90%	≤ 35%	12-110%	≤ 42%	GG.	Acenaphthene	31-137%	≤ 19%	46-118%	≤ 31%
C.	2-Chlorophenol	25-102%	≤ 50%	27-123%	≤ 40%	II.	4-Nitrophenol	11-114%	≤ 50%	10-80%	≤ 50%
E.	1,4-Dichlorobenzene	28-104%	≤ 27%	36-97%	≤ 28%	KK.	2,4-Dinitrotoluene	28-89%	≤ 47%	24-96%	≤ 38%
J.	N-Nitroso-di-n-propylamine	41-126%	≤ 38%	41-116%	≤ 38%	TT.	Pentachlorophenol	17-109%	≤ 47%	9-103%	≤ 50%
R.	1,2,4-Trichlorobenzene	38-107%	≤ 23%	39-98%	≤ 28%	ZZ.	Pyrene	35-142%	≤ 36%	26-127%	≤ 31%
V.	4-Chloro-3-methylphenol	26-103%	≤ 33%	23-97%	≤ 42%						

NW Natural Gasco Site
Data Validation Reports
LDC# 16563

Metals

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 9, 2007
LDC Report Date:	April 21, 2007
Matrix:	Water
Parameters:	Metals
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0701987

Sample Identification

GS-070309-1
GS-070309-1MS
GS-070309-1DUP

Introduction

This data review covers 3 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Methods 6020 and 7000 for Metals. The metals analyzed were Arsenic, Beryllium, Cadmium, Chromium, Copper, Lead, Mercury, Nickel, Selenium, Silver, Thallium, and Zinc.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Silver	0.016 ug/L	All samples in SDG K0701987
ICB/CCB	Arsenic Silver	0.1 ug/L 0.02 ug/L	All samples in SDG K0701987

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
GS-070309-1	Silver	0.006 ug/L	0.020U ug/L

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

Raw data were not reviewed for this SDG.

IX. Furnace Atomic Absorption QC

Raw data were not reviewed for this SDG.

X. ICP Serial Dilution

ICP serial dilution analysis was performed by the laboratory. The analysis criteria were met.

XI. Sample Result Verification

Raw data were not reviewed for this SDG.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

No field duplicates were identified in this SDG.

XIV. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Metals - Data Qualification Summary - SDG K0701987

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Metals - Laboratory Blank Data Qualification Summary - SDG K0701987

SDG	Sample	Analyte	Modified Final Concentration	A or P
K0701987	GS-070309-1	Silver	0.020U ug/L	A

Columbia Analytical Services

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client:	Anchor Environmental	Service Request:	K0701987
Project No.:	000029-02 New Wells	Date Collected:	03/09/07
Project Name:	Gasco Groundwater Sampling	Date Received:	03/09/07
Matrix:	WATER	Units:	µG/L
		Basis:	NA

Sample Name: GS-070309-1 Lab Code: K0701987-001

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q
Arsenic	6020	0.5	0.1	1	3/12/07	3/14/07	1.6		
Beryllium	6020	0.020	0.008	1	3/12/07	3/14/07	0.017	B	
Cadmium	6020	0.02	0.02	1	3/12/07	3/14/07	0.03		
Chromium	6020	0.20	0.07	1	3/12/07	3/14/07	0.70		
Copper	6020	0.10	0.03	1	3/12/07	3/14/07	1.67		
Lead	6020	0.020	0.008	1	3/12/07	3/14/07	0.204		
Mercury	7470A	0.20	0.02	1	3/13/07	3/14/07	0.02	U	
Nickel	6020	0.2	0.2	1	3/12/07	3/14/07	1.7		
Selenium	6020	1.0	0.2	1	3/12/07	3/14/07	0.3	B	
Silver	6020	0.020	0.003	1	3/12/07	3/14/07	0.006	B	0.020U
Thallium	6020	0.020	0.005	1	3/12/07	3/14/07	0.005	U	
Zinc	6020	0.5	0.3	1	3/12/07	3/14/07	7.2		

% Solids: 0.0

Comments:

LDC #: 16563C4

SDG #: K0701987

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

Page: 1 of 1

Reviewer: W

2nd Reviewer: R

METHOD: Metals (EPA SW 846 Method ~~6010B~~ 6020/7000)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/9/07
II.	Calibration	A	
III.	Blanks	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	A	3 MS / Dup
VI.	Duplicate Sample Analysis	A	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	Not reviewed
IX.	Furnace Atomic Absorption QC	N	Not utilized
X.	ICP Serial Dilution	A	
XI.	Sample Result Verification	N	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	N	
XIV.	Field Blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

AL

1	GS-070309-1	11		21		31	
2	GS-070309-1MS	12		22		32	
3	GS-070309-1DUP	13		23		33	
4	PB	14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 165634
SDG #: K0701987

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MH
2nd reviewer: R

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1	Air	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
MS3	Air	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
ICP Trace		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN-, ___

Comments: Mercury by CVAA if performed

LDC #: 16563C4
SDG #: K0709B7

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Page: 1 of 1
Reviewer: WH
2nd Reviewer: 2

METHOD: Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: _____
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: All

					Sample Identification										
Analyte	Maximum PB* (mg/Kg)	Maximum PB* (ug/L)	Maximum ICB/CCB* (ug/L)	Blank Action Limit	1										
Al															Al
Sb															Sb
As			0.1	0.5											As
Ba															Ba
Be															Be
Cd															Cd
Ca															Ca
Cr															Cr
Co															Co
Cu															Cu
Fe															Fe
Pb															Pb
Mg															Mg
Mn															Mn
Hg															Hg
Ni															Ni
K															K
Se															Se
Ag		0.016	0.02	0.10	0.006/0.020										Ag
Na															Na
Tl															Tl
V															V
Zn															Zn
B															B
Mo															Mo
Sr															Sr

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".
Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

BLNKSMP.4S2

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 15, 2007
LDC Report Date:	April 21, 2007
Matrix:	Water
Parameters:	Metals
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0702193

Sample Identification

GS-070315-2
GS-070315-3
GS-070315-4
GS-070315-2MS
GS-070315-2DUP
GS-070315-3MS
GS-070315-3DUP

Introduction

This data review covers 7 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA SW 846 Methods 6010B, 6020, and 7000 for Metals. The metals analyzed were Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Selenium, Silver, Sodium, Thallium, and Zinc.

This review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified as P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blanks are summarized in Section III.

Field duplicates are summarized in Section XIII.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

An initial calibration was performed.

The frequency and analysis criteria of the initial calibration verification (ICV) and continuing calibration verification (CCV) were met.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks with the following exceptions:

Method Blank ID	Analyte	Maximum Concentration	Associated Samples
PB (prep blank)	Chromium Silver	0.16 ug/L 0.010 ug/L	All samples in SDG K0702193
ICB/CCB	Chromium Lead Silver	0.07 ug/L 0.010 ug/L 0.02 ug/L	All samples in SDG K0702193

Data qualification by the initial, continuing and preparation blanks (ICB/CCB/PBs) was based on the maximum contaminant concentration in the ICB/CCB/PBs in the analysis of each analyte. The sample concentrations were either not detected or were significantly greater (>5X blank contaminants) than the concentrations found in the associated method blanks with the following exceptions:

Sample	Analyte	Reported Concentration	Modified Final Concentration
GS-070315-2	Chromium Silver	0.61 ug/L 0.008 ug/L	0.61U ug/L 0.020U ug/L
GS-070315-3	Chromium Silver	0.73 ug/L 0.008 ug/L	0.73U ug/L 0.020U ug/L
GS-070315-4	Silver	0.013 ug/L	0.020U ug/L

IV. ICP Interference Check Sample (ICS) Analysis

The frequency of analysis was met.

The criteria for analysis were met.

V. Matrix Spike Analysis

Matrix spike (MS) analyses were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VI. Duplicate Sample Analysis

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VII. Laboratory Control Samples (LCS)

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VIII. Internal Standards (ICP-MS)

Raw data were not reviewed for this SDG.

IX. Furnace Atomic Absorption QC

Raw data were not reviewed for this SDG.

X. ICP Serial Dilution

ICP serial dilution analysis was performed by the laboratory. The analysis criteria were met.

XI. Sample Result Verification

Raw data were not reviewed for this SDG.

XII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

XIII. Field Duplicates

No field duplicates were identified in this SDG.

XIV. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Metals - Data Qualification Summary - SDG K0702193

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Metals - Laboratory Blank Data Qualification Summary - SDG K0702193

SDG	Sample	Analyte	Modified Final Concentration	A or P
K0702193	GS-070315-2	Chromium Silver	0.61U ug/L 0.020U ug/L	A
K0702193	GS-070315-3	Chromium Silver	0.73U ug/L 0.020U ug/L	A
K0702193	GS-070315-4	Silver	0.020U ug/L	A

Columbia Analytical Services

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client:	Anchor Environmental	Service Request:	K0702193
Project No.:	000029-02	Date Collected:	03/15/07
Project Name:	Gasco NW Natural	Date Received:	03/16/07
Matrix:	WATER	Units:	µG/L
		Basis:	NA

Sample Name: GS-070315-2 Lab Code: K0702193-001

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q	
Aluminum	6020	2.0	0.7	1	3/20/07	3/21/07	78.9			
Antimony	6020	0.05	0.02	1	3/20/07	3/21/07	0.05	B		
Arsenic	6020	0.5	0.1	1	3/20/07	3/21/07	2.3			
Barium	6020	0.05	0.04	1	3/20/07	3/21/07	33.2			
Beryllium	6020	0.020	0.008	1	3/20/07	3/21/07	0.011	B		
Cadmium	6020	0.02	0.02	1	3/20/07	3/21/07	0.03			
Calcium	6010B	50	20	1	3/20/07	3/22/07	51000			
Chromium	6020	0.20	0.07	1	3/20/07	3/21/07	0.61			U
Copper	6020	0.10	0.03	1	3/20/07	3/21/07	0.56			
Iron	6010B	20.0	3.0	1	3/20/07	3/22/07	11500			
Lead	6020	0.020	0.008	1	3/21/07	3/22/07	0.097			
Magnesium	6010B	20	20	1	3/20/07	3/22/07	30800			
Manganese	6010B	5.0	0.3	1	3/20/07	3/22/07	660			
Mercury	7470A	0.20	0.02	1	3/20/07	3/21/07	0.02	U		
Nickel	6020	0.2	0.2	1	3/20/07	3/21/07	1.8			
Potassium	6010B	2000	50	1	3/20/07	3/22/07	5090			
Selenium	6020	1.0	0.2	1	3/20/07	3/21/07	0.5	B		
Silver	6020	0.020	0.003	1	3/20/07	3/21/07	0.008	B		0.020U
Sodium	6010B	100	20	1	3/20/07	3/22/07	19700			
Thallium	6020	0.020	0.005	1	3/20/07	3/21/07	0.005	U		
Zinc	6020	0.5	0.3	1	3/20/07	3/21/07	5.5			

% Solids: 0.0

Comments:

4/4/2007

Columbia Analytical Services

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client:	Anchor Environmental	Service Request:	K0702193
Project No.:	000029-02	Date Collected:	03/15/07
Project Name:	Gasco NW Natural	Date Received:	03/16/07
Matrix:	WATER	Units:	µG/L
		Basis:	NA

Sample Name: GS-070315-3 Lab Code: K0702193-002

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q	
Aluminum	6020	2.0	0.7	1	3/20/07	3/21/07	116			
Antimony	6020	0.05	0.02	1	3/20/07	3/21/07	0.02	U		
Arsenic	6020	0.5	0.1	1	3/20/07	3/21/07	9.8			
Barium	6020	0.05	0.04	1	3/20/07	3/21/07	62.9			
Beryllium	6020	0.020	0.008	1	3/20/07	3/21/07	0.019	B		
Cadmium	6020	0.02	0.02	1	3/20/07	3/21/07	0.02	U		
Calcium	6010B	50	20	1	3/20/07	3/22/07	53600			
Chromium	6020	0.20	0.07	1	3/20/07	3/21/07	0.73			U
Copper	6020	0.10	0.03	1	3/20/07	3/21/07	0.53			
Iron	6010B	20.0	3.0	1	3/20/07	3/22/07	30500			
Lead	6020	0.020	0.008	1	3/21/07	3/22/07	0.089			
Magnesium	6010B	20	20	1	3/20/07	3/22/07	21200			
Manganese	6010B	5.0	0.3	1	3/20/07	3/22/07	2340			
Mercury	7470A	0.20	0.02	1	3/20/07	3/21/07	0.02	U		
Nickel	6020	0.2	0.2	1	3/20/07	3/21/07	1.9			
Potassium	6010B	2000	50	1	3/20/07	3/22/07	3660			
Selenium	6020	1.0	0.2	1	3/20/07	3/21/07	0.5	B		
Silver	6020	0.020	0.003	1	3/20/07	3/21/07	0.008	B		0.020U
Sodium	6010B	100	20	1	3/20/07	3/22/07	10500			
Thallium	6020	0.020	0.005	1	3/20/07	3/21/07	0.005	U		
Zinc	6020	0.5	0.3	1	3/20/07	3/21/07	3.1			

% Solids: 0.0

Comments:

8/24/07

Columbia Analytical Services

METALS

-1-

INORGANIC ANALYSIS DATA SHEET

Client:	Anchor Environmental	Service Request:	K0702193
Project No.:	000029-02	Date Collected:	03/15/07
Project Name:	Gasco NW Natural	Date Received:	03/16/07
Matrix:	WATER	Units:	µG/L
		Basis:	NA

Sample Name: GS-070315-4 Lab Code: K0702193-003

Analyte	Analysis Method	MRL	MDL	Dil.	Date Extracted	Date Analyzed	Result	C	Q
Aluminum	6020	40.0	14.0	20	3/20/07	3/21/07	1310		
Antimony	6020	0.05	0.02	1	3/20/07	3/21/07	0.23		
Arsenic	6020	0.5	0.1	1	3/20/07	3/21/07	9.2		
Barium	6020	0.05	0.04	1	3/20/07	3/21/07	61.9		
Beryllium	6020	0.020	0.008	1	3/20/07	3/21/07	0.075		
Cadmium	6020	0.02	0.02	1	3/20/07	3/21/07	0.04		
Calcium	6010B	50	20	1	3/20/07	3/22/07	65800		
Chromium	6020	0.20	0.07	1	3/20/07	3/21/07	2.64		
Copper	6020	0.10	0.03	1	3/20/07	3/21/07	4.58		
Iron	6010B	20.0	3.0	1	3/20/07	3/22/07	27200		
Lead	6020	0.020	0.008	1	3/21/07	3/22/07	1.190		
Magnesium	6010B	20	20	1	3/20/07	3/22/07	20100		
Manganese	6010B	5.0	0.3	1	3/20/07	3/22/07	4020		
Mercury	7470A	0.20	0.02	1	3/20/07	3/21/07	0.02	U	
Nickel	6020	0.2	0.2	1	3/20/07	3/21/07	2.9		
Potassium	6010B	2000	50	1	3/20/07	3/22/07	5680		
Selenium	6020	1.0	0.2	1	3/20/07	3/21/07	0.5	B	
Silver	6020	0.020	0.003	1	3/20/07	3/21/07	0.013	B	0.0204
Sodium	6010B	100	20	1	3/20/07	3/22/07	18600		
Thallium	6020	0.020	0.005	1	3/20/07	3/21/07	0.009	B	
Zinc	6020	0.5	0.3	1	3/20/07	3/21/07	10.3		

% Solids: 0.0

Comments:

LDC #: 16563E4

SDG #: K0702193

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: Metals (EPA SW 846 Method ~~6010B~~ 6020/7000) 6010B

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/15/07
II.	Calibration	A	
III.	Blanks	SW	
IV.	ICP Interference Check Sample (ICS) Analysis	A	
V.	Matrix Spike Analysis	A	3 MS/DUP
VI.	Duplicate Sample Analysis	A	
VII.	Laboratory Control Samples (LCS)	A	LCS
VIII.	Internal Standard (ICP-MS)	N	Not required
IX.	Furnace Atomic Absorption QC	N	Not utilized
X.	ICP Serial Dilution	A	
XI.	Sample Result Verification	N	
XII.	Overall Assessment of Data	A	
XIII.	Field Duplicates	N	
XIV.	Field Blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: As

1	GS-070315-2	11		21		31	
2	GS-070315-3	12		22		32	
3	GS-070315-4	13		23		33	
4	GS-070315-2MS	14		24		34	
5	GS-070315-2DUP	15		25		35	
6	GS-070315-3MS	16		26		36	
7	GS-070315-3DUP	17		27		37	
8	PB	18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 16563B4
SDG #: K0702193

VALIDATION FINDINGS WORKSHEET
Sample Specific Element Reference

Page: 1 of 1
Reviewer: MH
2nd reviewer: [illegible]

All circled elements are applicable to each sample.

Sample ID	Matrix	Target Analyte List (TAL)
1-3	Aq	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
m4 ~~5~~	Aq	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
6.7	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
5	↓	Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
Analysis Method		
ICP		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP Trace		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
ICP-MS		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___ ___
GFAA		Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn, Mo, B, Si, CN⁻, ___

Comments: Mercury by CVAA if performed

LDC #: 16563E4
SDG #: K0702193

VALIDATION FINDINGS WORKSHEET
PB/ICB/CCB QUALIFIED SAMPLES

Page: 1 of 1
Reviewer: WH
2nd Reviewer: [illegible]

METHOD: Trace Metals (EPA SW 846 Method 6010/7000) Soil preparation factor applied: _____
Sample Concentration units, unless otherwise noted: ug/L Associated Samples: All

					Sample Identification										
Analyte	Maximum PB[a] (mg/Kg)	Maximum PB[a] (ug/L)	Maximum ICB/CCB[a] (ug/L)	Blank Action Limit	1		2		3						
Al															Al
Sb															Sb
As															As
Ba															Ba
Be															Be
Cd															Cd
Ca															Ca
Cr		0.16	0.07	0.80	0.61/U		0.73/U								Cr
Co															Co
Cu															Cu
Fe															Fe
Pb			0.010	0.050											Pb
Mg															Mg
Mn															Mn
Hg															Hg
Ni															Ni
K															K
Se															Se
Ag		0.010	0.02	0.10	0.008/0.020		0.008/0.020		0.013/0.020						Ag
Na															Na
Tl															Tl
V															V
Zn															Zn
B															B
Mo															Mo
Sr															Sr

Samples with analyte concentrations within five times the associated ICB, CCB or PB concentration are listed above with the identifications from the Validation Completeness Worksheet. These sample results were qualified as not detected, "U".

Note : a - The listed analyte concentration is the highest ICB, CCB, or PB detected in the analysis of each element.

BLNKSMP.4S2

NW Natural Gasco Site
Data Validation Reports
LDC# 16563

Wet Chemistry

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name: NW Natural Gasco Site

Collection Date: February 22 through February 26, 2007

LDC Report Date: April 21, 2007

Matrix: Sediment

Parameters: Particle Size

Validation Level: EPA Level III

Laboratory: Columbia Analytical Services, Inc.

Sample Delivery Group (SDG): K0701557

Sample Identification

PW-2-S(30)
PW-2-S(40)
PW-2-S(50)
PW-2-S(60)
PW-2-S(70)
PW-2-S(80)
PW-2-S(90)
PW-2-S(100)
PW-2-S(110)
PW-2-S(120)
PW-2-S(130)
PW-2-S(140)
PW-2-S(150)
PW-2-S(160)
PW-2-S(170)
PW-2-S(180)
PW-2-S(190)
PW-2-S(200)
PW-2-S(210)
PW-2-S(222)
PW-2-S(140)DUP
PW-2-S(140)TRP

Introduction

This data review covers 22 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per PSEP Method for Particle Size.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blank analysis is not required for particle size and was not performed.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) analysis is not required for particle size and was not performed.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control sample analysis is not required for particle size and was not performed.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Particle Size - Data Qualification Summary - SDG K0701557

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Particle Size - Laboratory Blank Data Qualification Summary - SDG K0701557

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (30)
Lab Code: K0701557-001

Sand Fraction: Dry Weight (Grams)	67.0
Sand Fraction: Weight Recovered (Grams)	66.9822
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	2.3470	3.09
Sand, Very Coarse	-1 to 0 Ø	1.8520	2.44
Sand, Coarse	0 to 1 Ø	1.1509	1.52
Sand, Medium	1 to 2 Ø	10.0883	13.3
Sand, Fine	2 to 3 Ø	44.4013	58.5
Sand, Very Fine	3 to 4 Ø	6.4840	8.54
Silt	4 to 8 Ø	6.0350	7.95
Clay	> 8 Ø	2.1150	2.79
	Total	74.4735	98.1

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (40)
Lab Code: K0701557-002

Sand Fraction: Dry Weight (Grams)	36.8495
Sand Fraction: Weight Recovered (Grams)	36.9467
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	27.0540	57.5
Sand, Very Coarse	-1 to 0 Ø	3.0313	6.44
Sand, Coarse	0 to 1 Ø	1.6523	3.51
Sand, Medium	1 to 2 Ø	1.2637	2.69
Sand, Fine	2 to 3 Ø	1.4162	3.01
Sand, Very Fine	3 to 4 Ø	1.7614	3.74
Silt	4 to 8 Ø	6.4850	13.8
Clay	> 8 Ø	5.0850	10.8
	Total	47.7489	101

Approved By: _____ Date: 3/13/07

3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (50)
Lab Code: K0701557-003

Sand Fraction: Dry Weight (Grams)	21.6454
Sand Fraction: Weight Recovered (Grams)	21.6501
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	1.7046	3.66
Sand, Very Coarse	-1 to 0 Ø	0.3894	0.96
Sand, Coarse	0 to 1 Ø	0.3030	0.74
Sand, Medium	1 to 2 Ø	1.5321	3.76
Sand, Fine	2 to 3 Ø	9.7600	23.9
Sand, Very Fine	3 to 4 Ø	6.4675	15.9
Silt	4 to 8 Ø	15.9900	39.2
Clay	> 8 Ø	5.3400	13.1
	Total	41.4866	101

Approved By: _____ Date: 3/13/07

8/04/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (60)
Lab Code: K0701557-004

Sand Fraction: Dry Weight (Grams)	40.9309
Sand Fraction: Weight Recovered (Grams)	40.9496
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	4.6564	7.66
Sand, Very Coarse	-1 to 0 Ø	0.2557	0.42
Sand, Coarse	0 to 1 Ø	0.2410	0.40
Sand, Medium	1 to 2 Ø	10.9568	18.0
Sand, Fine	2 to 3 Ø	17.0222	28.0
Sand, Very Fine	3 to 4 Ø	6.5463	10.77
Silt	4 to 8 Ø	16.2300	26.7
Clay	> 8 Ø	5.3300	8.77
	Total	61.2384	101

Approved By: _____ Date: 3/13/07

3/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (70)
Lab Code: K0701557-005

Sand Fraction: Dry Weight (Grams)	52.1729
Sand Fraction: Weight Recovered (Grams)	52.2382
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	7.9601	10.7
Sand, Very Coarse	-1 to 0 Ø	0.7059	0.95
Sand, Coarse	0 to 1 Ø	0.3278	0.44
Sand, Medium	1 to 2 Ø	3.4307	4.60
Sand, Fine	2 to 3 Ø	21.5175	28.9
Sand, Very Fine	3 to 4 Ø	15.0704	20.2
Silt	4 to 8 Ø	17.6800	23.7
Clay	> 8 Ø	8.4500	11.3
	Total	75.1424	101

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (80)
Lab Code: K0701557-006

Sand Fraction: Dry Weight (Grams)	62.4462
Sand Fraction: Weight Recovered (Grams)	62.5734
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.2666	0.37
Sand, Very Coarse	-1 to 0 Ø	0.2456	0.34
Sand, Coarse	0 to 1 Ø	0.3734	0.51
Sand, Medium	1 to 2 Ø	25.9697	35.6
Sand, Fine	2 to 3 Ø	29.3868	40.3
Sand, Very Fine	3 to 4 Ø	5.8746	8.05
Silt	4 to 8 Ø	6.7750	9.29
Clay	> 8 Ø	3.1500	4.32
	Total	72.0417	98.8

Approved By: _____ Date: 3/13/07

3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (90)
Lab Code: K0701557-007

Sand Fraction: Dry Weight (Grams)	36.458
Sand Fraction: Weight Recovered (Grams)	36.4151
Sand Fraction: Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.4234	0.66
Sand, Very Coarse	-1 to 0 Ø	0.3028	0.47
Sand, Coarse	0 to 1 Ø	1.0727	1.67
Sand, Medium	1 to 2 Ø	15.4757	24.0
Sand, Fine	2 to 3 Ø	12.9807	20.2
Sand, Very Fine	3 to 4 Ø	4.1763	6.49
Silt	4 to 8 Ø	21.8250	33.9
Clay	> 8 Ø	5.8350	9.06
	Total	62.0916	96.4

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (100)
Lab Code: K0701557-008

Sand Fraction: Dry Weight (Grams)	70.1354
Sand Fraction: Weight Recovered (Grams)	70.3597
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0238	0.03
Sand, Very Coarse	-1 to 0 Ø	0.0579	0.08
Sand, Coarse	0 to 1 Ø	3.6433	4.88
Sand, Medium	1 to 2 Ø	47.6599	63.9
Sand, Fine	2 to 3 Ø	16.1703	21.7
Sand, Very Fine	3 to 4 Ø	2.4780	3.32
Silt	4 to 8 Ø	4.2300	5.67
Clay	> 8 Ø	1.2150	1.63
	Total	75.4782	101

Approved By: _____ Date: 3/13/07

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (110)
Lab Code: K0701557-009

Sand Fraction:	Dry Weight (Grams)	74.9664
Sand Fraction:	Weight Recovered (Grams)	74.927
Sand Fraction:	Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	1.4879	1.80
Sand, Very Coarse	-1 to 0 Ø	0.2800	0.34
Sand, Coarse	0 to 1 Ø	15.6031	18.9
Sand, Medium	1 to 2 Ø	47.8432	58.0
Sand, Fine	2 to 3 Ø	7.5188	9.12
Sand, Very Fine	3 to 4 Ø	1.8881	2.29
Silt	4 to 8 Ø	4.8750	5.91
Clay	> 8 Ø	1.5650	1.90
	Total	81.0611	98.3

Approved By: _____ Date: 3/13/07

3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (120)
Lab Code: K0701557-010

Sand Fraction:	Dry Weight (Grams)	70.9821
Sand Fraction:	Weight Recovered (Grams)	70.9391
Sand Fraction:	Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0307	0.04
Sand, Very Coarse	-1 to 0 Ø	0.4259	0.56
Sand, Coarse	0 to 1 Ø	17.2236	22.8
Sand, Medium	1 to 2 Ø	43.8189	58.1
Sand, Fine	2 to 3 Ø	7.5927	10.1
Sand, Very Fine	3 to 4 Ø	1.6422	2.18
Silt	4 to 8 Ø	3.7850	5.02
Clay	> 8 Ø	1.0800	1.43
	Total	75.5990	100

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/22/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (130)
Lab Code: K0701557-011

Sand Fraction: Dry Weight (Grams)	68.8
Sand Fraction: Weight Recovered (Grams)	68.9132
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0223	0.03
Sand, Very Coarse	-1 to 0 Ø	0.0476	0.06
Sand, Coarse	0 to 1 Ø	5.6745	7.37
Sand, Medium	1 to 2 Ø	44.1904	57.4
Sand, Fine	2 to 3 Ø	15.7426	20.4
Sand, Very Fine	3 to 4 Ø	2.7874	3.62
Silt	4 to 8 Ø	6.7400	8.75
Clay	> 8 Ø	1.8450	2.40
	Total	77.0498	100

Approved By: BL Date: 3/13/07

K0701557wet.MD2 \3/12/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client: Anchor Environmental
Project: GASCO/000029-02
Sample Matrix: Sediment

Service Request: K0701557
Date Collected: 2/23/2007
Date Received: 2/27/2007
Date Analyzed: 3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (140)
Lab Code: K0701557-012

Sand Fraction: Dry Weight (Grams)	65.2
Sand Fraction: Weight Recovered (Grams)	65.2745
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0135	0.02
Sand, Very Coarse	-1 to 0 Ø	0.0180	0.02
Sand, Coarse	0 to 1 Ø	0.8186	1.03
Sand, Medium	1 to 2 Ø	33.6866	42.3
Sand, Fine	2 to 3 Ø	24.7845	31.1
Sand, Very Fine	3 to 4 Ø	5.2240	6.55
Silt	4 to 8 Ø	10.7100	13.4
Clay	> 8 Ø	3.3550	4.21
	Total	78.6102	98.6

Approved By: BL Date: 3/13/07

K0701557wet.MD3 \3/12/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/23/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (150)
Lab Code: K0701557-013

Sand Fraction: Dry Weight (Grams)	63.4968
Sand Fraction: Weight Recovered (Grams)	63.6437
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0079	0.01
Sand, Coarse	0 to 1 Ø	0.3190	0.41
Sand, Medium	1 to 2 Ø	9.1074	11.6
Sand, Fine	2 to 3 Ø	43.9323	55.8
Sand, Very Fine	3 to 4 Ø	8.8907	11.3
Silt	4 to 8 Ø	11.2450	14.3
Clay	> 8 Ø	3.0250	3.85
	Total	76.5273	97.3

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/23/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (160)
Lab Code: K0701557-014

Sand Fraction: Dry Weight (Grams)	62.9553
Sand Fraction: Weight Recovered (Grams)	62.9336
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.2923	0.39
Sand, Very Coarse	-1 to 0 Ø	0.0292	0.04
Sand, Coarse	0 to 1 Ø	0.8768	1.16
Sand, Medium	1 to 2 Ø	23.2299	30.8
Sand, Fine	2 to 3 Ø	27.8852	37.0
Sand, Very Fine	3 to 4 Ø	9.6566	12.8
Silt	4 to 8 Ø	10.4400	13.9
Clay	> 8 Ø	2.8300	3.76
	Total	75.2400	100

Approved By: _____ Date: 3/13/07

3/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/23/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (170)
Lab Code: K0701557-015

Sand Fraction: Dry Weight (Grams)	72.4202
Sand Fraction: Weight Recovered (Grams)	72.5069
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0304	0.04
Sand, Very Coarse	-1 to 0 Ø	0.0293	0.04
Sand, Coarse	0 to 1 Ø	2.7139	3.41
Sand, Medium	1 to 2 Ø	51.1231	64.2
Sand, Fine	2 to 3 Ø	15.8315	19.9
Sand, Very Fine	3 to 4 Ø	2.4761	3.11
Silt	4 to 8 Ø	3.9750	4.99
Clay	> 8 Ø	0.9800	1.23
	Total	77.1593	96.9

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/23/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (180)
Lab Code: K0701557-016

Sand Fraction: Dry Weight (Grams)	66.6386
Sand Fraction: Weight Recovered (Grams)	66.6885
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.3284	0.42
Sand, Very Coarse	-1 to 0 Ø	0.0278	0.04
Sand, Coarse	0 to 1 Ø	2.7745	3.54
Sand, Medium	1 to 2 Ø	40.3306	51.5
Sand, Fine	2 to 3 Ø	18.1923	23.2
Sand, Very Fine	3 to 4 Ø	4.4560	5.69
Silt	4 to 8 Ø	8.5850	11.0
Clay	> 8 Ø	2.5350	3.24
	Total	77.2296	98.6

Approved By: BL Date: 3/13/07

8/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/23/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (190)
Lab Code: K0701557-017

Sand Fraction: Dry Weight (Grams)	79.0476
Sand Fraction: Weight Recovered (Grams)	79.1676
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1809	0.22
Sand, Very Coarse	-1 to 0 Ø	2.5206	3.03
Sand, Coarse	0 to 1 Ø	27.0658	32.5
Sand, Medium	1 to 2 Ø	37.6596	45.3
Sand, Fine	2 to 3 Ø	9.8041	11.8
Sand, Very Fine	3 to 4 Ø	1.7456	2.10
Silt	4 to 8 Ø	0.0000	0.00
Clay	> 8 Ø	1.0600	1.27
	Total	80.0366	96.2

Approved By: _____ Date: 3/13/07

3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/26/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (200)
Lab Code: K0701557-018

Sand Fraction: Dry Weight (Grams)	79.459
Sand Fraction: Weight Recovered (Grams)	79.5191
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	2.8299	3.36
Sand, Very Coarse	-1 to 0 Ø	7.9792	9.48
Sand, Coarse	0 to 1 Ø	34.4332	40.9
Sand, Medium	1 to 2 Ø	29.2338	34.7
Sand, Fine	2 to 3 Ø	3.9088	4.64
Sand, Very Fine	3 to 4 Ø	1.0333	1.23
Silt	4 to 8 Ø	2.9300	3.48
Clay	> 8 Ø	1.0500	1.25
	Total	83.3982	99.0

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/26/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (210)
Lab Code: K0701557-019

Sand Fraction:	Dry Weight (Grams)	79.9614
Sand Fraction:	Weight Recovered (Grams)	80.1213
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	1.6791	1.97
Sand, Very Coarse	-1 to 0 Ø	5.4651	6.41
Sand, Coarse	0 to 1 Ø	34.6116	40.6
Sand, Medium	1 to 2 Ø	32.8335	38.5
Sand, Fine	2 to 3 Ø	4.2096	4.94
Sand, Very Fine	3 to 4 Ø	1.0960	1.28
Silt	4 to 8 Ø	3.6750	4.31
Clay	> 8 Ø	1.3600	1.59
	Total	84.9299	100

Approved By: _____ Date: 3/13/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701557
Project:	GASCO/000029-02	**Date Collected:**	2/26/2007
Sample Matrix:	Sediment	**Date Received:**	2/27/2007
		Date Analyzed:	3/2/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: PW-2-S (222)
Lab Code: K0701557-020

Sand Fraction:	Dry Weight (Grams)	91.1954
Sand Fraction:	Weight Recovered (Grams)	91.2407
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	81.9455	84.7
Sand, Very Coarse	-1 to 0 Ø	3.2580	3.37
Sand, Coarse	0 to 1 Ø	2.2892	2.37
Sand, Medium	1 to 2 Ø	1.5358	1.59
Sand, Fine	2 to 3 Ø	1.1224	1.16
Sand, Very Fine	3 to 4 Ø	0.9637	1.00
Silt	4 to 8 Ø	3.2850	3.39
Clay	> 8 Ø	1.0400	1.07
	Total	95.4396	98.6

Approved By: _____ Date: 3/13/07

Nov 4x07

LDC #: 16563A6

SDG #: K0701557

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

Page: 1 of 1

Reviewer:

2nd Reviewer:

METHOD: Particle Size (PSEP Method)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 2/22/07 - 2/26/07
IIa.	Initial calibration	A	balance only
IIb.	Calibration verification	A	✓
III.	Blanks	N	3 not required
IV	Matrix Spike/Matrix Spike Duplicates	N	
V	Duplicates	A	Triplicates
VI.	Laboratory control samples	N	not required
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: See Form A

1	PW-2-S(30)	11	PW-2-S(130)	21	PW-2-S(140)DUP	31	
2	PW-2-S(40)	12	PW-2-S(140)	22	PW-2-S(140)TRP	32	
3	PW-2-S(50)	13	PW-2-S(150)	23		33	
4	PW-2-S(60)	14	PW-2-S(160)	24		34	
5	PW-2-S(70)	15	PW-2-S(170)	25		35	
6	PW-2-S(80)	16	PW-2-S(180)	26		36	
7	PW-2-S(90)	17	PW-2-S(190)	27		37	
8	PW-2-S(100)	18	PW-2-S(200)	28		38	
9	PW-2-S(110)	19	PW-2-S(210)	29		39	
10	PW-2-S(120)	20	PW-2-S(222)	30		40	

Notes:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	February 28 through March 1, 2007
LDC Report Date:	April 21, 2007
Matrix:	Sediment
Parameters:	Particle Size
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0701748

Sample Identification

MW-19-S(30)
MW-19-S(40)
MW-19-S(50)
MW-19-S(60)
MW-19-S(70)
MW-19-S(80)
MW-19-S(90)
MW-19-S(100)
MW-19-S(110)
MW-19-S(120)
MW-19-S(130)
MW-19-S(140)
MW-19-S(150)
MW-19-S(160)
MW-19-S(170)
MW-19-S(180)
MW-19-S(190)
MW-19-S(200)
MW-19-S(30)DUP
MW-19-S(30)TRP

Introduction

This data review covers 20 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per PSEP Method for Particle Size.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blank analysis is not required for particle size and was not performed.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) analysis is not required for particle size and was not performed.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control sample analysis is not required for particle size and was not performed.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Particle Size - Data Qualification Summary - SDG K0701748

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Particle Size - Laboratory Blank Data Qualification Summary - SDG K0701748

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S (30)
Lab Code: K0701748-001

Sand Fraction: Dry Weight (Grams)	58.4
Sand Fraction: Weight Recovered (Grams)	58.5037
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0016	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0273	0.04
Sand, Coarse	0 to 1 Ø	0.0465	0.07
Sand, Medium	1 to 2 Ø	4.9337	7.17
Sand, Fine	2 to 3 Ø	35.0178	50.9
Sand, Very Fine	3 to 4 Ø	17.0039	24.7
Silt	4 to 8 Ø	8.7300	12.7
Clay	> 8 Ø	2.4800	3.60
	Total	68.2408	99.2

Approved By: JR Date: 3/14/07

3/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(40)
Lab Code: K0701748-002

Sand Fraction: Dry Weight (Grams)	67.4
Sand Fraction: Weight Recovered (Grams)	67.4693
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0000	0.00
Sand, Coarse	0 to 1 Ø	0.0144	0.02
Sand, Medium	1 to 2 Ø	7.8528	10.9
Sand, Fine	2 to 3 Ø	49.6848	69.2
Sand, Very Fine	3 to 4 Ø	9.4936	13.2
Silt	4 to 8 Ø	3.9050	5.44
Clay	> 8 Ø	0.9200	1.28
	Total	71.8706	100

Approved By: RR Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(50)
Lab Code: K0701748-003

Sand Fraction: Dry Weight (Grams)	50
Sand Fraction: Weight Recovered (Grams)	50.1672
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.2547	0.35
Sand, Very Coarse	-1 to 0 Ø	0.3618	0.49
Sand, Coarse	0 to 1 Ø	0.1853	0.3
Sand, Medium	1 to 2 Ø	6.2915	8.5
Sand, Fine	2 to 3 Ø	25.0393	34.0
Sand, Very Fine	3 to 4 Ø	14.4932	19.7
Silt	4 to 8 Ø	21.6800	29.4
Clay	> 8 Ø	5.2750	7.15
	Total	73.5808	100

Approved By: _____ Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(60)
Lab Code: K0701748-004

Sand Fraction: Dry Weight (Grams)	18.9471
Sand Fraction: Weight Recovered (Grams)	18.9035
Sand Fraction: Percent Recovery	99.8

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0063	0.01
Sand, Very Coarse	-1 to 0 Ø	0.4095	0.85
Sand, Coarse	0 to 1 Ø	0.5833	1.22
Sand, Medium	1 to 2 Ø	1.2135	2.53
Sand, Fine	2 to 3 Ø	6.1558	12.8
Sand, Very Fine	3 to 4 Ø	7.0335	14.7
Silt	4 to 8 Ø	23.2200	48.4
Clay	> 8 Ø	6.8050	14.2
	Total	45.4269	94.7

Approved By: _____ Date: 3/14/07

3/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(70)
Lab Code: K0701748-005

Sand Fraction:	Dry Weight (Grams)	13.2183
Sand Fraction:	Weight Recovered (Grams)	13.2446
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1127	0.28
Sand, Very Coarse	-1 to 0 Ø	0.8442	2.07
Sand, Coarse	0 to 1 Ø	0.3810	0.94
Sand, Medium	1 to 2 Ø	1.1645	2.86
Sand, Fine	2 to 3 Ø	3.6654	9.01
Sand, Very Fine	3 to 4 Ø	4.5189	11.1
Silt	4 to 8 Ø	20.7450	51.0
Clay	> 8 Ø	6.2700	15.4
	Total	37.7017	92.6

Approved By: _____ Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(80)
Lab Code: K0701748-006

Sand Fraction:	Dry Weight (Grams)	71.0729
Sand Fraction:	Weight Recovered (Grams)	71.2465
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1329	0.17
Sand, Very Coarse	-1 to 0 Ø	0.0534	0.07
Sand, Coarse	0 to 1 Ø	0.4042	0.52
Sand, Medium	1 to 2 Ø	30.4402	39.2
Sand, Fine	2 to 3 Ø	36.4833	46.9
Sand, Very Fine	3 to 4 Ø	3.3931	4.36
Silt	4 to 8 Ø	5.1800	6.66
Clay	> 8 Ø	1.6200	2.08
	Total	77.7071	100

Approved By: [illegible] Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(90)
Lab Code: K0701748-007

Sand Fraction: Dry Weight (Grams)	69.2269
Sand Fraction: Weight Recovered (Grams)	69.3852
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0015	0.00
Sand, Coarse	0 to 1 Ø	0.8473	1.10
Sand, Medium	1 to 2 Ø	43.7315	57.0
Sand, Fine	2 to 3 Ø	21.7848	28.4
Sand, Very Fine	3 to 4 Ø	2.6378	3.44
Silt	4 to 8 Ø	5.2300	6.81
Clay	> 8 Ø	1.8700	2.44
	Total	76.1029	99.1

Approved By: l d r Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	2/28/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(100)
Lab Code: K0701748-008

Sand Fraction: Dry Weight (Grams)	31.0719
Sand Fraction: Weight Recovered (Grams)	31.0953
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	1.3094	2.08
Sand, Very Coarse	-1 to 0 Ø	0.2537	0.40
Sand, Coarse	0 to 1 Ø	0.8502	1.35
Sand, Medium	1 to 2 Ø	14.0684	22.4
Sand, Fine	2 to 3 Ø	7.3973	11.8
Sand, Very Fine	3 to 4 Ø	4.9010	7.79
Silt	4 to 8 Ø	25.9450	41.2
Clay	> 8 Ø	7.9050	12.6
	Total	62.6300	100

Approved By: 1 8 2 Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(110)
Lab Code: K0701748-009

Sand Fraction: Dry Weight (Grams)	68.6937
Sand Fraction: Weight Recovered (Grams)	69.8008
Sand Fraction: Percent Recovery	102

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0418	0.05
Sand, Very Coarse	-1 to 0 Ø	0.1362	0.17
Sand, Coarse	0 to 1 Ø	13.3779	17.2
Sand, Medium	1 to 2 Ø	49.6478	63.7
Sand, Fine	2 to 3 Ø	5.9431	7.63
Sand, Very Fine	3 to 4 Ø	0.5411	0.69
Silt	4 to 8 Ø	4.7500	6.10
Clay	> 8 Ø	1.4100	1.81
	Total	75.8479	97.3

Approved By: _____ Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(120)
Lab Code: K0701748-010

Sand Fraction: Dry Weight (Grams)	75.1417
Sand Fraction: Weight Recovered (Grams)	75.2507
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0394	0.05
Sand, Very Coarse	-1 to 0 Ø	0.2347	0.30
Sand, Coarse	0 to 1 Ø	11.5400	14.5
Sand, Medium	1 to 2 Ø	52.9877	66.8
Sand, Fine	2 to 3 Ø	9.4048	11.9
Sand, Very Fine	3 to 4 Ø	0.9699	1.22
Silt	4 to 8 Ø	2.6050	3.28
Clay	> 8 Ø	1.0450	1.32
	Total	78.8265	99.4

Approved By: _____ Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(130)
Lab Code: K0701748-011

Sand Fraction: Dry Weight (Grams)	69.0
Sand Fraction: Weight Recovered (Grams)	69.1438
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1399	0.17
Sand, Very Coarse	-1 to 0 Ø	0.2951	0.37
Sand, Coarse	0 to 1 Ø	10.2844	12.8
Sand, Medium	1 to 2 Ø	42.5123	53.0
Sand, Fine	2 to 3 Ø	12.6653	15.8
Sand, Very Fine	3 to 4 Ø	2.7149	3.38
Silt	4 to 8 Ø	0.6550	0.82
Clay	> 8 Ø	1.0600	1.32
	Total	70.3269	87.6

Approved By: 1&2 Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(140)
Lab Code: K0701748-012

Sand Fraction: Dry Weight (Grams)	72.2
Sand Fraction: Weight Recovered (Grams)	72.4033
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0122	0.02
Sand, Coarse	0 to 1 Ø	0.4322	0.53
Sand, Medium	1 to 2 Ø	30.6971	37.9
Sand, Fine	2 to 3 Ø	35.5512	43.9
Sand, Very Fine	3 to 4 Ø	5.3796	6.64
Silt	4 to 8 Ø	4.4450	5.49
Clay	> 8 Ø	2.3650	2.92
	Total	78.8823	97.4

Approved By: RJ2 Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(150)
Lab Code: K0701748-013

Sand Fraction: Dry Weight (Grams)	71.6416
Sand Fraction: Weight Recovered (Grams)	71.9413
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0072	0.01
Sand, Very Coarse	-1 to 0 Ø	4.5118	5.98
Sand, Coarse	0 to 1 Ø	47.4650	63.0
Sand, Medium	1 to 2 Ø	17.4565	23.2
Sand, Fine	2 to 3 Ø	2.0319	2.69
Sand, Very Fine	3 to 4 Ø	0.2224	0.29
Silt	4 to 8 Ø	3.0700	4.07
Clay	> 8 Ø	0.9150	1.21
	Total	75.6798	100

Approved By: _____ Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(160)
Lab Code: K0701748-014

Sand Fraction: Dry Weight (Grams)	65.5255
Sand Fraction: Weight Recovered (Grams)	65.3704
Sand Fraction: Percent Recovery	99.8

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0154	0.02
Sand, Coarse	0 to 1 Ø	0.2617	0.33
Sand, Medium	1 to 2 Ø	18.5565	23.3
Sand, Fine	2 to 3 Ø	32.7742	41.1
Sand, Very Fine	3 to 4 Ø	12.7633	16.0
Silt	4 to 8 Ø	10.0050	12.5
Clay	> 8 Ø	3.2100	4.03
	Total	77.5861	97.3

Approved By: LRR Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(170)
Lab Code: K0701748-015

Sand Fraction: Dry Weight (Grams)	73.2369
Sand Fraction: Weight Recovered (Grams)	73.3367
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0451	0.06
Sand, Coarse	0 to 1 Ø	3.0022	3.75
Sand, Medium	1 to 2 Ø	54.9261	68.7
Sand, Fine	2 to 3 Ø	12.7990	16.0
Sand, Very Fine	3 to 4 Ø	2.2864	2.86
Silt	4 to 8 Ø	5.3000	6.63
Clay	> 8 Ø	1.7900	2.24
	Total	80.1488	100

Approved By: [illegible] Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(180)
Lab Code: K0701748-016

Sand Fraction: Dry Weight (Grams)	67.9768
Sand Fraction: Weight Recovered (Grams)	68.0399
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0223	0.03
Sand, Very Coarse	-1 to 0 Ø	0.2336	0.28
Sand, Coarse	0 to 1 Ø	15.4965	18.6
Sand, Medium	1 to 2 Ø	42.7441	51.4
Sand, Fine	2 to 3 Ø	6.6625	8.01
Sand, Very Fine	3 to 4 Ø	2.3196	2.79
Silt	4 to 8 Ø	10.6900	12.9
Clay	> 8 Ø	1.9500	2.34
	Total	80.1186	96.3

Approved By: _____ Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(190)
Lab Code: K0701748-017

Sand Fraction:	Dry Weight (Grams)	79.8036
Sand Fraction:	Weight Recovered (Grams)	79.9379
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	10.5112	12.6
Sand, Very Coarse	-1 to 0 Ø	10.9853	13.2
Sand, Coarse	0 to 1 Ø	36.3190	43.6
Sand, Medium	1 to 2 Ø	18.9836	22.8
Sand, Fine	2 to 3 Ø	2.2261	2.67
Sand, Very Fine	3 to 4 Ø	0.7989	0.96
Silt	4 to 8 Ø	2.5850	3.10
Clay	> 8 Ø	0.8550	1.03
	Total	83.2641	100

Approved By: 12.2 Date: 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701748
Project:	Gasco/000029-02	**Date Collected:**	3/1/2007
Sample Matrix:	Sediment	**Date Received:**	3/5/2007
		Date Analyzed:	3/12/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-19-S-(200)
Lab Code: K0701748-018

Sand Fraction: Dry Weight (Grams)	92.634
Sand Fraction: Weight Recovered (Grams)	92.5851
Sand Fraction: Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	74.8269	85.1
Sand, Very Coarse	-1 to 0 Ø	3.7199	4.23
Sand, Coarse	0 to 1 Ø	7.4934	8.52
Sand, Medium	1 to 2 Ø	5.1875	5.90
Sand, Fine	2 to 3 Ø	1.0236	1.16
Sand, Very Fine	3 to 4 Ø	0.2747	0.31
Silt	4 to 8 Ø	0.7850	0.89
Clay	> 8 Ø	0.3450	0.39
	Total	93.6560	106

Approved By: [illegible] Date: 3/14/07

LDC #: 16563B6

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

SDG #: K0701748

Page: 1 of 1

Laboratory: Columbia Analytical Services

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: Particle Size (PSEP Method)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 2/28/07 - 3/1/07
IIa.	Initial calibration	A	balance only
IIb.	Calibration verification	A	✓
III.	Blanks	N	} not required
IV	Matrix Spike/Matrix Spike Duplicates	N	
V	Duplicates	A	Triplicates
VI.	Laboratory control samples	N	not required
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: Sediment

1	MW-19-S(30)	11	MW-19-S(130)	21		31	
2	MW-19-S(40)	12	MW-19-S(140)	22		32	
3	MW-19-S(50)	13	MW-19-S(150)	23		33	
4	MW-19-S(60)	14	MW-19-S(160)	24		34	
5	MW-19-S(70)	15	MW-19-S(170)	25		35	
6	MW-19-S(80)	16	MW-19-S(180)	26		36	
7	MW-19-S(90)	17	MW-19-S(190)	27		37	
8	MW-19-S(100)	18	MW-19-S(200)	28		38	
9	MW-19-S(110)	19	MW-19-S(30)DUP	29		39	
10	MW-19-S(120)	20	MW-19-S(30)TRP	30		40	

Notes:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 9, 2007
LDC Report Date:	April 21, 2007
Matrix:	Water
Parameters:	Wet Chemistry
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0701987

Sample Identification

GS-070309-1
GS-070309-1MS
GS-070309-1DUP

Introduction

This data review covers 3 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 335.1 for Amenable to Chlorination Cyanide, EPA Method 335.4 for Cyanide, total, and ASTM Method D4282-02 for Cyanide by Microdiffusion.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met with the following exceptions:

Sample	Analyte	Total Time From Sample Collection Until Analysis	Required Holding Time From Sample Collection Until Analysis	Flag	A or P
All samples in SDG K0701987	Cyanide by microdiffusion	95.5 hours	48 hours	J (all detects) UJ (all non-detects)	P

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration of each method were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Wet Chemistry - Data Qualification Summary - SDG K0701987

SDG	Sample	Analyte	Flag	A or P	Reason
K0701987	GS-070309-1	Cyanide by microdiffusion	J (all detects) UJ (all non-detects)	P	Technical holding times

NW Natural Gasco Site
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG K0701987

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Anchor Environmental
Project Name : Gasco Groundwater Sampling
Project Number : 000029-02 New Wells
Sample Matrix : Water

Service Request : K0701987
Date Collected : 03/09/07
Date Received : 03/09/07

Cyanide, Total

Prep Method : Method
Analysis Method : 335.4
Test Notes :

Units : mg/L
Basis : NA

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Result	Result Notes
GS-070309-1	K0701987-001	0.01	0.003	1	3/13/2007	03/14/07	0.04	
Method Blank	K0701987-MB	0.01	0.003	1	3/13/2007	03/14/07	ND	

K0702507

Report By: CSKILLERN

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Anchor Environmental
Project Name : Gasco Groundwater Sampling
Project Number : 000029-02 New Wells
Sample Matrix : Water

Service Request : K0701987
Date Collected : 03/09/07
Date Received : 03/09/07

Cyanide, Microdiffusion

Prep Method : None
Analysis Method : D 4282-02
Test Notes :

Units : ug/L
Basis : NA

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Result	Result Notes
GS-070309-1	K0701987-001	10	5	1	3/13/2007	03/13/07	ND UJ	X
Method Blank	K0701987-MB	10	5	1	3/13/2007	03/13/07	ND	

Mp 3/27

Report By: CMIHAI-LAZAR

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Anchor Environmental
Project Name : Gasco Groundwater Sampling
Project Number : 000029-02 New Wells
Sample Matrix : Water

Service Request : K0701987
Date Collected : 03/09/07
Date Received : 03/09/07

Cyanide, Amenable to Chlorination

Prep Method : Method
Analysis Method : 335.1
Test Notes :

Units : mg/L
Basis : NA

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Result	Result Notes
GS-070309-1	K0701987-001	0.01	0.003	1	03/16/07	03/16/07	ND	
Method Blank	K0701987-MB	0.01	0.003	1	03/16/07	03/16/07	ND	

Rl 4x07

Report By: CSKILLERN

LDC #: 16563C6

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

SDG #: K0701987

Page: 1 of 1

Laboratory: Columbia Analytical Services

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: Cyanide by Microdiffusion (ASTM D4282-02), Total Cyanide (EPA Method 335.4), Amenable to Chlorination Cyanide (EPA Method 335.1)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	SW	Sampling dates: 3/9/07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	3 MS/DUP
V	Duplicates	A	
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples:

1	GS-070309-1	11		21		31	
2	GS-070309-1MS	12		22		32	
3	GS-070309-1DUP	13		23		33	
4	MB	14		24		34	
5		15		25		35	
6		16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 16586C6
SDG #: K0701987

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MY
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter			
1	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}	CN by micro	[illegible]	
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
m23	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}	✓		✓
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN^- NH_3 TKN TOC CR^{6+}			

Comments:

LDC #: 165636
SDG #: K0701987

VALIDATION FINDINGS WORKSHEET
Technical Holding Times

Page: 1 of 1
Reviewer: MM
2nd reviewer: N

All circled dates have exceeded the technical holding time.
(Y) N N/A Were all samples preserved as applicable to each method ?
(Y) N N/A Were all cooler temperatures within validation criteria?

Method:		ASTM D4282-02					
Parameters:		CN by Micro diffusion					
Technical holding time:		48 hr					
Sample ID	Sampling date	Analysis date	Analysis date	Analysis date	Analysis date	Analysis date	Qualifier
All	3/9/07 1030	3/13/07 1000	(95.5 hr)				J/UJ/R

HT.6

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 7 through March 8, 2007
LDC Report Date:	April 21, 2007
Matrix:	Sediment
Parameters:	Particle Size
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0701989

Sample Identification

MW-20-S(30)
MW-20-S(40)
MW-20-S(50)
MW-20-S(60)
MW-20-S(70)
MW-20-S(80)
MW-20-S(90)
MW-20-S(100)
MW-20-S(110)
MW-20-S(120)
MW-20-S(130)
MW-20-S(140)
MW-20-S(150)
MW-20-S(160)
MW-20-S(170)
MW-20-S(180)
MW-20-S(190)
MW-20-S(200)
MW-20-S(140)DUP
MW-20-S(140)TRP

Introduction

This data review covers 20 sediment samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per PSEP Method for Particle Size.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met.

III. Blanks

Method blank analysis is not required for particle size and was not performed.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) analysis is not required for particle size and was not performed.

V. Duplicates/Triplicates

Duplicate (DUP) and triplicate (TRP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control sample analysis is not required for particle size and was not performed.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Particle Size - Data Qualification Summary - SDG K0701989

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Particle Size - Laboratory Blank Data Qualification Summary - SDG K0701989

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(30)
Lab Code: K0701989-001

Sand Fraction:	Dry Weight (Grams)	25.6
Sand Fraction:	Weight Recovered (Grams)	25.6228
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	3.9097	11.1
Sand, Very Coarse	-1 to 0 Ø	1.2677	3.59
Sand, Coarse	0 to 1 Ø	1.1778	3.34
Sand, Medium	1 to 2 Ø	3.3645	9.53
Sand, Fine	2 to 3 Ø	9.2044	26.1
Sand, Very Fine	3 to 4 Ø	6.0989	17.3
Silt	4 to 8 Ø	8.9000	25.2
Clay	> 8 Ø	4.2450	12.0
	Total	38.1680	108

Approved By: _____ Date: 3/16/07

00012

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(40)
Lab Code: K0701989-002

Sand Fraction:	Dry Weight (Grams)	65.1783
Sand Fraction:	Weight Recovered (Grams)	65.0367
Sand Fraction:	Percent Recovery	99.8

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0079	0.01
Sand, Very Coarse	-1 to 0 Ø	0.0434	0.06
Sand, Coarse	0 to 1 Ø	0.0927	0.14
Sand, Medium	1 to 2 Ø	13.2774	19.5
Sand, Fine	2 to 3 Ø	44.1482	64.7
Sand, Very Fine	3 to 4 Ø	7.0644	10.4
Silt	4 to 8 Ø	5.5250	8.10
Clay	> 8 Ø	2.0200	2.96
	Total	72.1790	106

Approved By: _____ Date: 3/16/07

Kof 3-27

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(50)
Lab Code: K0701989-003

Sand Fraction: Dry Weight (Grams)	5.8638
Sand Fraction: Weight Recovered (Grams)	5.8585
Sand Fraction: Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0271	0.10
Sand, Very Coarse	-1 to 0 Ø	0.0607	0.22
Sand, Coarse	0 to 1 Ø	0.0466	0.17
Sand, Medium	1 to 2 Ø	0.1667	0.60
Sand, Fine	2 to 3 Ø	0.8588	3.10
Sand, Very Fine	3 to 4 Ø	3.3351	12.0
Silt	4 to 8 Ø	20.5050	74.1
Clay	> 8 Ø	4.5750	16.5
	Total	29.5750	107

Approved By: _____ Date: 3/16/07

3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(60)
Lab Code: K0701989-004

Sand Fraction:	Dry Weight (Grams)	70.3984
Sand Fraction:	Weight Recovered (Grams)	70.3411
Sand Fraction:	Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0216	0.03
Sand, Very Coarse	-1 to 0 Ø	0.0417	0.05
Sand, Coarse	0 to 1 Ø	0.0838	0.11
Sand, Medium	1 to 2 Ø	28.6084	36.8
Sand, Fine	2 to 3 Ø	36.9539	47.6
Sand, Very Fine	3 to 4 Ø	4.2424	5.46
Silt	4 to 8 Ø	5.2900	6.81
Clay	> 8 Ø	1.7450	2.25
	Total	76.9868	99.1

Approved By: _____ Date: 3/16/07

8/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(70)
Lab Code: K0701989-005

Sand Fraction:	Dry Weight (Grams)	69.6119
Sand Fraction:	Weight Recovered (Grams)	69.5473
Sand Fraction:	Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0000	0.00
Sand, Coarse	0 to 1 Ø	0.0173	0.03
Sand, Medium	1 to 2 Ø	14.2151	20.6
Sand, Fine	2 to 3 Ø	47.8247	69.4
Sand, Very Fine	3 to 4 Ø	7.1796	10.4
Silt	4 to 8 Ø	4.0750	5.91
Clay	> 8 Ø	1.1550	1.68
	Total	74.4667	108

Approved By: _____ Date: 3/16/07

Ecf-507

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(80)
Lab Code: K0701989-006

Sand Fraction:	Dry Weight (Grams)	75.0732
Sand Fraction:	Weight Recovered (Grams)	75.1209
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0889	0.12
Sand, Very Coarse	-1 to 0 Ø	0.0280	0.04
Sand, Coarse	0 to 1 Ø	3.1227	4.28
Sand, Medium	1 to 2 Ø	42.7898	58.6
Sand, Fine	2 to 3 Ø	25.3845	34.8
Sand, Very Fine	3 to 4 Ø	3.4209	4.69
Silt	4 to 8 Ø	3.1200	4.27
Clay	> 8 Ø	0.8650	1.18
	Total	78.8198	108

Approved By: _____ Date: 3/16/07

3/04/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/7/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(90)
Lab Code: K0701989-007

Sand Fraction:	Dry Weight (Grams)	5.7103
Sand Fraction:	Weight Recovered (Grams)	5.6807
Sand Fraction:	Percent Recovery	99.5

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1491	0.57
Sand, Very Coarse	-1 to 0 Ø	0.3496	1.34
Sand, Coarse	0 to 1 Ø	0.1494	0.57
Sand, Medium	1 to 2 Ø	0.2128	0.81
Sand, Fine	2 to 3 Ø	0.9717	3.72
Sand, Very Fine	3 to 4 Ø	2.5197	9.64
Silt	4 to 8 Ø	17.0350	65.2
Clay	> 8 Ø	4.7300	18.1
	Total	26.1173	100

Approved By: _____ Date: 3/16/07

8/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(100)
Lab Code: K0701989-008

Sand Fraction: Dry Weight (Grams)	11.6033
Sand Fraction: Weight Recovered (Grams)	11.5946
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0449	0.13
Sand, Very Coarse	-1 to 0 Ø	0.0933	0.27
Sand, Coarse	0 to 1 Ø	0.1635	0.48
Sand, Medium	1 to 2 Ø	3.5899	10.5
Sand, Fine	2 to 3 Ø	2.3241	6.80
Sand, Very Fine	3 to 4 Ø	3.5174	10.3
Silt	4 to 8 Ø	21.4150	62.6
Clay	> 8 Ø	5.9000	17.3
	Total	37.0481	108

Approved By: _____ Date: 3/16/07

Cofson

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(110)
Lab Code: K0701989-009

Sand Fraction:	Dry Weight (Grams)	79.2575
Sand Fraction:	Weight Recovered (Grams)	79.1683
Sand Fraction:	Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.1016	0.13
Sand, Coarse	0 to 1 Ø	14.4162	17.9
Sand, Medium	1 to 2 Ø	55.3294	68.8
Sand, Fine	2 to 3 Ø	8.0543	10.0
Sand, Very Fine	3 to 4 Ø	1.1859	1.47
Silt	4 to 8 Ø	2.3700	2.95
Clay	> 8 Ø	0.8950	1.11
	Total	82.3524	102

Approved By: _____ Date: 3/16/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(120)
Lab Code: K0701989-010

Sand Fraction:	Dry Weight (Grams)	76.8144
Sand Fraction:	Weight Recovered (Grams)	76.7861
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0927	0.12
Sand, Coarse	0 to 1 Ø	11.9606	15.2
Sand, Medium	1 to 2 Ø	51.0497	64.9
Sand, Fine	2 to 3 Ø	12.3674	15.7
Sand, Very Fine	3 to 4 Ø	1.2037	1.53
Silt	4 to 8 Ø	1.4400	1.83
Clay	> 8 Ø	0.5150	0.66
	Total	78.6291	100

Approved By: _____ Date: 3/16/07

K0701989 00021

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(130)
Lab Code: K0701989-011

Sand Fraction:	Dry Weight (Grams)	70.0
Sand Fraction:	Weight Recovered (Grams)	70.0517
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0145	0.02
Sand, Very Coarse	-1 to 0 Ø	0.1667	0.21
Sand, Coarse	0 to 1 Ø	5.0762	6.52
Sand, Medium	1 to 2 Ø	39.5969	50.8
Sand, Fine	2 to 3 Ø	22.1438	28.4
Sand, Very Fine	3 to 4 Ø	2.8887	3.71
Silt	4 to 8 Ø	6.9500	8.92
Clay	> 8 Ø	2.6150	3.36
	Total	79.4518	102

Approved By: _____ Date: 3/16/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(140)
Lab Code: K0701989-012

Sand Fraction: Dry Weight (Grams)	70.2531
Sand Fraction: Weight Recovered (Grams)	70.2049
Sand Fraction: Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0163	0.02
Sand, Very Coarse	-1 to 0 Ø	0.0606	0.08
Sand, Coarse	0 to 1 Ø	7.7118	10.3
Sand, Medium	1 to 2 Ø	47.7649	63.6
Sand, Fine	2 to 3 Ø	11.0946	14.8
Sand, Very Fine	3 to 4 Ø	3.1553	4.20
Silt	4 to 8 Ø	7.2000	9.58
Clay	> 8 Ø	2.8100	3.74
	Total	79.8135	106

Approved By: _____ Date: 3/16/07

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(150)
Lab Code: K0701989-013

Sand Fraction: Dry Weight (Grams)	73.1465
Sand Fraction: Weight Recovered (Grams)	73.1689
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0000	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0170	0.02
Sand, Coarse	0 to 1 Ø	0.9660	1.27
Sand, Medium	1 to 2 Ø	42.4030	55.7
Sand, Fine	2 to 3 Ø	26.2823	34.5
Sand, Very Fine	3 to 4 Ø	3.3195	4.36
Silt	4 to 8 Ø	4.7700	6.27
Clay	> 8 Ø	2.1300	2.80
	Total	79.8878	105

Approved By: _____ Date: 3/16/07

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COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(160)
Lab Code: K0701989-014

Sand Fraction:	Dry Weight (Grams)	69.6945
Sand Fraction:	Weight Recovered (Grams)	69.6455
Sand Fraction:	Percent Recovery	99.9

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0025	0.00
Sand, Very Coarse	-1 to 0 Ø	0.0121	0.02
Sand, Coarse	0 to 1 Ø	1.0992	1.52
Sand, Medium	1 to 2 Ø	31.0345	42.8
Sand, Fine	2 to 3 Ø	31.9040	44.0
Sand, Very Fine	3 to 4 Ø	5.0745	7.00
Silt	4 to 8 Ø	7.0350	9.70
Clay	> 8 Ø	2.4600	3.39
	Total	78.6218	108

Approved By: _____ Date: 3/16/07

3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(170)
Lab Code: K0701989-015

Sand Fraction: Dry Weight (Grams)	66.8578
Sand Fraction: Weight Recovered (Grams)	66.851
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1104	0.14
Sand, Very Coarse	-1 to 0 Ø	0.1939	0.25
Sand, Coarse	0 to 1 Ø	0.5720	0.75
Sand, Medium	1 to 2 Ø	23.1652	30.2
Sand, Fine	2 to 3 Ø	31.8316	41.5
Sand, Very Fine	3 to 4 Ø	10.0826	13.2
Silt	4 to 8 Ø	13.3000	17.4
Clay	> 8 Ø	3.7350	4.88
	Total	82.9907	108

Approved By: _____ Date: 3/16/07

8/04/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(180)
Lab Code: K0701989-016

Sand Fraction: Dry Weight (Grams)	78.1711
Sand Fraction: Weight Recovered (Grams)	78.1438
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.0503	0.06
Sand, Very Coarse	-1 to 0 Ø	0.4506	0.58
Sand, Coarse	0 to 1 Ø	11.9130	15.2
Sand, Medium	1 to 2 Ø	43.0025	55.0
Sand, Fine	2 to 3 Ø	19.1276	24.5
Sand, Very Fine	3 to 4 Ø	3.2358	4.14
Silt	4 to 8 Ø	5.1700	6.61
Clay	> 8 Ø	1.8850	2.41
	Total	84.8348	108

Approved By: _____ Date: 3/16/07

SC 3/14/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(190)
Lab Code: K0701989-017

Sand Fraction: Dry Weight (Grams)	74.0566
Sand Fraction: Weight Recovered (Grams)	74.0198
Sand Fraction: Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	0.1602	0.20
Sand, Very Coarse	-1 to 0 Ø	0.9655	1.23
Sand, Coarse	0 to 1 Ø	23.1739	29.4
Sand, Medium	1 to 2 Ø	40.4752	51.4
Sand, Fine	2 to 3 Ø	6.4538	8.19
Sand, Very Fine	3 to 4 Ø	2.5687	3.26
Silt	4 to 8 Ø	8.3100	10.5
Clay	> 8 Ø	3.7650	4.78
	Total	85.8723	109

Approved By: _____ Date: 3/16/07

3/14/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client:	Anchor Environmental	**Service Request:**	K0701989
Project:	Gasco/000029-02	**Date Collected:**	3/8/2007
Sample Matrix:	Soil	**Date Received:**	3/9/2007
		Date Analyzed:	3/13/2007

Particle Size Determination
Puget Sound Estuary Program Protocol

Sample Name: MW-20-S-(200)
Lab Code: K0701989-018

Sand Fraction:	Dry Weight (Grams)	582.5094
Sand Fraction:	Weight Recovered (Grams)	582.2599
Sand Fraction:	Percent Recovery	100

Description	Phi Size	Dry Weight (Grams)	Percent of Total Weight Recovered
Gravel	<-1 Ø	482.1712	81.8
Sand, Very Coarse	-1 to 0 Ø	23.0537	3.91
Sand, Coarse	0 to 1 Ø	45.5678	7.73
Sand, Medium	1 to 2 Ø	20.7368	3.52
Sand, Fine	2 to 3 Ø	6.2027	1.05
Sand, Very Fine	3 to 4 Ø	3.6980	0.63
Silt	4 to 8 Ø	11.7300	1.99
Clay	> 8 Ø	5.4100	0.92
	Total	598.5702	102

Approved By: _____ Date: 3/16/07

3/16/2007

LDC #: 16563D6

SDG #: K0701989

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

Page: 1 of 1

Reviewer: w

2nd Reviewer: [illegible]

METHOD: Particle Size (PSEP Method)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/7/07, 3/8/07
IIa.	Initial calibration	A	balance
IIb.	Calibration verification	A	↓
III.	Blanks	N	Not required
IV	Matrix Spike/Matrix Spike Duplicates	N	
V	Duplicates	A	triplicates
VI.	Laboratory control samples	N	Not required
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: Sediment

1	MW-20-S(30)	11	MW-20-S(130)	21		31	
2	MW-20-S(40)	12	MW-20-S(140)	22		32	
3	MW-20-S(50)	13	MW-20-S(150)	23		33	
4	MW-20-S(60)	14	MW-20-S(160)	24		34	
5	MW-20-S(70)	15	MW-20-S(170)	25		35	
6	MW-20-S(80)	16	MW-20-S(180)	26		36	
7	MW-20-S(90)	17	MW-20-S(190)	27		37	
8	MW-20-S(100)	18	MW-20-S(200)	28		38	
9	MW-20-S(110)	19	MW-20-S(140)DUP	29		39	
10	MW-20-S(120)	20	MW-20-S(140)TRP	30		40	

Notes:

Laboratory Data Consultants, Inc.
Data Validation Report

Project/Site Name:	NW Natural Gasco Site
Collection Date:	March 15, 2007
LDC Report Date:	April 21, 2007
Matrix:	Water
Parameters:	Wet Chemistry
Validation Level:	EPA Level III
Laboratory:	Columbia Analytical Services, Inc.
Sample Delivery Group (SDG):	K0702193

Sample Identification

GS-070315-2
GS-070315-3
GS-070315-4
GS-070315-2MS
GS-070315-2DUP

Introduction

This data review covers 5 water samples listed on the cover sheet including dilutions and reanalysis as applicable. The analyses were per EPA Method 335.1 for Amenable to Chlorination Cyanide, EPA Method 335.4 for Cyanide, total, and ASTM Method D4282-02 for Cyanide by Microdiffusion.

The review follows a modified outline of the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review (October 2004) as there are no current guidelines for the methods stated above.

A qualification summary table is provided at the end of this report if data has been qualified. Flags are classified a P (protocol) or A (advisory) to indicate whether the flag is due to a laboratory deviation from a specified protocol or is of technical advisory nature.

Blank results are summarized in Section III.

Field duplicates are summarized in Section IX.

Raw data were not reviewed for this SDG. The review was based on QC data.

The following are definitions of the data qualifiers:

U Indicates the compound or analyte was analyzed for but not detected at or above the stated limit.

J Indicates an estimated value.

R Quality control indicates the data is not usable.

N Presumptive evidence of presence of the constituent.

UJ Indicates the compound or analyte was analyzed for but not detected. The sample detection limit is an estimated value.

A Indicates the finding is based upon technical validation criteria.

P Indicates the finding is related to a protocol/contractual deviation.

None Indicates the data was not significantly impacted by the finding, therefore qualification was not required.

I. Technical Holding Times

All technical holding time requirements were met.

The chain-of-custodies were reviewed for documentation of cooler temperatures. All cooler temperatures met validation criteria.

II. Calibration

a. Initial Calibration

All criteria for the initial calibration of each method were met.

b. Calibration Verification

Calibration verification frequency and analysis criteria were met for each method when applicable.

III. Blanks

Method blanks were reviewed for each matrix as applicable. No contaminant concentrations were found in the initial, continuing and preparation blanks.

IV. Matrix Spike/Matrix Spike Duplicates

Matrix spike (MS) samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

V. Duplicates

Duplicate (DUP) sample analyses were reviewed for each matrix as applicable. Results were within QC limits.

VI. Laboratory Control Samples

Laboratory control samples were reviewed for each matrix as applicable. Percent recoveries (%R) were within QC limits.

VII. Sample Result Verification

Raw data were not reviewed for this SDG.

VIII. Overall Assessment of Data

Data flags are summarized at the end of this report if data has been qualified.

IX. Field Duplicates

No field duplicates were identified in this SDG.

X. Field Blanks

No field blanks were identified in this SDG.

NW Natural Gasco Site
Wet Chemistry - Data Qualification Summary - SDG K0702193

No Sample Data Qualified in this SDG

NW Natural Gasco Site
Wet Chemistry - Laboratory Blank Data Qualification Summary - SDG K0702193

No Sample Data Qualified in this SDG

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Anchor Environmental
Project Name : Gasco NW Natural
Project Number : 000029-02
Sample Matrix : Water

Service Request : K0702193
Date Collected : 03/15/07
Date Received : 03/16/07

Cyanide, Amenable to Chlorination

Prep Method : NONE
Analysis Method : 335.1
Test Notes :

Units : mg/L
Basis : NA

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Result	Result Notes
GS-070315-2	K0702193-001	0.01	0.003	1	3/19/2007	03/23/07	ND	
GS-070315-3	K0702193-002	0.01	0.003	1	3/19/2007	03/23/07	ND	
GS-070315-4	K0702193-003	0.01	0.003	1	3/19/2007	03/23/07	ND	
Method Blank	K0702193-MB	0.01	0.003	1	3/19/2007	03/23/07	ND	

4/02/2007

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Anchor Environmental
Project Name : Gasco NW Natural
Project Number : 000029-02
Sample Matrix : Water

Service Request : K0702193
Date Collected : 03/15/07
Date Received : 03/16/07

Cyanide, Free

Units : ug/L
Basis : NA

Analysis Method : ASTM D 4282-02
Test Notes :

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Analyzed	Result	Result Notes
GS-070315-2	K0702193-001	10	5	1	03/17/07	ND	
GS-070315-3	K0702193-002	10	5	1	03/17/07	ND	
GS-070315-4	K0702193-003	10	5	1	03/17/07	ND	
Method Blank	K0702193-MB	10	5	1	03/17/07	ND	

3/21/07

COLUMBIA ANALYTICAL SERVICES, INC.

Analytical Report

Client : Anchor Environmental
Project Name : Gasco NW Natural
Project Number : 000029-02
Sample Matrix : Water

Service Request : K0702193
Date Collected : 03/15/07
Date Received : 03/16/07

Cyanide, Total

Prep Method : Method
Analysis Method : 335.4
Test Notes :

Units : mg/L
Basis : NA

Sample Name	Lab Code	MRL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Result	Result Notes
GS-070315-2	K0702193-001	0.01	0.003	1	3/20/2007	03/20/07	0.04	
GS-070315-3	K0702193-002	0.01	0.003	1	3/20/2007	03/20/07	0.02	
GS-070315-4	K0702193-003	0.01	0.003	1	3/20/2007	03/20/07	0.13	
Method Blank	K0702193-MB	0.01	0.003	1	3/20/2007	03/20/07	ND	

LDC #: 16563E6

SDG #: K0702193

Laboratory: Columbia Analytical Services

VALIDATION COMPLETENESS WORKSHEET

Level III

Date: 4/21/07

Page: 1 of 1

Reviewer: [illegible]

2nd Reviewer: [illegible]

METHOD: Cyanide by Microdiffusion (ASTM D4282-02), Total Cyanide (EPA Method 335.4), Amenable to Chlorination Cyanide (EPA Method 335.1)

The samples listed below were reviewed for each of the following validation areas. Validation findings are noted in attached validation findings worksheets.

	Validation Area		Comments
I.	Technical holding times	A	Sampling dates: 3/15/07
IIa.	Initial calibration	A	
IIb.	Calibration verification	A	
III.	Blanks	A	
IV	Matrix Spike/Matrix Spike Duplicates	A	3 ms/msd
V	Duplicates	A	
VI.	Laboratory control samples	A	LCS
VII.	Sample result verification	N	
VIII.	Overall assessment of data	A	
IX.	Field duplicates	N	
X	Field blanks	N	

Note: A = Acceptable; N = Not provided/applicable; SW = See worksheet; ND = No compounds detected; R = Rinsate; FB = Field blank; D = Duplicate; TB = Trip blank; EB = Equipment blank

Validated Samples: All

1	GS-070315-2	11		21		31	
2	GS-070315-3	12		22		32	
3	GS-070315-4	13		23		33	
4	GS-070315-2MS	14		24		34	
5	GS-070315-2DUP	15		25		35	
6	MB	16		26		36	
7		17		27		37	
8		18		28		38	
9		19		29		39	
10		20		30		40	

Notes:

LDC #: 16563B6
SDG #: K0N0219

VALIDATION FINDINGS WORKSHEET
Sample Specific Analysis Reference

Page: 1 of 1
Reviewer: MY
2nd reviewer: [illegible]

All circled methods are applicable to each sample.

Sample ID	Parameter				
1-3	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK (CN) NH_3 TKN TOC CR^{6+}	Amenable CN		Amenable CN	
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
4-5	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK (CN) NH_3 TKN TOC CR^{6+}	✓		✓	
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				
	pH TDS Cl F NO_3 NO_2 SO_4 PO_4 ALK CN NH_3 TKN TOC CR^{6+}				

Comments: