



SEGMENT 2 CAPTURE ZONE FIELD TEST REPORT GASCO SEDIMENTS SITE, PORTLAND, OREGON

Prepared for

NW Natural

Prepared by

Anchor QEA, LLC

March 2011

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LIST OF ACRONYMS AND ABBREVIATIONS

City	City of Portland
DEQ	Oregon Department of Environmental Quality
DNAPL	dense non-aqueous phase liquid
EPA	U.S. Environmental Protection Agency
Field Test Report	Segment 2 Capture Zone Field Test Report
GAC	Granular activated carbon
gpm	gallons per minute
HASP	health and safety plan
Order	Administrative Settlement Agreement and Order on Consent
POTW	Publicly Owned Treatment Works
Siltronic	Siltronic Corporation
Test Plan	Capture Zone Field Test Plan (Anchor QEA 2009c)
WBZ	Water bearing zone

1 INTRODUCTION

NW Natural and Siltronic Corporation (Siltronic) are working with the U.S. Environmental Protection Agency (EPA) under an Administrative Settlement Agreement and Order on Consent (Order) for sediments cleanup at the Gasco Sediments Site within Portland Harbor. The Segment 2 Capture Zone Field Test was conducted to provide information on offshore groundwater seepage control for the design of the in-water sediment cleanup.

Anchor QEA, LLC, is also designing a groundwater and dense non-aqueous phase liquid (DNAPL) source control system for the NW Natural Gasco Upland Site working with Oregon Department of Environmental Quality (DEQ) under a Voluntary Cleanup Program agreement. Anchor QEA is currently preparing the Draft Groundwater Source Control Design Report. The findings presented in the Segment 2 Capture Zone Field Test Report (Field Test Report) will also be used by Anchor QEA to support that design.

Studies conducted to date for upland groundwater source control design conclude that the shoreline extraction wells will control groundwater discharge from the Gasco Sediments Site into the river. Shoreline groundwater containment will also reduce groundwater discharge from the sediment mudline into the river channel within an area of the riverbed near the Gasco Sediments Site. Because regional groundwater discharge would continue at some distance from the Gasco Sediments Site, the effect of the Gasco groundwater controls on groundwater flux are expected to diminish with distance from the site.

In order to best evaluate design alternatives for the sediment cleanup, Anchor QEA will conduct modeling studies to predict the offshore area of groundwater seepage control that would result from operation of the upland shoreline extraction wells. To better inform these modeling efforts and assist in the overall design of the in-water sediment cleanup, it is important to measure the offshore area of seepage control that will be induced by the shoreline source control extraction wells. The information presented in this report will be used to support that modeling effort.

Segment 2 is one of three shoreline segments designated by NW Natural and approved by DEQ for identifying potential shoreline areas for upland source control. As shown on Figure 1, Segment 1 extends across portions of NW Natural and Siltronic property. Segment 2 is located on the north shoreline of NW Natural property. DEQ has designated Segments 1 and 2 as having high priority for source control. Segment 3 is located on the south shoreline of Siltronic

property. The *Source Control Evaluation Report "Segment 3" Siltronic Property Related to NW Natural "Gasco" Site* (Anchor QEA 2009b) was submitted to DEQ in February 2009, and comments have not yet been received from DEQ.

The findings from this Segment 2 field test are intended to adjust and calibrate the groundwater model to better predict the area of offshore seepage control along the entire shoreline where sediment cleanup is expected to occur.

The *Capture Zone Field Test Plan* (Anchor QEA 2009c; Test Plan) describes the process of constructing and testing shoreline extraction wells, upland monitoring wells, and offshore piezometers to accomplish the following goals:

1. Determine the offshore area of seepage control that results from pumping the shoreline wells at the pumping rate identified in Goal No. 2.
2. Confirm the model-predicted pumping rates anticipated to achieve groundwater capture at the shoreline adjacent to the Gasco Sediments Site.
3. Determine if adjustments to the extraction well pumping rates are needed to change the area of offshore seepage control to better complement cost-effective offshore sediment cleanup.

The information collected during achievement of these goals will be used for the future design of the in-water cleanup action.

The following sections of this Field Test Report describe the field Investigation and findings resulting from the offshore capture zone investigation.

2 FIELD INVESTIGATION

2.1 Capture Zone Field Test Plan

The Test Plan was submitted to EPA and DEQ in September, 2009. At NW Natural's request EPA and DEQ completed an expedited review of the piezometer and well construction portion of the plan to facilitate implementation of the offshore work during the in-water construction window. EPA and DEQ reviewed the Test Plan and provided comments and conditional approval in an October 8, 2009 email. In an October 23, 2009 letter, Anchor QEA responded to EPA and DEQ comments on the Test Plan. On October 27, Anchor QEA sent EPA's consultant, CDM, proposed piezometer construction details, a memorandum providing request for proposal discussions with drillers to install offshore piezometers at the site, and copies of typical field forms. EPA sent NW Natural an October 28, 2009 letter containing further comments and instructing NW Natural to proceed with the work, conditioned upon EPA approval of the health and safety plan (HASP) and NW Natural responses to comments. On November 8, 2009, Anchor QEA submitted to EPA a document titled "Revised Additional Responses to Agency's Capture Zone Field Test Plan Comments and Responses" to EPA's HASP comments. On November 11, 2009, EPA sent an email to Anchor QEA and NW Natural approving NW Natural's response to the Test Plan comments, pending EPA approval of the project HASP. A November 15 e-mail from EPA to Anchor QEA stated the agency has no further comments on the HASP and that work may proceed. EPA's conditional approval of the Test Plan was e-mailed to NW Natural and Anchor QEA on January 7, 2010.

2.2 Well Installation and Instrumentation

Table 1 shows the construction details of all site monitoring wells, piezometers, and pilot extraction wells. Per the Test Plan, a number of new monitoring wells, offshore piezometers, and pilot extraction wells were installed for the offshore capture zone assessment. The geologic logs and construction details for the new wells are included in Appendix A.

Between November 19 and December 4, 2009, the following offshore piezometers were installed using a barge mounted rotosonic drill rig:

- PZ1-50
- PZ2-43
- PZ2-77
- PZ3-33

- PZ4-12
- PZ4-41
- PZ5-5
- PZ5-20
- PZ5-55
- PZ5-85

Between January 28 and March 8, 2010, the following upland monitoring wells, observation wells, and Pilot Extraction Wells were installed with a truck mounted roto sonic drill rig.

- MW22-80
- MW23-27
- MW23-75
- MW23-123
- MW24-70
- MW24-130
- OW7-17
- OW8-15
- OW9-25
- PW7-93
- PW8-68
- PW9-92

Observation well OW8-28 and pilot extraction well PW8-39 were both installed on August 13, 2010 using a truck mounted roto sonic drill rig.

All wells were installed and completed with locking protective surface casings, as described in the Test Plan, and the screens were developed using the methods described in the Test Plan. Copies of the well development records are in Appendix B. Investigation derived waste generated from the well installation and development was handled as described in the Test Plan. The wastewater was treated in the onsite GAC treatment system prior to discharge under permit to the City of Portland (City) Publicly Owned Treatment Works (POTW). The soil was drummed, characterized, and disposed offsite at Waste Management's Subtitle D landfill in Hillsboro, Oregon.

Prior to beginning the field tests, *InSitu LevelTroll 500* pressure transducers were installed in the new monitoring wells, piezometers, pilot extraction wells, 16 pre-existing wells, and the Willamette River.

2.3 Field Tests

2.3.1 Lower Alluvium Extraction Wells

Prior to beginning the field tests, a temporary pipeline to the onsite GAC treatment system was constructed. The pipeline was connected to all of the extraction wells. During the subsequent pump tests the groundwater was treated and discharged under permit to the City POTW.

Table 2 shows a summary of the pump tests that were conducted during this investigation, including pumping period, pumping rate in gpm, and the wells that were pumped during each period.

From April 19 to 21, 2010, each of the three lower alluvium pilot wells (PW7-93, PW8-68, and PW9-68) were pumped for approximate two-hour periods at varying pumping rates to test the specific capacity of each well. The purpose was to make sure that each well is capable of pumping the desired flow without excessive drawdown. The tests concluded that each well was capable of pumping the required discharge.

Table 3 shows the groundwater elevation data for each of the wells during all of the 72 hour pump tests. As shown on Table 3, the three lower alluvium wells were subjected to two 72-hour tests in April and May 2010. For the test conducted from April 27 to 30, each of the three wells was pumped at a constant rate of 25 gallons per minute (gpm). The 25 gpm rate was selected because that pumping rate was predicted by modeling to be appropriate for achieving upland groundwater containment. Transducer data from each of the tests shown in Table 3 are included in a data CD in Appendix C. The data CD also contains water elevation hydrographs and water temperature graphs plotted from the transducer data.

Following the 25 gpm test, Anchor QEA conducted another period of ambient monitoring. The second 72-hour pump test was conducted from May 4 to 7, with each of the three wells pumping at a constant rate of 35 gpm. The 35 gpm test was conducted to determine if the offshore groundwater gradients would be substantially different at a higher pumping rate.

As described in the Section 2.3.2, an upper alluvium pilot extraction well (PW8-39) was installed and tested following the previously described 35-gpm 72-hour test.

Following installation and testing of PW8-39, a final 72-hour test of all four pilot extraction wells was conducted. Before the test, a period of ambient monitoring occurred from November 5 to November 8, 2010. This was followed by the 72-hour test that extended from November 8 to November 11, 2010. During that test, the three lower alluvium wells were pumped at a constant rate of 25 gpm and well PW8-39 was pumped at a rate of 2 gpm.

2.3.2 Upper Alluvium Extraction Well

The groundwater elevation data derived from the April and May 2010 72-hour tests (described in Section 2.3.1) indicated that the low hydraulic conductivity and interbedded silt layers of the upper alluvium near well PW8-68 were reducing the seepage control effect of the lower alluvium extraction wells. That analysis will be further explained in Section 3.

Following the April and May 2010 tests, a pilot extraction well was proposed for the upper alluvium near well PW8-68. A June 24, 2010 technical memorandum was sent to EPA with the plan to install an upper alluvium pilot extraction well (Anchor QEA 2010a). That memorandum provided a summary of the results of testing the lower alluvium extraction wells and how those results indicated that an upper alluvium extraction well should be installed and tested.

EPA approved the June 24 technical memorandum, and well PW8-37 was installed on July 1. Following installation, Anchor QEA prepared the July 15 *Capture Zone Field Test Plan Addendum* to provide further details on plans to continue capture zone testing (Anchor QEA 2010b). On July 21, comments from DEQ on the *Capture Zone Field Test Plan Addendum* directed NW Natural to prepare plans to abandon well PW8-37. On July 28, Anchor QEA sent EPA and DEQ a letter with a plan for abandonment and a request for further discussion to better understand and potentially resolve DEQ's concerns about the well. Although Anchor QEA did not agree that the construction of the well violated Oregon Well Construction regulations, DEQ continued to require abandonment of the well. Nonetheless, at DEQ's direction, the Oregon Water Resources Department required the drilling contractor, Cascade Drilling Corporation, to decommission the well. Despite multiple requests, the Water Resources Department has not provided a written explanation for its determination that the well was in violation of Oregon regulations.

In the August 3 *Capture Zone Test Plan Addendum 2* (Anchor QEA 2010c), Anchor QEA provided a plan to abandon PW8-37 and construct a new extraction well in the same borehole. Further details on the proposed field procedures were provided to EPA and DEQ in the August 6 *Capture Zone Test Plan Addendum 3* (Anchor QEA 2010d). At DEQ's request, the third addendum included a plan to install a new observation well near the planned replacement for PW7-37.

Following these agreements, Anchor QEA installed pilot extraction well PW8-39 and observation well OW8-28 on August 13, 2010. Those wells were constructed and the screens developed using the same protocols as the previously installed wells. Following installation of the two wells, Anchor QEA installed pressure transducers and short term pump tests were conducted to determine the specific capacity of well PW8-39. The tests determined that the well has a very low specific capacity and that the maximum sustained yield of the well is about 2 gpm.

Following installation and pretesting of new pilot well PW8-39, Anchor QEA conducted a 72-hour pump test of that well. From September 9 through September 12, 2010, Anchor QEA pumped well PW8-39 at a constant rate of 2 gpm. The lower alluvium extraction wells were not pumped during this period. As described in the previous section, a final 72-hour pump test was then conducted in November 2010 with all four pilot extraction wells.

3 CAPTURE ZONE ANALYSIS

Figure 2 shows the locations of wells in the capture zone test study area, and the locations for two cross sections prepared as part of this Field Test Report. On the cross sections, the upper alluvium is designated with a solid green color and the lower alluvium is designated with a green cross hatch pattern. The upper alluvium is silty fine sand with silt interbeds. The lower alluvium is medium sand with fewer silt interbeds. Based on historic aquifer tests conducted in wells located further south along the shoreline, the hydraulic conductivity of the lower alluvium is about 200 feet per day and the upper alluvium about 10 feet per day. However, as further explained in the next subsection, subsequent field tests have shown that the hydraulic conductivity of the upper alluvium in the vicinity of the Segment 2 Capture Zone test area is about 1 foot per day, much lower than further south along the shoreline.

Figure 3 (F-F' cross section) and Figure 4 (G-G' cross section) show the difference (ΔH) between the average water elevation at the wells and piezometers compared to the river water elevation for pre-test ambient flow conditions. Figure 5 (F-F' cross section) and Figure 6 (G-G' cross section) show the difference during the 25 gpm pump test.

Where ΔH is positive, the groundwater elevation is higher than the river elevation; where ΔH is negative, the groundwater elevation is lower than the river elevation. Negative ΔH indicates reversal of gradient (that is, no groundwater seepage into the river at that location). The river elevation data are from the permanent electric water level transducer attached to the dock. The groundwater elevations were calculated from the pump test data using the method of Serfes (1991) that was described in the Test Plan. The data and calculated elevations are shown on Table 3.

On Table 3, the negative or downward gradients are shown in red. The Serfes method filters tidal data over a 72-hour period to obtain mean groundwater and river elevations. These mean elevations are used to determine groundwater gradients and flow direction. The Serfes method is specifically designed for use at sites where groundwater levels are strongly influenced by tidal fluctuations, as with the Gasco Sediments Site.

At all well locations on Figures 3 and 4, for the pre-pumping ambient data, the ΔH is positive, indicating groundwater gradient toward the river. However, the difference is very small in the lower alluvium, so there is very little groundwater gradient. The cross sections on Figures 3 and 4 also display the tidal efficiencies for the pre-test ambient condition calculated at each

well/piezometer. As expected, the figures show higher tidal efficiencies at the wells screened in the more permeable lower alluvium.

The gradient calculations completed from the April 2010, 25 gpm pump test data are shown on the cross sections of Figures 5 and 6. For pumping conditions, the tidal efficiency is not relevant, so it is not shown on these figures. As with Figures 3 and 4, the ΔH on Figures 5 and 6 were calculated using the 72-hour averaging method of Serfes (1991).

A simple interpretation of the data shows that negative differences mean the groundwater levels are below the river and therefore contained by the pumping wells. In both sections, the lower alluvium is captured by the pumping wells. By comparing the ΔH in the upper alluvium between the pretest data and the 25 gpm data, it is seen that significant gradient reductions in the upper alluvium are also achieved; however, in the fill and shallow alluvium, only PZ4-12 on Figure 6 is contained.

3.1 Groundwater Chemistry Testing

In comments to the Test Plan, DEQ requested that groundwater chemistry data be collected as part of the capture zone testing (DEQ 2009). Accordingly, Anchor QEA conducted groundwater sampling during the final 72 hour pump test. Copies of the field sampling data sheets are in Appendix B. Groundwater and river water samples were obtained at start of the test on November 8, during the test on November 10, and at the end of the test on November 11. The samples were obtained from spigots that had been installed at each well head. The sampling methods and analytes tested were consistent with the DEQ's request. Copies of the laboratory data reports are in Appendix D. Laboratory data was subjected to a standard data validation review. The data were judged to be acceptable for their intended use as qualified. Please refer to the data validation review in Appendix E. The validated data are shown on Table 4.

4 FINDINGS

4.1 Capture Zone Analysis

In 2011, slug tests have been conducted in a number of upper alluvium and Fill WBZ monitoring wells and pilot extraction wells. The findings from those slug tests were provided to DEQ and EPA in a February 17, 2011 data report (Anchor QEA 2011).

The slug test findings and the information from the testing of the Segment 2 pilot extraction well PW8-39 show that the hydraulic conductivity of the upper alluvium declines from the southern shoreline area to the north. Based on historic testing of well PW3-85, the hydraulic conductivity of the upper alluvium in the area near the Gasco/Siltronic property line is about 10 feet per day. Testing of well PW1-80 during the Gasco Remedial Investigation showed the hydraulic conductivity of the upper alluvium in that area is about 5 feet per day. Subsequent 2011 slug testing of monitoring wells and the 2010 pump test of Segment 2 pilot well PW8-39 indicate that the hydraulic conductivity of the upper alluvium in the vicinity of PW8-39 is about 1 foot per day, about an order of magnitude lower than the vicinity of well PW3-85.

The area for the Segment 2 capture zone tests was selected because there is no DNAPL in the Segment 2 area of the shoreline. Based on the previously stated findings, the Segment 2 capture zone tests were inadvertently conducted in an area where the hydraulic conductivity of the upper alluvium is the lowest of any known area along the Gasco/Siltronic shoreline source control area. Therefore, the pump test results for the upper alluvium in the area of PW8-39 are not representative of the upper alluvium in the rest of the planned shoreline source control area.

However, because the Segment 2 tests did achieve a high degree of gradient reduction in the upper alluvium, Anchor QEA believes that complete containment can be achieved by varying the extraction well pumping rate to counterbalance the effect of river tidal fluctuations on groundwater gradients. The Final Source Control design is intended to use a Programmable Logic Control system to monitor the ΔH between groundwater and river elevation at selected control wells. The system will use variable frequency drive extraction well pumps whose discharge can be varied with the tidal fluctuations. By doing this, it is anticipated that the upper alluvium gradient reduction will be improved for seepage control.

Hydraulic conductivity data obtained from the Segment 2 capture zone tests, plus the individual well slug tests, are being used as input to the site MODFLOW model. The updated

groundwater model will be used for future design of the sediment cleanup action and is being used for final design of the upland source control system.

4.2 Groundwater Chemistry Data

The groundwater chemistry data obtained during the Segment 2 tests are shown on Table 4. Figure 7 shows the data for the four pilot extraction wells and the river water plotted on a Piper diagram. The data show that the river water chemistry and groundwater chemistry are similar and plot in the same general quadrants of the diagrams.

There were detections of total and WAD cyanide in the three Willamette River samples, but these detections were caused by contamination from either the sampling equipment, cross contamination during storage, or another unknown source. This accidental contamination of the samples is evidenced by the detection of total cyanide and WAD cyanide in the field blank sample obtained on November 10. The field blank is composed of deionized water that is put through the same sampling, storage, and chain of custody procedures as the actual samples. Since new polyethylene tubing was used to obtain the samples, it is very unlikely the contamination was sourced from the sampling equipment. There were no cyanide detections in the laboratory blank, so the Willamette River data were not qualified as a result of data validation.

5 REFERENCES

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- NW Natural Gasco, Pump Test Analysis and MODFLOW Model Summary, 2008. SS. Papadopoulos & Associates, Inc. April 25, 2008.
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TABLES

Table 1
Well and Piezometer Construction Details
Gasco Siltronic, Portland, Oregon

Well Number	Installed Transducer	Water-Bearing Zone	Date Installed	Date De-commissioned	Installation Method	Monument Type	Screen Type	Slot Size (inches)	Sand Pack (Colorado)	Well Diam. (inches)	Ground Surface (feet COP)	Top of Casing		Well Depth ¹		Top Screen		Base Screen	
												(feet COP)	(feet bgs)	(feet bgs)	(feet COP)	(feet bgs)	(feet COP)	(feet bgs)	(feet COP)
Existing Monitoring Well																			
MW-1-22		Surficial Fill	23-Oct-91	-	Hollow-Stem Auger	Above-grade	Slotted PVC	0.020	10-20	2	32.00	34.75	(2.8)	22.0	10.0	11.0	21.0	21.0	11.0
MW-1-55		Alluvial	9-Jul-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	33.10	35.75	(2.7)	57.0	-23.9	45.0	-11.9	55.0	-21.9
MW-1-82		Alluvial	8-Jul-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	33.50	36.08	(2.6)	85.4	-51.9	72.0	-38.5	82.0	-48.5
MW-2-32	X	Surficial Fill	5-Nov-91	-	Hollow-Stem Auger	Flush	Slotted PVC	0.020	10-20	2	34.83	34.50	0.3	32.5	2.3	21.5	13.3	31.5	3.3
MW-2-61	X	Alluvial	7-Oct-94	-	Hollow-Stem Auger	Flush	Slotted PVC	0.020	10-20	2	34.61	34.42	0.2	61.5	-26.9	50.0	-15.4	60.0	-25.4
MW-2-104	X	Alluvial	24-Jun-03	-	Sonic	Flush	Continuous wrap stainless steel	0.020	10-20	2	34.86	34.88	(0.0)	116.5	-81.6	94.0	-59.1	104.0	-69.1
MW-3-26	X	Surficial Fill	31-Oct-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.30	34.13	(2.8)	26.0	5.3	15.0	16.3	25.0	6.3
MW-3-56	X	Alluvial	31-Oct-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.51	34.10	(2.6)	56.0	-24.5	45.0	-13.5	55.0	-23.5
MW-4-35		Surficial Fill	30-Oct-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.70	34.54	(2.8)	35.0	-3.3	24.0	7.7	34.0	-2.3
MW-4-57		Alluvial	29-Oct-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.70	34.53	(2.8)	57.0	-25.3	46.0	-14.3	56.0	-24.3
MW-4-101		Alluvial	15-Oct-94	-	Dual Wall Reverse Air	Above-grade	Slotted PVC (pre-pack)	0.010	20-40	2	31.80	34.36	(2.6)	120.0	-88.2	89.5	-57.7	99.5	-67.7
MW-5-32		Surficial Fill/Alluvial	26-Oct-91	-	Hollow-Stem Auger	Above-grade	Slotted PVC	0.020	10-20	2	25.10	27.83	(2.7)	32.0	-6.9	21.0	4.1	31.0	-5.9
MW-5-100		Alluvial	22-Oct-94	-	Dual Wall Reverse Air	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	25.40	27.31	(1.9)	100.0	-74.6	88.0	-62.6	98.0	-72.6
MW-5-175		Alluvial	21-Oct-94	-	Dual Wall Reverse Air	Above-grade	Slotted PVC (pre-pack)	0.010	20-40	2	25.20	27.19	(2.0)	175.0	-149.8	163.0	-137.8	173.0	-147.8
MW-6-32		Surficial Fill	8-Nov-91	-	Hollow-Stem Auger	Flush	Continuous wrap stainless steel	0.020	10-20	2	35.80	35.51	0.3	32.0	3.8	21.0	14.8	31.0	4.8
MW-6-61		Alluvial	6-Nov-91	21-Dec-93	Hollow-Stem Auger	Flush	Continuous wrap stainless steel	0.020	10-20	2	35.80	34.50	1.3	61.0	-25.2	50.0	-14.2	60.0	-24.2
MW-8-29		Surficial Fill	25-Oct-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	36.50	39.09	(2.6)	29.0	7.5	18.0	18.5	28.0	8.5
MW-8-56		Alluvial	24-Oct-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	36.50	39.13	(2.6)	56.0	-19.5	45.0	-8.5	55.0	-18.5
MW-9-29		Surficial Fill/Alluvial	22-Oct-91	-	Hollow-Stem Auger	Flush	Slotted PVC	0.020	10-20	2	37.90	37.65	0.3	29.0	8.9	18.0	19.9	28.0	9.9
MW-10-25		Surficial Fill	8-Nov-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	36.50	39.22	(2.7)	25.0	11.5	14.0	22.5	24.0	12.5
MW-10-61		Alluvial	7-Nov-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	36.50	39.33	(2.8)	61.0	-24.5	50.0	-13.5	60.0	-23.5
MW-11-32		Surficial Fill	2-Nov-91	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	35.40	38.39	(3.0)	32.0	3.4	21.0	14.4	31.0	4.4
MW-12-36		Surficial Fill/Alluvial	22-Oct-91	-	Hollow-Stem Auger	Above-grade	Slotted PVC	0.020	10-20	2	35.90	38.69	(2.8)	36.0	-0.1	25.0	10.9	35.0	0.9
MW-13-30		Surficial Fill	18-Dec-93	-	Hollow-Stem Auger	Flush	Continuous wrap stainless steel	0.020	10-20	2	35.23	34.86	0.4	30.0	5.2	19.0	16.2	29.0	6.2

Table 1
Well and Piezometer Construction Details
Gasco Siltronic, Portland, Oregon

Well Number	Installed Transducer	Water-Bearing Zone	Date Installed	Date De-commissioned	Installation Method	Monument Type	Screen Type	Slot Size (inches)	Sand Pack (Colorado)	Well Diam. (inches)	Ground Surface (feet COP)	Top of Casing		Well Depth ¹		Top Screen		Base Screen	
												(feet COP)	(feet bgs)	(feet bgs)	(feet COP)	(feet bgs)	(feet COP)	(feet bgs)	(feet COP)
MW-13-61		Alluvial	17-Dec-93	-	Hollow-Stem Auger	Flush	Continuous wrap stainless steel	0.020	10-20	2	35.23	34.78	0.4	61.0	-25.8	50.0	-14.8	60.0	-24.8
MW-13-61R		Alluvial	31-May-03	-	Sonic	Flush	Continuous wrap stainless steel	0.020	20-40	2	35.31	35.38	(0.1)	63.0	-27.7	51.0	-15.7	61.0	-25.7
MW-14-110		Alluvial	18-Oct-94	-	Dual Wall Reverse Air	Above-grade	Slotted stainless steel (pre-pack)	0.010	20-40	2	35.30	37.41	(2.1)	110.0	-74.7	98.0	-62.7	108.0	-72.7
MW-15-50		Alluvial	30-Jun-95	-	Air Rotary	Flush	Slotted stainless steel (pre-pack)	0.010	10-20	2	36.27	35.97	0.3	50.0	-13.7	40.0	-3.7	50.0	-13.7
MW-15-66		Alluvial	29-Jun-95	-	Air Rotary	Flush	Slotted stainless steel	0.010	10-20	2	36.27	36.06	0.2	66.0	-29.7	60.5	-24.2	65.5	-29.2
MW-16-45		Alluvial	19-Jul-00	-	Sonic	Above-grade	Slotted stainless steel	0.010	10-20	2	30.81	33.12	(2.3)	49.0	-18.2	30.0	0.8	45.0	-14.2
MW-16-65	X	Alluvial	18-Jul-00	-	Sonic	Above-grade	Slotted stainless steel	0.010	10-20	2	30.75	33.21	(2.5)	68.0	-37.3	55.0	-24.3	65.0	-34.3
MW-16-125		Alluvial	14-Jul-00	26-Apr-10	Sonic	Above-grade	Slotted stainless steel	0.010	10-20	2	30.90	33.18	(2.3)	130.0	-99.1	115.0	-84.1	125.0	-94.1
MW-17-79		Alluvial	25-Jul-01	-	Sonic	Above-grade	Continuous wrap stainless steel	0.010	10-20	2	32.56	34.83	(2.3)	82.0	-49.4	38.5	-5.9	78.5	-45.9
MW-18-30		Surficial Fill	26-Feb-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.61	34.27	(2.7)	30.0	1.6	19.0	12.6	29.0	2.6
MW-18-125		Alluvial	22-Apr-10	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.93	34.65	(2.7)	126.0	-94.1	115.0	-83.1	125.0	-93.1
MW-18-180	X	Alluvial	25-Feb-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	31.70	33.90	(2.2)	230.0	-198.3	170.0	-138.3	180.0	-148.3
MW-19-22		Surficial Fill	5-Mar-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	27.40	29.82	(2.4)	23.0	4.4	12.0	15.4	22.0	5.4
MW-19-125		Alluvial	11-Mar-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	27.20	29.42	(2.2)	126.0	-98.8	115.0	-87.8	125.0	-97.8
MW-19-180		Alluvial	1-Mar-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	27.28	29.81	(2.5)	227.0	-199.7	170.0	-142.7	180.0	-152.7
MW-20-120		Alluvial	7-Mar-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	25.63	27.84	(2.2)	213.0	-187.4	110.0	-84.4	120.0	-94.4
MW-21-12	X	Surficial Fill	5-Jul-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	20.34	23.25	(2.9)	14.0	6.3	7.0	13.3	12.0	8.3
MW-21-75	X	Alluvial	4-Jul-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	20.22	23.11	(2.9)	77.0	-56.8	65.0	-44.8	75.0	-54.8
MW-21-115	X	Alluvial	1-Jul-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	20.32	23.43	(3.1)	118.0	-97.7	105.0	-84.7	115.0	-94.7
MW-21-166	X	Alluvial	27-Jun-03	-	Sonic	Above-grade	Continuous wrap stainless steel	0.020	10-20	2	20.35	23.15	(2.8)	193.0	-172.7	156.0	-135.7	166.0	-145.7
MW-22-80	X	Alluvial	28-Jan-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	33.59	36.01	(2.5)	80.9	-47.3	69.9	-36.3	79.9	-46.3
MW-23-27	X	Surficial Fill	16-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	32.77	34.72	(2.3)	28.0	4.8	17.7	15.1	27.7	5.1
MW-23-75	X	Alluvial	16-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	32.91	34.87	(2.5)	75.7	-42.8	64.7	-31.8	74.7	-41.8
MW-23-123	X	Alluvial	5-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	32.88	35.05	(2.5)	124.3	-91.4	113.3	-80.4	123.3	-90.4
MW-24-70	X	Alluvial	3-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	31.42	33.83	(2.4)	71.1	-39.7	60.1	-28.7	70.1	-38.7
MW-24-130	X	Alluvial	2-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	31.34	33.76	(2.5)	131.1	-99.8	120.1	-88.8	130.1	-98.8
PW-01-80		Alluvial	8-Aug-01	-	Sonic	Flush	Continuous wrap stainless steel	0.020	10-20	6	32.00	31.80	0.2	82.0	-50.0	39.5	-7.5	79.5	-47.5

Table 1
Well and Piezometer Construction Details
Gasco Siltronic, Portland, Oregon

Well Number	Installed Transducer	Water-Bearing Zone	Date Installed	Date De-commissioned	Installation Method	Monument Type	Screen Type	Slot Size (inches)	Sand Pack (Colorado)	Well Diam. (inches)	Ground Surface (feet COP)	Top of Casing		Well Depth ¹		Top Screen		Base Screen	
												(feet COP)	(feet bgs)	(feet bgs)	(feet COP)	(feet bgs)	(feet COP)	(feet bgs)	(feet COP)
Existing Observation Well																			
OW-7-17	X	Surficial Fill	23-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	24.20	26.51	(2.3)	17.7	6.5	12.5	11.7	17.5	6.7
OW-8-15	X	Surficial Fill	12-Feb-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	24.56	26.42	(1.9)	15.3	9.3	10.1	14.5	15.1	9.5
OW-8-28	X	Alluvial	13-Aug-10	-	Hollow-Stem Auger	Above-grade	Slotted PVC	0.020	10-20	2	23.79	26.38	(2.6)	29.0	-5.2	23.1	0.7	28.1	-4.3
OW-9-25	X	Surficial Fill	8-Mar-10	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	33.11	35.38	(2.3)	25.3	7.8	20.0	13.1	25.0	8.1
Existing Extraction Well																			
PW-7-93	X	Alluvial	22-Feb-10	-	Sonic	Above-grade	Continuous wrap stainless steel	0.035	10-20	8	24.19	26.74	(2.6)	95.5	-71.3	73.5	-49.3	93.5	-69.3
PW-8-39	X	Alluvial	13-Aug-10	-	Hollow-Stem Auger	Above-grade	Continuous wrap stainless steel	0.035	10-20	15	23.22	25.69	(2.5)	50.0	-26.8	24.2	-1.0	39.2	-16.0
PW-8-68	X	Alluvial	11-Feb-10	-	Sonic	Above-grade	Continuous wrap stainless steel	0.035	10-20	8	24.64	27.13	(2.5)	70.0	-45.4	48.0	-23.4	68.0	-43.4
PW-9-92	X	Alluvial	1-Mar-10	-	Sonic	Above-grade	Continuous wrap stainless steel	0.035	10-20	8	33.02	35.78	(2.8)	94.6	-61.6	72.6	-39.6	92.6	-59.6
Existing Piezometer																			
PZ1-5	X	Surficial Fill	18-Mar-09	-	Manual	Above-grade	Solinst push point		NA	1	9.96	36.07	(26.1)	5.6	4.3	4.5	5.5	5.4	4.6
PZ1-20	X	Alluvial	18-Mar-09	-	Manual	Above-grade	Solinst push point		NA	1	10.15	36.43	(26.3)	20.5	-10.3	19.3	-9.2	20.2	-10.1
PZ1-50	X	Alluvial	23-Nov-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	10.17	37.67	(27.5)	50.4	-40.2	45.2	-35.0	50.2	-40.0
PZ2-5	X	Alluvial	18-Mar-09	-	Manual	Above-grade	Solinst push point		NA	1	2.89	37.90	(35.0)	6.7	-3.8	5.5	-2.6	6.4	-3.5
PZ2-20	X	Alluvial	18-Mar-09	-	Manual	Above-grade	Solinst push point		NA	1	3.38	37.89	(34.5)	21.7	-18.4	20.6	-17.2	21.5	-18.1
PZ2-43	X	Alluvial	3-Dec-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	3.76	37.96	(34.2)	43.6	-39.8	38.4	-34.6	43.4	-39.6
PZ2-77	X	Alluvial	2-Dec-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	3.05	38.65	(35.6)	77.2	-74.2	72.0	-69.0	77.0	-74.0
PZ4-12	X	Alluvial	4-Dec-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	-8.63	34.67	(43.3)	12.0	-20.6	6.8	-15.4	11.8	-20.4
PZ4-41	X	Alluvial	24-Nov-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	-8.33	33.07	(41.4)	41.4	-49.7	36.2	-44.5	41.2	-49.5
PZ5-5	X	Surficial Fill	20-Nov-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	10.70	16.51	(5.5)	5.0	5.7	3.8	6.9	4.8	5.9
PZ5-20	X	Alluvial	20-Nov-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	10.72	16.24	(5.5)	20.3	-9.6	15.1	-4.4	20.1	-9.4
PZ5-55	X	Alluvial	20-Nov-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	10.79	16.31	(5.5)	55.3	-44.5	50.1	-39.3	55.1	-44.3
PZ5-85	X	Alluvial	19-Nov-09	-	Sonic	Above-grade	Slotted PVC	0.020	10-20	2	10.79	16.44	(5.4)	85.2	-74.4	80.0	-69.2	85.0	-74.2

Notes:

- Highlighted cells = Previous survey value updated with 3/15/2009 survey results
- bgs = below ground surface
- btc = below top of casing
- COP = City of Portland Datum
- PVC = polyvinyl chloride
- ¹ actual completion depths may differ depending on actual lithology encountered during drilling

Table 2
Pump Test Summary
Gasco Segment 2 Capture Zone Test

Test Duration and Rate	Start Pump Test	End Pump Test	Pumping Wells			
			PW-7-93	PW-8-39	PW-8-68	PW-9-92
2 hour Pump Test - 15 GPM	4/19/2010 8:45	4/19/2010 10:45	X		X	X
2 hour Pump Test - 25 GPM	4/20/2010 9:30	4/20/2010 11:30	X		X	X
2 hour Pump Test - 35 GPM	4/21/2010 10:42	4/21/2010 12:42	X		X	X
72 hour Pump Test - 25 GPM	4/26/2010 16:57	4/30/2010 8:38	X		X	X
72 hour Pump Test - 35 GPM	5/4/2010 8:37	5/7/2010 16:29	X		X	X
72 hour Pump Test - 2 GPM	9/9/2010 10:28	9/12/2010 10:28		X		
72 hour Pump Test - 25 GPM	11/8/2010 12:00	11/11/2010 12:45	X	X*	X	X

Note:

GPM = gallons per minute

* Well pumped at 2 GPM

**Table 3
Pump Test Results – Groundwater Elevations**

	Ambient Pre-Test		Ambient Pre-test		72 hour Pump Test - 25 GPM		72 hour Pump Test - 35 GPM		Pre Test Ambient		72 hour Pump Test - 25 GPM		Post Test Ambient	
	4/21 18:00 - 4/24 18:00		4/23 0:00 - 4/26 0:00		4/27 0:00 - 4/30 0:00 25 GPM		5/4 12:00 - 5/7 12:00		11/5 12:00 - 11/8 11:00		11/8 12:47 - 11/11 12:47		11/12 8:40 - 11/15 8:40	
	72 hour Moving Average	Δ H from River	72 hour Moving Average	Δ H from River	72 hour Moving Average	Δ H from River	72 hour Moving Average	Δ H from River	72 hour Moving Average	Δ H from River	72 hour Moving Average	Δ H from River	72 hour Moving Average	Δ H from River
MW-2-32	13.13	5.60	13.11	4.97	13.27	3.92	13.08	5.21	10.14	2.61	10.22	2.76	9.79	4.08
MW-2-61	7.63	0.11	8.24	0.10	9.12	(0.23)	7.57	(0.30)	7.65	0.12	7.27	(0.19)	5.91	0.19
MW-2-104	7.64	0.11	8.25	0.11	9.11	(0.24)	7.54	(0.33)	7.69	0.16	7.30	(0.16)	5.96	0.24
MW-3-26	13.78	6.26	13.65	5.51	14.31	4.96	13.82	5.94	13.97	6.44	14.44	6.98	14.37	8.66
MW-3-56	7.76	0.24	8.33	0.19	9.34	(0.01)	7.96	0.09	7.77	0.25	7.54	0.08	6.14	0.43
MW-16-65	7.76	0.24	8.33	0.19	9.37	0.02	8.00	0.13	9.22	1.69	9.02	1.56	7.58	1.87
MW-18-125									6.22	(1.31)	5.98	(1.48)	4.48	(1.24)
MW-18-180	7.74	0.22	8.35	0.21	9.51	0.16	8.06	0.19	7.78	0.25	7.68	0.22	6.03	0.32
MW-21-12	12.73	5.20	12.72	4.58	13.16	3.81	12.85	4.98	12.23	4.70	12.48	5.02	12.34	6.62
MW-21-75	7.67	0.15	8.28	0.14	9.12	(0.23)	7.56	(0.32)	7.73	0.20	7.32	(0.14)	6.01	0.29
MW-21-115	7.73	0.20	8.33	0.19	9.23	(0.12)	7.65	(0.22)	7.78	0.25	7.40	(0.06)	6.02	0.31
MW-21-166	7.84	0.32	8.45	0.31	9.60	0.25	8.14	0.26	7.88	0.35	7.76	0.30	6.12	0.41
MW-22-80	7.53	0.00	8.14	(0.00)	9.09	(0.26)	7.63	(0.25)	7.64	0.11	7.32	(0.14)	5.88	0.17
MW-23-27	9.51	1.99	9.59	1.45	10.10	0.75	9.89	2.01	9.01	1.48	9.16	1.70	8.86	3.15
MW-23-75	7.58	0.06	8.20	0.06	9.05	(0.30)	7.51	(0.37)	7.65	0.12	7.27	(0.19)	5.89	0.18
MW-23-123	7.59	0.07	8.20	0.06	9.19	(0.16)	7.69	(0.18)	7.69	0.16	7.37	(0.09)	5.93	0.22
MW-24-70	7.73	0.21	8.30	0.16	9.32	(0.03)	7.93	0.05	7.78	0.25	7.55	0.09	6.14	0.42
MW-24-130	7.66	0.14	8.27	0.13	9.28	(0.07)	7.78	(0.09)	7.70	0.17	7.44	(0.02)	5.95	0.24
OW-7-17	11.72	4.19	11.71	3.57	12.28	2.93	11.78	3.91	11.91	4.38	12.18	4.72	11.88	6.17
OW-8-15	12.02	4.50	12.04	3.90	12.49	3.14	12.15	4.28	11.42	3.89	11.54	4.08	11.34	5.62
OW-8-28									9.24	1.71	8.21	0.75	8.38	2.66
OW-9-25	9.83	2.31	9.88	1.74	10.29	0.94	9.93	2.05	9.31	1.78	9.40	1.93	9.17	3.45
PW-7-93	7.87	0.35	8.48	0.34	3.59	(5.76)	-1.14	(9.02)	7.83	0.30	1.73	(5.73)	6.09	0.37
PW-8-39									8.24	0.71	-7.88	(15.34)	6.72	1.00
PW-8-68	7.81	0.29	8.42	0.28	6.38	(2.97)	3.60	(4.27)	7.84	0.31	4.51	(2.95)	6.09	0.37
PW-9-92	7.78	0.25	8.39	0.25	-2.83	(12.18)	-10.60	(18.47)	7.69	0.16	-4.41	(11.87)	5.94	0.22
PZ1-5	7.87	0.34	8.35	0.21	9.63	0.28	8.38	0.51	8.33	0.80	8.29	0.83	7.08	1.37
PZ1-20	7.86	0.34	8.41	0.27	9.47	0.12	8.14	0.27	7.67	0.14	7.50	0.04	5.97	0.25
PZ1-50	7.63	0.10	8.24	0.10	9.17	(0.18)	7.64	(0.23)	7.66	0.13	7.32	(0.14)	5.91	0.20
PZ2-5	7.68	0.15	8.29	0.15	9.31	(0.04)	7.80	(0.08)	7.63	0.10	7.57	0.11	5.83	0.12
PZ2-20	7.70	0.18	8.30	0.16	9.39	0.04	7.97	0.10	7.67	0.14	7.50	0.04	5.97	0.25
PZ2-43	7.60	0.08	8.21	0.07	9.30	(0.05)	7.83	(0.05)	7.65	0.12	7.46	(0.00)	5.90	0.19
PZ2-77	7.68	0.15	8.29	0.15	9.31	(0.04)	7.80	(0.08)	7.70	0.17	7.45	(0.02)	5.94	0.23
PZ4-12	7.55	0.03	8.13	(0.01)	9.28	(0.07)	7.90	0.02	7.60	0.07	7.49	0.03	5.91	0.19
PZ4-41	7.59	0.06	8.19	0.05	9.34	(0.01)	7.89	0.01	7.63	0.10	7.50	0.04	5.87	0.16
PZ5-5	9.52	2.00	9.69	1.55	10.35	1.00	9.69	1.81	9.61	2.08	9.60	2.14	9.12	3.41
PZ5-20	8.58	1.05	8.98	0.84	9.92	0.57	8.88	1.00	8.61	1.08	8.51	1.05	7.55	1.83
PZ5-55	7.69	0.17	8.30	0.16	9.21	(0.14)	7.67	(0.21)	7.71	0.18	7.35	(0.11)	5.96	0.25
PZ5-85	7.70	0.18	8.31	0.17	9.24	(0.11)	7.70	(0.17)	7.71	0.18	7.35	(0.11)	5.96	0.24
Willamette River	7.52	0.00	8.14	0.00	9.35	0.00	7.87	0.00	7.53	0.00	7.46	0.00	5.71	0.00

Notes:
 Values represent average water level elevation in feet, City of Portland datum. Average values calculated using a 72 hour moving average method (Serfes, 1991).
 Values in red with parentheses represent negative values (average water level in River higher than average water level in well).

**Table 4
Groundwater Chemistry Data**

Sample ID	GS-110810-1	GS-111010-6	GS-111110-15	GS-110810-3	GS-111010-8	GS-111010-9	GS-111110-14	GS-110810-2	GS-111010-7	GS-111110-13
Well ID	PW-7-93	PW-7-93	PW-7-93	PW-8-39	PW-8-39	PW-8-39	PW-8-39	PW-8-68	PW-8-68	PW-8-68
Sample Date	11/8/2010	11/10/2010	11/11/2010	11/8/2010	11/10/2010	11/10/2010	11/11/2010	11/8/2010	11/10/2010	11/11/2010
Sample Type	N	N	N	N	N	Dup	N	N	N	N
Conventional Parameters (mg/l)										
Alkalinity, Bicarbonate as CaCO3	374	347	352	353	327	318	319	359	320	317
Alkalinity, Carbonate as CaCO3	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U	20 U
Alkalinity, total as CaCO3	374	347	352	353	327	318	319	359	320	317
Chloride (total)	7.08	7.3	7.33	79.9	54.2	53.7	51.7	17.1	8.01	8.05
Cyanide, total	0.1	0.0742	0.0781	0.0788	0.0709	0.0659	0.0839	0.122	0.0877	0.12
Cyanide, free	0.005 UJ	0.005 U	0.005 U	0.005 UJ	0.005 U	0.005 U	0.005 U	0.005 UJ	0.005 U	0.005 U
Cyanide, Weak acid dissociable (WAD)	0.0282	0.0141	0.0388	0.0198	0.0278	0.0334	0.0364	0.0209	0.0249	0.0309
Nitrate as nitrogen	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U
Sulfate	1 U	24.2	33.2	28.5	13	13	9.84	1 U	1 U	1 U
Dissolved Metals (µg/l)										
Calcium	77200	79300	81200	62700	59000	58300	56800	57700	64600	65800
Iron	42200	43500	44400	31900	21400	21200	21500	42500	42000	41200
Magnesium	27900	29000	29600	30800	34700	33900	34600	39900	23600	23800
Manganese	3150	3320	3450	2750	2000	1980	1910	2050	4360	4280
Potassium	6450	6830	6470	2800	2970	2940	2780	3890	5000	4610
Sodium	18200	18300	18600	81200	56600	55500	46200	20100	15500	15700
Total Metals (µg/l)										
Calcium	71600	76500	59700	58500	55700	56100	59700	54100	64100	66500
Iron	40500	42400	42500	31100	20900	20500	20900	43000	41100	40700
Magnesium	26300	28500	28600	29200	33300	33200	35100	39000	23900	23400
Manganese	3010	3240	3210	2600	1960	1940	1870	1960	4250	4130
Potassium	6230	6690	6700	2710	3030	3030	2800	3900	5170	4770
Sodium	17200	18200	15300	76800	54800	54800	48600	19700	15900	15500

Notes:

Bold = Detected result

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated detection limit

**Table 4
Groundwater Chemistry Data**

Sample ID	GS-110810-4	GS-111010-10	GS-111110-17	GS-110810-5	GS-111010-12	GS-111110-16	GS-111010-11
Well ID	PW-9-92	PW-9-92	PW-9-92	Willamette River	Willamette River	Willamette River	Field Blank
Sample Date	11/8/2010	11/10/2010	11/11/2010	11/8/2010	11/10/2010	11/11/2010	11/10/2010
Sample Type	N	N	N	N	N	N	N
Conventional Parameters (mg/l)							
Alkalinity, Bicarbonate as CaCO ₃	299	306	312	27.6	27.6	24.2	20 U
Alkalinity, Carbonate as CaCO ₃	20	U 20	U 20	U 20	U 20	U 20	U 20 U
Alkalinity, total as CaCO ₃	299	306	312	27.6	27.6	24.2	20 U
Chloride (total)	25.4	17.6	17	4.65	4.29	3.76	1 U
Cyanide, total	0.15	0.165	0.185	0.0251	0.0076	0.0246	0.0082
Cyanide, free	0.005	UJ 0.005	U 0.005	U 0.005	U 0.005	U 0.005	U 0.005 U
Cyanide, Weak acid dissociable (WAD)	0.0309	0.0416	0.0387	0.0297	0.0351	0.0128	0.0273
Nitrate as nitrogen	0.25	U 0.25	U 0.25	U 0.536	0.572	0.715	0.25 U
Sulfate	1	U 1	U 1	U 3.53	3.44	3.69	1 U
Dissolved Metals (µg/l)							
Calcium	58800	58800	58000	6680	6550	6690	30.6 J
Iron	43400	42700	41300	156	132	218	16.2 J
Magnesium	30000	29200	28300	2150	2070	2110	50 U
Manganese	3340	3280	3210	11.1	11.6	12.4	0.467 J
Potassium	3320	3530	3210	1040	1040	1150	100 U
Sodium	15600	15600	15200	5220	4880	4580	100 U
Total Metals (µg/l)							
Calcium	56200	56200	83300	6130	6640	6810	100 U
Iron	43500	41100	44600	383	431	646	50 U
Magnesium	29100	28200	29500	2080	2200	2160	50 U
Manganese	3290	3160	3370	18.1	21.4	21.8	1 U
Potassium	3290	3460	3290	938	1060	1170	13.9 J
Sodium	15300	15300	18300	4920	5010	4620	46.1 J

Notes:

Bold = Detected result

J = Estimated value

U = Compound analyzed, but not detected above detection limit

UJ = Compound analyzed, but not detected above estimated detec

FIGURES

K:\Jobs\000029-GASCO\00002902\00002902-PP-116.dwg FIG 2-1
 Jan 27, 2011 11:08am cdavidson

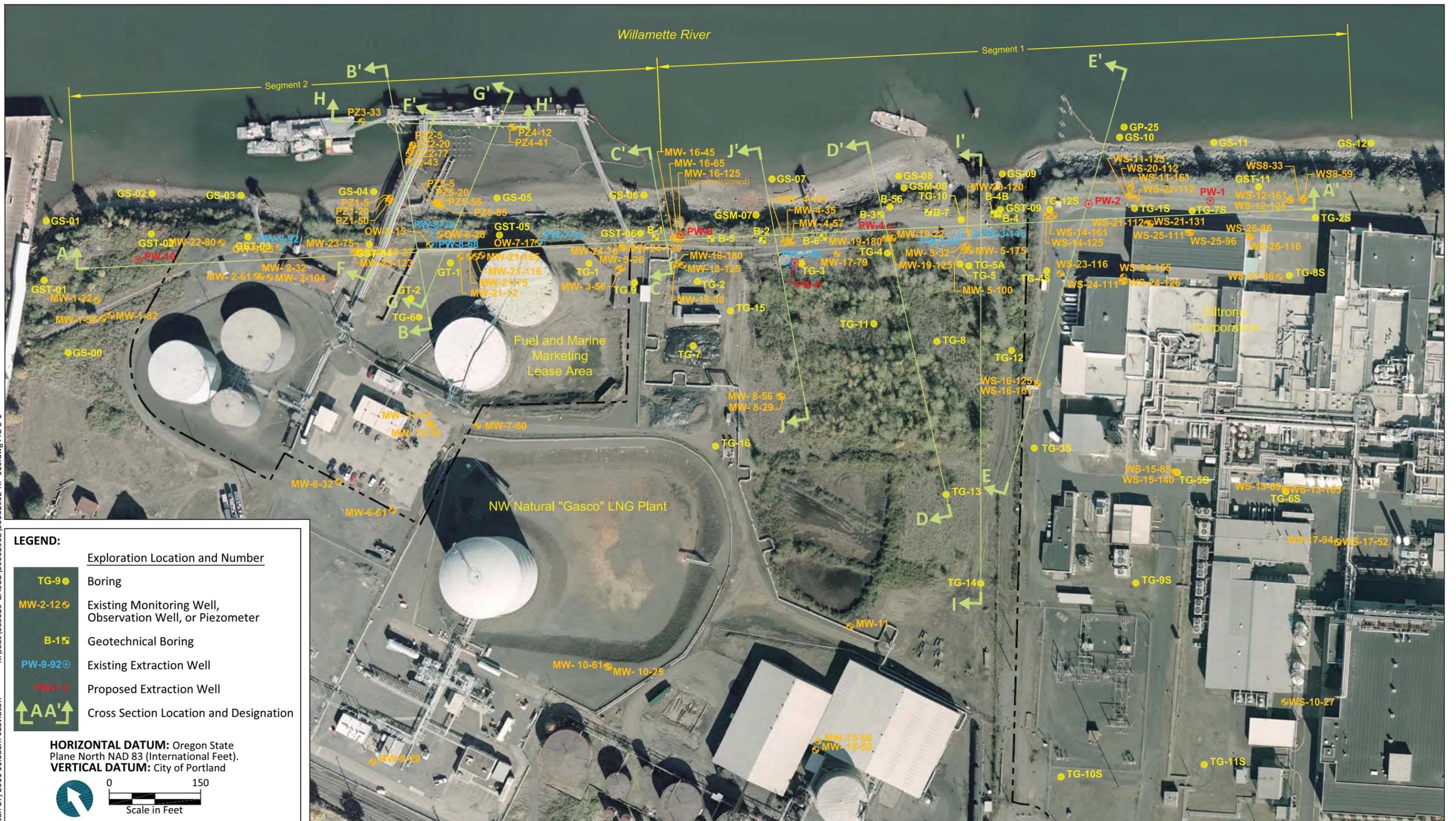
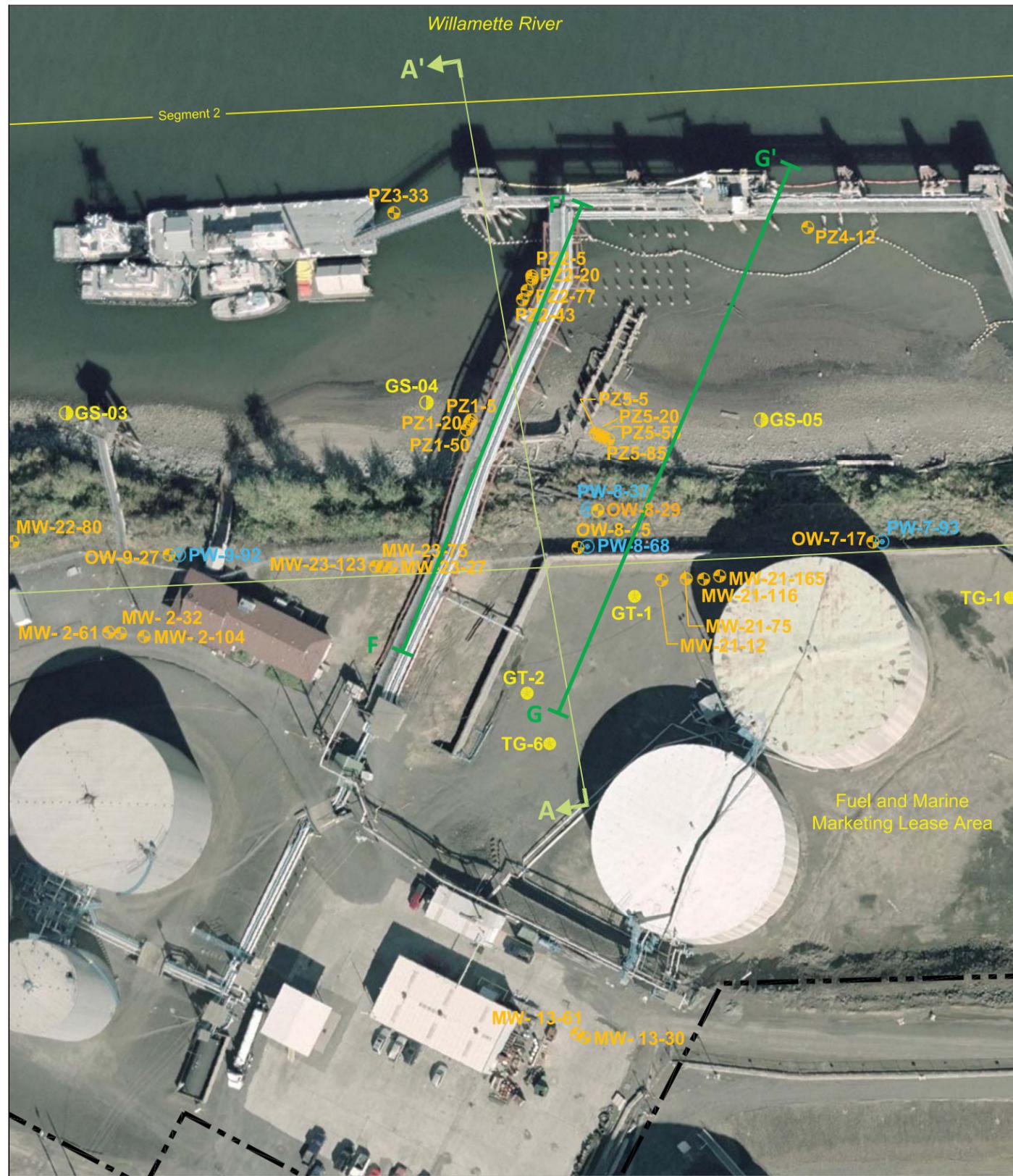


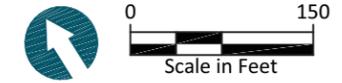
Figure 1
 Well Location Map
 Segment 2 Capture Zone Field Test
 Gasco, Portland, Oregon

Jul 13, 2010 11:09am cdav/dson obs\000029-GASCO\00002902\00002902-RP-098.dwg FIG 1

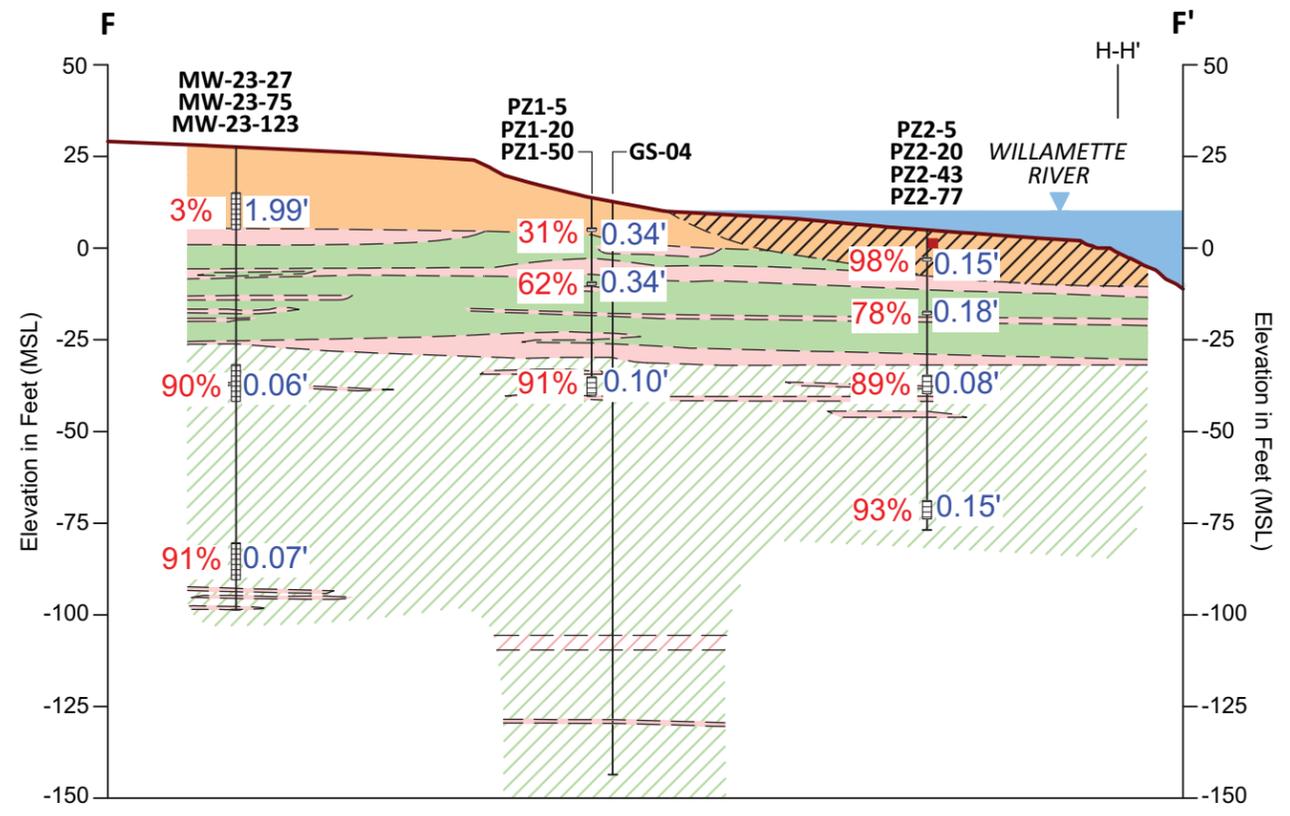


LEGEND:

- | Exploration Location and Number | |
|---------------------------------|---|
| TG-9 ● | Boring |
| 12 ● | Existing Monitoring Well, Observation Well, or Piezometer |
| GS-01 ● | Gasco Phase 1 Offshore Boring |
| B-1 ■ | Geotechnical Boring |
| PW-9-92 ● | Existing Extraction Well |
| PW-1 ● | Proposed Extraction Well |
| ↑AA'↑ | Cross Section Location and Designation |



HORIZONTAL DATUM: Oregon State Plane North NAD 83 (International Feet).
VERTICAL DATUM: City of Portland



Tidal Efficiencies / ΔH from River

LEGEND:

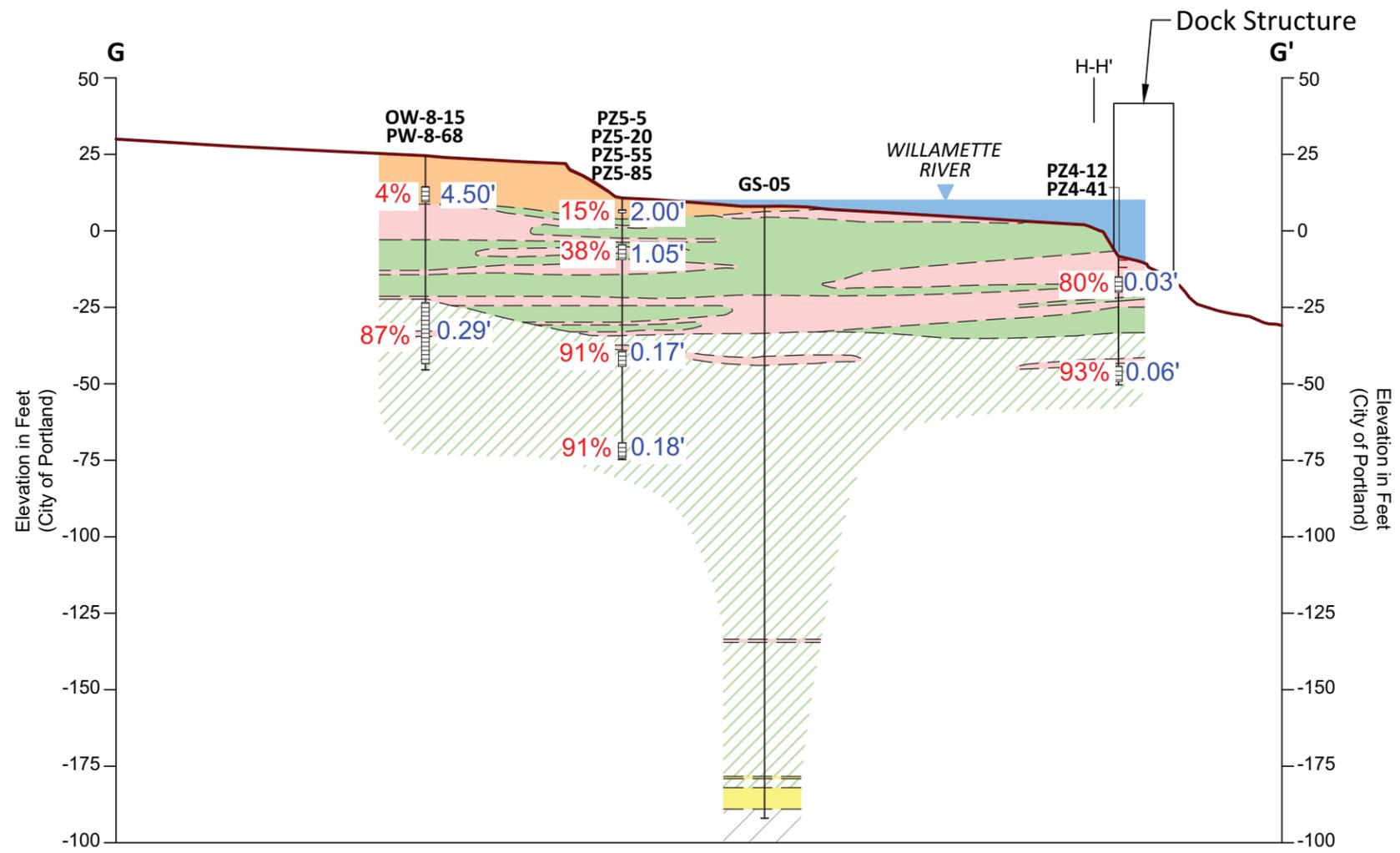
- | | | | | |
|--|---|--|---|---|
| | Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers | | SAND and SILT mixed with wood chips and anthropogenic material (wood, metal, cardboard) | MW-23-123 —Boring ID
NAPL and/or Tar Interval
xx—Boring ID
 |
| | Aquitard; Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers | | Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt | |
| | Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers | | Primarily medium grained SAND with generally less than 15% fines. | |
| | Fill composed of gravel, silt, sand, metal, brick, and concrete debris | | Basalt BEDROCK | |
| | Existing Ground Surface | | | <p>Scale in Feet</p> |

obs\000029-GASCO\00002902\00002902-RP-086.dwg F-F'

Jan 27, 2011 11:01am cdavidson



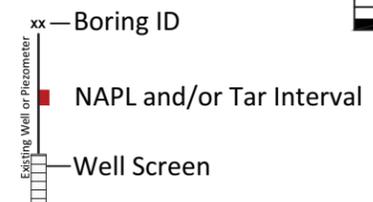
Figure 3
 Pre-test Data
 Cross Section F-F'
 Segment 2 Capture Zone Test Report
 Gasco, Portland, Oregon



LEGEND:

- Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Aquitard; Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers
- Fill composed of gravel, silt, sand, metal, brick, and concrete debris
- Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt
- Primarily medium grained SAND with generally less than 15% fines.
- Basalt BEDROCK
- Existing Ground Surface

PW8-68 — Boring ID

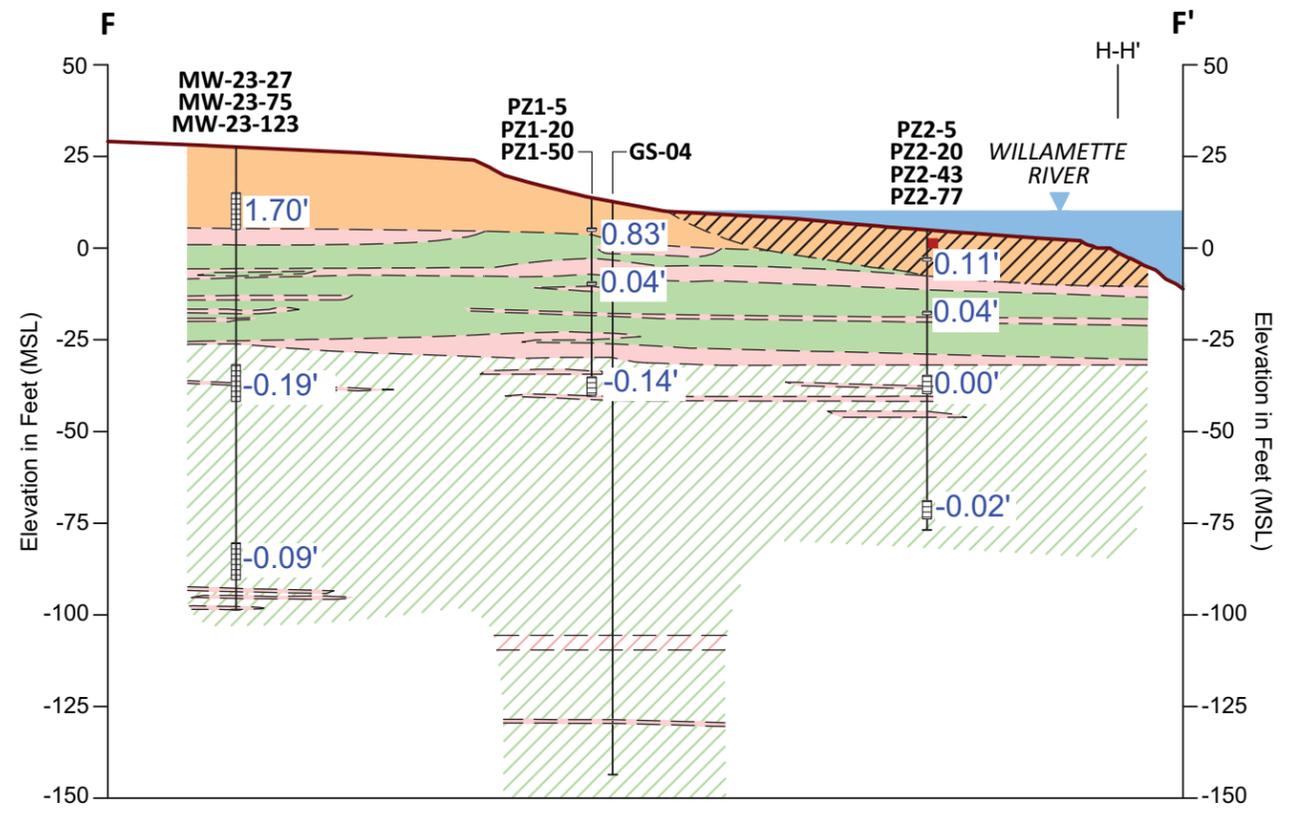


K:\Jobs\000029-GASCO\00002902\00002902-RP-086.dwg G-G'

Jan 27, 2011 11:02am cdaavidson



Figure 4
Pre-test Data
Cross Section G-G'
Segment 2 Capture Zone Test Report
Gasco, Portland, Oregon



ΔH from River

LEGEND:

- | | | | | |
|--|---|--|---|---|
| | Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers | | SAND and SILT mixed with wood chips and anthropogenic material (wood, metal, cardboard) | <p>MW-23-123— Boring ID
NAPL and/or Tar Interval</p> |
| | Aquitard; Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers | | Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt | |
| | Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers | | Primarily medium grained SAND with generally less than 15% fines. | |
| | Fill composed of gravel, silt, sand, metal, brick, and concrete debris | | Basalt BEDROCK | |
| | | | Existing Ground Surface | <p>Scale in Feet</p> |

obs\000029-GASCO\00002902\00002902-RP-086.dwg F-F'

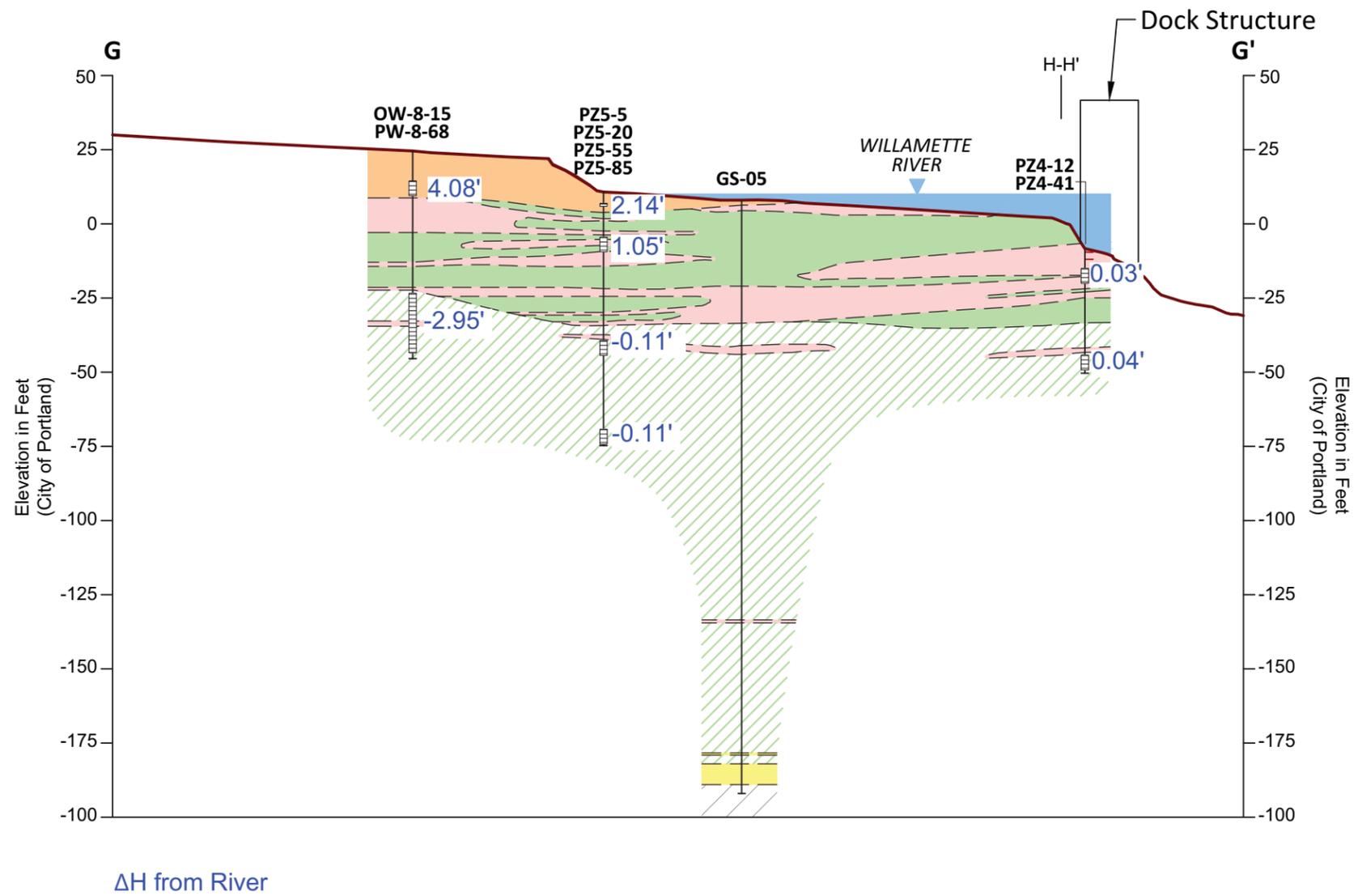
Jan 27, 2011 11:01am cdavidson



Figure 5
3 Day 25 GPM Data
Cross Section F-F'
Segment 2 Capture Zone Test Report
Gasco, Portland, Oregon

K:\Jobs\000029-GASCO\00002902\00002902-RP-086.dwg G-G'

Jan 27, 2011 11:02am cdaavidson



LEGEND:

- Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Aquitard; Primarily SILT and SANDY-SILT interbedded with thin sand and silty-sand layers
- Primarily fine to medium grained SAND and SILTY-SAND interbedded with thin silt and sandy-silt layers
- Fill composed of gravel, silt, sand, metal, brick, and concrete debris

- Alluvial GRAVEL, sandy gravel, gravelly sand, and gravelly silt
- Primarily medium grained SAND with generally less than 15% fines.
- Basalt BEDROCK
- Existing Ground Surface

PW8-68 — Boring ID

- Boring ID
- NAPL and/or Tar Interval
- Well Screen

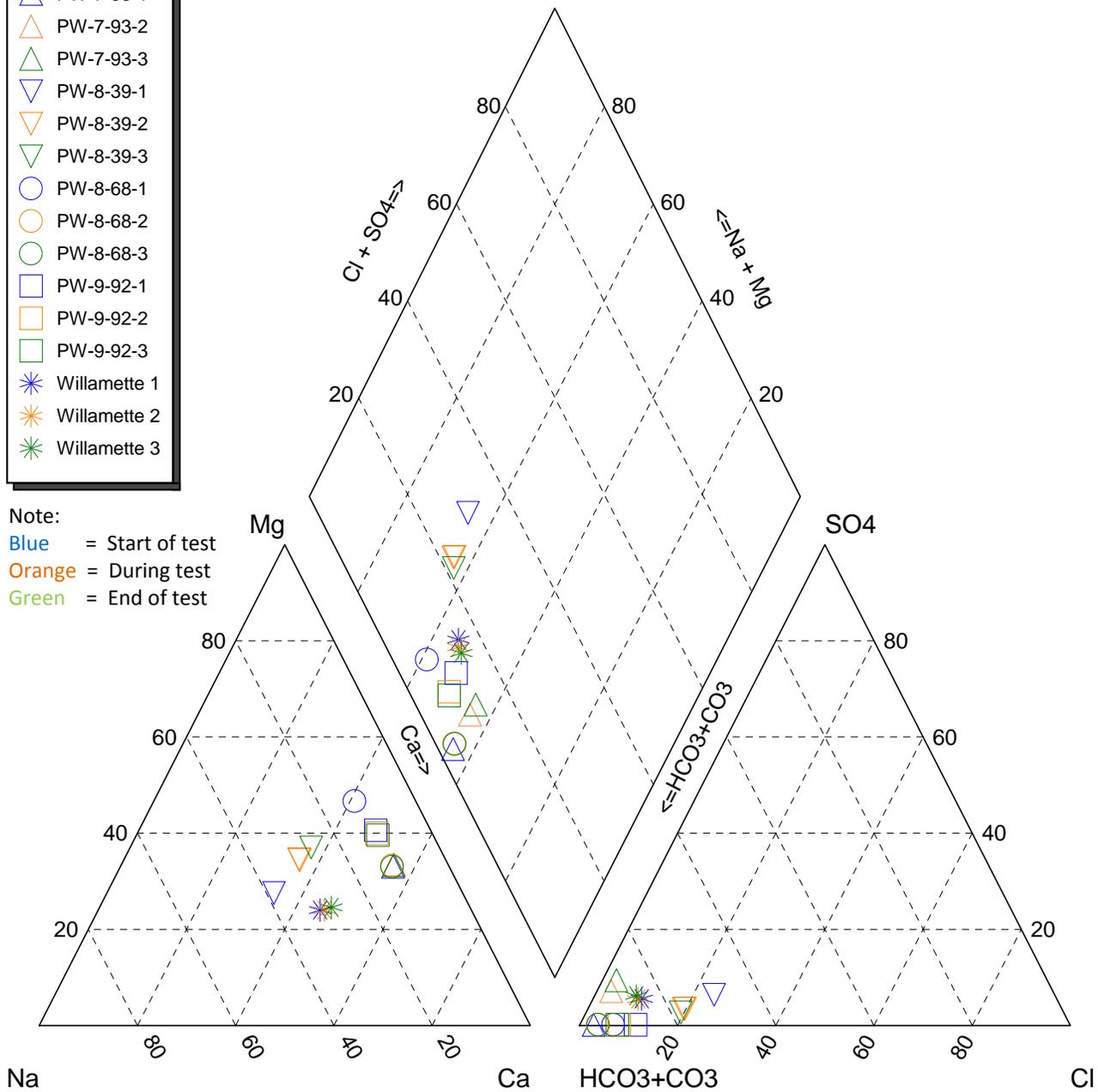


Figure 6
3 Day 25 GPM Data
Cross Section G-G'
Segment 2 Capture Zone Test Report
Gasco, Portland, Oregon



- △ PW-7-93-1
- △ PW-7-93-2
- △ PW-7-93-3
- ▽ PW-8-39-1
- ▽ PW-8-39-2
- ▽ PW-8-39-3
- PW-8-68-1
- PW-8-68-2
- PW-8-68-3
- PW-9-92-1
- PW-9-92-2
- PW-9-92-3
- ☆ Willamette 1
- ☆ Willamette 2
- ☆ Willamette 3

Note:
 Blue = Start of test
 Orange = During test
 Green = End of test



DESCRIPTION: 72 hour Pump Test Data



PROJECT: Gasco
 CLIENT: NW Natural

Figure 7
Piper Diagram
Segment 2 Capture Zone Test Report
Gasco, Portland, Oregon

APPENDIX A

BORING LOGS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-22-80
LOCATION	Portland, Oregon	PAGE	1 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	80.9 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	1/28/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009301
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102834

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
Hand Dug	0.8	0	None	NA	0			0 to 1.0 foot: GRAVEL (GW) , dark gray, angular. (FILL)	100	0	0
CB	0.7	0	None	2/8.5	1.0			1.0 to 10.0 feet: GRAVELLY SILT (ML) , dark brown, firm, moist, abundant rootlets, non plastic. @ 1.5 feet: abundant lampblack, gravel-sized pieces, small brick pieces, fibrous material, broken glass, electrical wires. (FILL)	20	0	80
	NA	NA	NA		5						
CB	2.4	2	None	3/5	10			10.0 to 15.0 feet: GRAVEL WITH SAND AND SILT (GW-GM) , black, moist, large chunks of brick and gravel, electrical wires, metal fragments, slight hydrocarbon-like odor, lampblack, concrete chunks, well graded. (FILL)	80	10	10
	NA	NA	NA		15						
CB	0.9	1	None	4.5/5	15			15.0 to 22.0 feet: SILTY SANDY GRAVEL (GW-GM) , black, dry, loose, abundant lampblack, brick, electrical wire, concrete chunks, well graded. (FILL)	50	30	20
	1.7	1	None		20			@ 18.5 feet: wet.			

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-22-80
LOCATION	Portland, Oregon	PAGE	2 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	80.9 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	1/28/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009301
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102834

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0	0	None	2/2				15.0 to 22.0 feet: SILTY SANDY GRAVEL (GW-GM) , continued.	50	30	20
CB	0.3	0	None	10/10				22.0 to 23.0 feet: SAND (SP) , dark reddish brown, loose, moist, poorly graded, medium grained, homogenous. (FILL)	0	100	0
	0.2	0	None					23.0 to 26.6 feet: SILTY SAND (SM) , gray, wet, with intermittent, thin silt layers. @ 24.5 to 26.6 feet: red and gray mottling. (FILL)	0	60	40
	0.5	0	None					26.6 to 40.0 feet: SILT WITH SAND (MH) , gray, wet, firm, highly plastic with thin sand layers (~1-2 mm). (ALLUVIUM)	0	10	90
	0.5	0	None								
	0.3	0	None					@ 30.5 to 31.5 feet: SILTY SAND layer (SM), dark gray, fine to medium sand. @ 31.5 to 40.0 feet: no recovery.	0	80	20
CB	NA	NA	NA	0/8							

REMARKS

LOG OF EXPLORATORY BORING

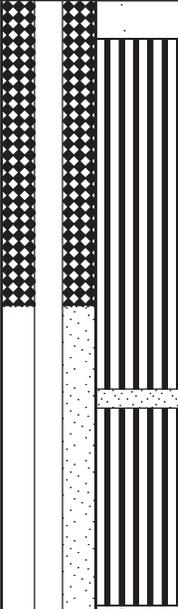
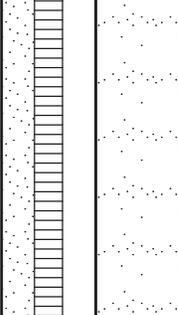
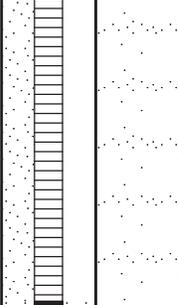
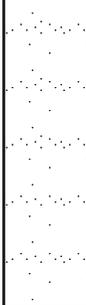
PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-22-80
LOCATION	Portland, Oregon	PAGE	3 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	80.9 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	1/28/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009301
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102834

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.1	0	None	3.8/5	45	50	55	40.0 to 45.0 feet: SANDY SILT (MH) , dark brownish gray, very soft, wet, medium plasticity, fine sand. (ALLUVIUM)	0	20-30	70-80
	0.0	0	None					@ 41.8 to 42.5 feet: silty sand layer, fine sand. (ALLUVIUM)	0	90	10
CB	0.3	0	None	5/5	50	55	60	45.0 to 45.9 feet: SAND (SP) , dark gray, loose, wet, fine sand, <5 percent fines, poorly graded, homogenous. (ALLUVIUM)	0	95-100	0-5
	1.0	0	None					45.9 to 49.3 feet: SANDY SILT (MH) , dark brownish gray, soft, moist, medium plasticity, intermittent thin (~1-2 mm) sand layers. (ALLUVIUM)	0	20-30	70-80
CB	0.4	0	None	10/10	55	60	65	@ 46.4 to 46.6 feet: sand layer.	0	95-100	0-5
			@ 47.1 to 47.2 feet: sand layer.								
			@ 48.0 to 48.2 feet: sand layer.								
			49.3 to 52.4 feet: SAND (SP) , dark gray, loose, wet, fine to medium grained, poorly graded sand, occasional silt blebs (<5 percent fines). (ALLUVIUM)								
	0.4	0	None					52.4 to 56.6 feet: SANDY SILT (MH) , dark brownish gray, soft, wet, medium plasticity, intermittent thin (~1-2 mm) sand layers. (ALLUVIUM)	0	20-30	70-80
	0.8	0	None					@ 53.8 to 54.0 feet: sand layer.			
								@ 55.4 to 55.6 feet: sand layer.			
	0.4	0	None					56.6 to 59.0 feet: SAND (SP) , dark gray, loose, wet, fine to medium grained, poorly graded sand, occasional silt blebs. (ALLUVIUM)	0	95-100	0-5
								@ 57.4 to 58.0 feet: silt layer.			
								59.0 to 60.0 feet: SILTY SAND (SM) , dark gray, loose, wet, fine to medium grained,	0	70-80	20-30

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-22-80
LOCATION	Portland, Oregon	PAGE	4 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	80.9 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	1/28/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009301
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102834

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.7	0	None	7.4/10	65			poorly graded sand, occasional silt blebs. (ALLUVIUM)	0	100	0
	0.7	0	None					60.0 to 60.6 feet: SAND (SP) , variegated sand grain color, dark gray, loose, wet, medium grained, poorly graded. (ALLUVIUM)	0	15	85
	0.4	0	None					60.6 to 69.5 feet: SILT (MH) , dark brownish gray, soft, moist, medium plasticity silt intermixed with medium grained sand. (ALLUVIUM)			
	0.3	0	None					@ 61.0 to 61.2 feet: medium grained sand layer. @ 66.1 to 66.4 feet: SAND (SP) , medium grained.			
CB	1.1	0	None	5/5	70			69.5 to 80.0 feet: SAND (SP) , dark gray, wet, loose, medium grained, poorly graded, variegated grain colors (mostly black with gray, white, red, tan). (ALLUVIUM)	0	100	0
	1.0	0	None								
CB	0.8	3	None	3.5/5	75						
	1.3	1	None								
					80						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-22-80
LOCATION	Portland, Oregon	PAGE	5 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	80.9 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	1/28/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009301
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102834

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					85			Total depth = 80.9 feet. WELL COMPLETION DETAILS 0 to 69.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe. 69.9 to 79.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 79.9 to 80.9 feet: 2-inch-diameter threaded end cap. 0 to 5.0 feet: Concrete. 5.0 to 64.8 feet: Bentonite grout. 64.8 to 67.8 feet: 20-40 Colorado silica sand. 67.8 to 80.9 feet: 10-20 Colorado silica sand.			
					90						
					95						
					100						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	1 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %					
CB	1.1	0	None	3/3				0 to 2.2 feet: GRAVELLY SILT (MH) , brown moist, soft, sticky, fine to cobble sized, angular gravel, highly plastic silt. (FILL)	40	0	60					
CB	0.6	0	None	2/4				5	2.2 to 9.0 feet: GRAVELLY SILT (ML) , black and dark olive gray mixed, dry, hard, concrete pieces at 3.8 to 4.0 feet, gravel is well rounded, fine to cobble sized, low plasticity silt. (FILL)	40-50	0	50-60				
CB	0.6	0	None						CB	1.8	0	None	0.8/2	10	9.0 to 14.5 feet: SILTY GRAVEL (GW) , gray and black mixed, dry, very hard, large cobble from 9.0 to 10.0 feet, gravel is angular, fine to cobble sized, well graded, nonplastic silt, very soft silt. (FILL) @ 10.0 feet: wet, black, sticky, concrete and lampblack (fine grained soot-like material present).	60-70	0	30-40
CB	0.9	0	None	CB				NA	NA	None	2.5/5	15							@ 14.4 feet: chunk of concrete. 14.5 to 21.0 feet: GRAVELLY SILT (ML), black, dry, hard, brittle, friable, nonplastic, strong hydrocarbon-like naphthalene-like odor. (FILL)	30	0	70
CB	1.1	0	None	CB				10.2	0	None			4/4	20	@ 17.9 feet: hard, dry, gray concrete. @ 18.6 feet: hard, dry, gray concrete.	30	0	70
CB	25.9	0	None	CB				9.0	0	None	2.5/3					

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	2 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
								14.5 to 21.0 feet: GRAVELLY SILT (ML) , continued.	30	0	70
CB	5.4	0	None	2/2				21.0 to 22.5 feet: SANDY SILT (ML) , dark gray to black, medium to high plasticity fines, fine to coarse sand, angular, fine gravel, naphthalene odor, moist to wet. (FILL)	5	25-30	70-75
CB								22.5 to 24.0 feet: GRAVELLY SILT (MH) , greenish gray, medium to high plasticity fines, fine to coarse gravel, angular to subrounded, moist. (FILL)	40	5	60
					25			24.0 to 24.5 feet: SAND (SP) , light brown, fine to medium, dry. (FILL)	0	0	100
								24.5 to 25.0 feet: SANDY SILT (MH) , dark gray to black, dense, brittle. (FILL)	0	0	100
CB	3.9	2	None	1/1				25.0 to 26.0 feet: SAND (SP) , light brown, fine to medium, dry. (FILL)	0	100	0
CB	0.9	0	None	3/3				26.0 to 27.5 feet: SILTY SAND (SM) , mottled dark gray to brown, fine to medium sand, medium to high plasticity fines, trace angular gravel, wood pieces at 27.5 feet (anthropogenic). (FILL)	Trace	40	60
					30			27.5 to 32.0 feet: SANDY SILT (MH) , light gray, medium to high plasticity fines, fine sand. (ALLUVIUM)	0	0-20	80-100
								@ 31.0 to 31.5 feet: fine sand lens.			
CB	1.1	0	None	3/3				32.0 to 59.0 feet: SAND (SP) , light gray, fine sand, trace root hairs and fine wood chips. (ALLUVIUM)	0	80-100	0-30
					35			@ 34.0 feet: 0.2-foot silt lens.			
								@ 35.0 feet: 0.2-foot silt lens.			
CB	0.9	0	None	2/2				@ 36.0 feet: 0.3-foot silt lens.			
								@ 37.5 feet: 0.2-foot silt lens.			
CB	0.6	0	None	3/3				@ 38.5 to 39.5 feet: silt lens.			
					40						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	3 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					32			32.0 to 59.0 feet: SAND (SP), (ALLUVIUM), continued.			
CB	1.2	0	None	2/2				@ 40.5 to 41.0 feet: silt lens.			
CB	1.2	0	None	3/3	45			@ 42.0 feet: 0.2-foot silt lens.			
CB	1.6	0	None	1/1				@ 46.5 to 47.0 feet: silt lens.			
CB	1.3	0	None	4/4	50			@ 49.5 feet: 0.3-foot silt lens.			
CB	1.0	0	None	3/3				@ 50.3 to 50.8 feet: silt lens.			
CB	1.0	0	None	3/3				@ 51.0 feet: 0.3-foot silt lens.			
CB	1.3	0	None	3/3	55			@ 52.0 feet: 0.5-foot silt lens.			
CB	0.9	0	None	2/2				@ 53.0 to 54.0 feet: silt with organic laminations.			
CB	1.0	0	None	3/3				@ 58.5 to 59.0 feet: silt lens, trace organics.			
					60			59.0 to 91.0 feet: SAND (SP) , as on following page.	0	95-100	0-5

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	4 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					65			59.0 to 91.0 feet: SAND (SP) , gray, medium grained, poorly graded, less than 5 percent fines, individual grains gray, red, white, clear. (ALLUVIUM)	0	95-100	0-5
CB	1.5	0	None								
CB	1.8	0	None	5/5							
CB	0.3	0	None		70			@ 68.0 feet: 0.1-foot silt lens, brown.			
	0.1	0	None	5/5				@ 69.0 feet: 0.1-foot silt lens.			
CB	0.2	1	None		75			@ 70.0 to 70.5 feet: silt lens, trace organics, medium plasticity.			
	0.2	0	None	5/5				@ 72.0 feet: 0.1-foot silt lens.			
	NA	NA	None	0/0				@ 74.7 feet: 0.2-foot silt lens.			
	NA	NA	None		80			@ 76.0 to 81.0 feet: no recovery/drillers pushed past without sampling.			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	5 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
	NA	NA	None					59.0 to 91.0 feet: SAND (SP) , as on previous page, medium grained, poorly graded. (ALLUVIUM)			
CB	0.5	3	None								
				5/5	85						
	0.0	0	None								
CB	0.4	3	None								
				4/5				@ 88.0 feet: 10 to 15 percent fines (increase in fines), soupy, loose, wet.	0	85-90	10-15
	0.5	9	None		90						
CB	0.4	8	None					91.0 to 97.0 feet: SILTY SAND (SM) , gray, fine to medium sand, low to medium plasticity fines, firm, dense, single piece of gravel at 92.0 feet, flat 1-inch diameter. (ALLUVIUM)	0	80-85	15-20
				5/5	95						
	0.8	12	None								
NA	NA	NA	None	0/0				@ 96.0 to 97.0 feet: no recovery, driller over drilled casing.			
CB	0.6	1	None	4/4				97.0 to 131.5 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained, <5 percent fines, homogenous, variegated grain colors (mostly black with gray, white, red, tan, clear). (ALLUVIUM)	0	95-100	0-5
					100						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	6 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					105			97.0 to 131.5 feet: SAND (SP), as on previous page, medium grained, poorly graded. (ALLUVIUM)	0	95-100	0-5
CB	1.0	0	None	3.6/5					0	95-100	0-5
					110			@ 114.9 to 115.3 feet: SANDY SILT (ML), dark grayish brown, dry, stiff, low plasticity, friable, medium grained sand.	0	20	80
CB	1.4	0	None								
	1.1	0	None	10/10							
	1.4	2	None								
					115						
					120						
CB	1.8	8	None	15/15							
	0.9	1	None								

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-123
LOCATION	Portland, Oregon	PAGE	7 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	131.5 ft.
LOGGED BY	Matt Wilson/John Renda	DATE COMPLETED	2/5/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009310
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102839

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
	2.8	8	None		125	125	125	<p>97.0 to 131.5 feet: SAND (SP) , as on previous page, medium grained, poorly graded. (ALLUVIUM)</p> <p>@ 123.0 feet: grain size change to fine grained.</p> <p>@ 123.5 to 124.0 feet: silt layer (MH).</p> <p>@ 124.2 to 124.5 feet: silt layer (MH).</p> <p>@ 125.4 to 125.5 feet: silt layer (MH).</p> <p>@ 125.7 to 126.6 feet: silt layer (MH).</p> <p>@ 126.7 to 126.9 feet: silt layer.</p> <p>@ 128.1 to 128.5 feet: silt layer.</p> <p>@ 129.3 feet: color change to mixed dark gray and brown, dark gray is fine grained sand, brown is medium grained sand.</p> <p>@ 130.7 to 131.0 feet: sandy silt layer.</p>	0	95-100	0-5
	1.4	2	None		130	130	130	<p>Total depth = 131.5 feet.</p> <p>WELL COMPLETION DETAILS</p> <p>0 to 113.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.</p> <p>113.3 to 123.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>123.3 to 124.3 feet: 2-inch-diameter threaded end cap.</p> <p>0 to 5.0 feet: Concrete.</p> <p>5.0 to 108.7.0 feet: Bentonite grout.</p> <p>108.7 to 111.4 feet: 20-40 Colorado silica sand.</p> <p>111.4 to 124.2 feet: 10-20 Colorado silica sand.</p> <p>124.2 to 131.5 feet: Bentonite chips.</p>			
	2.0	2	None		135	135	135				
	1.4	4	None		140	140	140				

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-27
LOCATION	Portland, Oregon	PAGE	2 of 2
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.8 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	30.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/16/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009312
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102841

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25		30	See boring log for well MW-23-123 for geologic description.			
					35		40	<p>Total depth = 30.0 feet.</p> <p>WELL COMPLETION DETAILS</p> <p>0 to 17.7 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.</p> <p>17.7 to 27.7 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>27.7 to 28.0 feet: 2-inch-diameter threaded end cap.</p> <p>0 to 1.0 foot: Concrete.</p> <p>1.0 to 15.9 feet: 3/8-inch bentonite chips.</p> <p>15.9 to 28.0 feet: 10-20 Colorado silica sand.</p> <p>28.0 to 30.0 feet: 3/8-inch bentonite chips.</p>			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-75
LOCATION	Portland, Oregon	PAGE	2 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	75.7 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/16/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009311
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102840

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25			See boring log for well MW-23-123 for geologic description.			
					30						
					35						
					40						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-23-75
LOCATION	Portland, Oregon	PAGE	3 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	32.9 ft msl
DRILL METHOD	Rotosonic - AMS I7-C Compact Sonic	TOTAL DEPTH	75.7 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/16/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009311
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102840

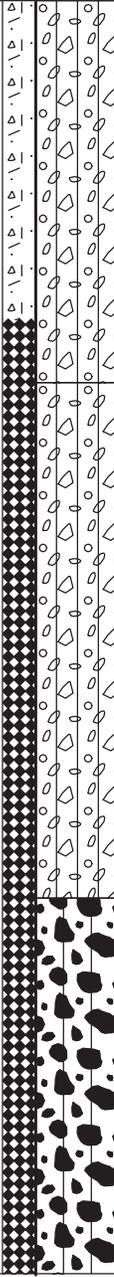
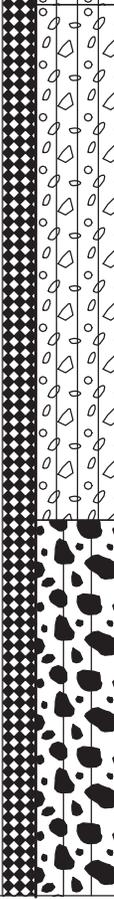
SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					45						
					50						
					55						
					60						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	1 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.7	0	None	6/6	5			0 to 6.0 feet: SILTY GRAVEL (GM) , dark brown, wet, fine to coarse gravel, nonplastic silt. (FILL) @ 1.6 feet: color change to light reddish brown, hard, dry. @ 4.5 feet: mixed black and light reddish brown color.	70	0	30
	0.4	0	None								
	0.5	0	None								
CB	0.1	0	None	4/4	10			6.0 to 14.1 feet: SILTY GRAVEL (GM) , dark brown, moist, soft, fine to cobble size angular gravel, highly plastic sticky silt. (FILL)	60	0	40
	1.0	0	None								
CB	0.6	3	None	4/5	15			14.1 to 25.0 feet: SILTY SANDY GRAVEL (GW-GM) , mixed dark gray and black, loose, dry, fine to cobble, well rounded angular gravel, nonplastic silt, well graded. (FILL) @ 18.2 feet: color change to black, wet, oily, strong hydrocarbon-like odor, spotty sheen at 19.0 to 20.0 feet.	60	20	20
	0.6	1	None								
	1.1	0	None								
CB	0.6	1	None	2.5/5	20						
	14.1	0	Yes ¹								

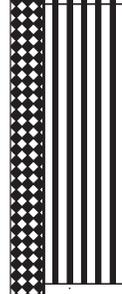
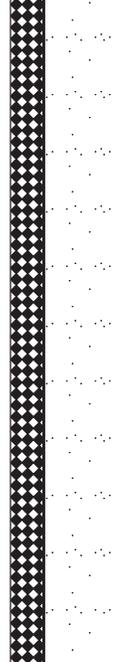
REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	2 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	10.9	0	Yes ¹	5/5	25			14.1 to 25.0 feet: SILTY SANDY GRAVEL (GW-GM) , as on previous page.	60	20	20
	16.1	0	Yes ¹					@ 21.0 to 24.6 feet: heavy sheen, oily, strong hydrocarbon-like odor. @ 22.2 to 22.4 feet: tar. @ 23.0 feet: lampblack and charcoal-like material. @ 24.0 feet: wood chips. @ 24.2 to 24.6 feet: gravelly sand layer, heavily saturated with oil.			
CB	29.6	0	Yes ¹	5/5	25			@ 24.6 to 25.0 feet: SILT WITH GRAVEL , dark olive gray with black banding, highly plastic, sticky, heavy sheen. (FILL)	30	70	0
	4.2	0	Yes ¹					@ 24.2 to 24.6 feet: gravelly sand layer, heavily saturated with oil. @ 24.6 to 25.0 feet: SILT WITH GRAVEL , dark olive gray with black banding, highly plastic, sticky, heavy sheen. (FILL) @ 25.0 to 29.4 feet: SANDY SILT (MH) , dark gray with red mottling, soft, moist, highly plastic, fine sand, spotty sheen, rootlets, hydrocarbon-like odor. (ALLUVIUM) @ 25.8 feet: increased sand content. @ 29.4 feet: heavy sheen, trace oil.			
CB	4.8	0	Yes ¹	8.9/10	30			29.4 to 65.5 feet: SAND (SP) , gray, wet, loose, poorly graded, fine to medium grained, occasional silt blebs, slight hydrocarbon-like odor. (ALLUVIUM)	0	100	0
	2.2	0	Yes ¹					@ 29.4 to 30.0 feet: heavy sheen, trace oil. @ 30.0 to 34.0 feet: slough from upper units.			
	1.0	0	Yes ²					@ 34.0 feet: no sheen.			
	1.4	2	None					@ 35.6 feet: color change to brown. @ 35.6 to 36.2 feet: rust colored banding.			

REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	3 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.9	0	None	9.3/10	45	45	45	29.4 to 65.5 feet: SAND (SP), (ALLUVIUM), same as previous page. @ 40.0 feet: color change to dark gray. @ 40.0 to 50.0 feet: slight hydrocarbon-like odor. @ 42.2 to 42.5 feet: silt layer, highly plastic.	0	100	0
	1.4	0	None								
CB	1.8	0	None	5/10	50	50	50	@ 45.8 to 46.2 feet: highly plastic silt layer. @ 47.0 to 47.3 feet: silt layer. @ 48.6 to 49.2 feet: silt layer.	5	85	10
	1.9	0	None								
CB	0.2	0	None	5/10	55	55	55	@ 57.6 feet: grain size change to fine to medium sand.	0	100	0
	0.7	0	None								

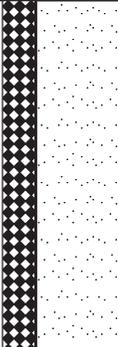
REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	4 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.0	1	None	7.3/10	65			29.4 to 65.5 feet: SAND (SP) , (ALLUVIUM), as on previous page.	0	95-100	0-5
	0.3	1	None					65.5 to 68.6 feet: SILT (MH) , dark brownish gray, firm, moist, highly plastic. (ALLUVIUM) @ 66.7 to 67.1 feet: poorly graded sand layer, fine grained.	0	0	100
	0.1	1	None						68.6 to 70.0 feet: SILTY SAND (SM) , dark gray, wet, slightly cohesive, fine grained sand, high plasticity silt, "dirty gym sock" odor. (ALLUVIUM)	0	60	40
	0.3	1	None					70.0 to 80.0 feet: SILT (MH) , dark brownish gray, firm, moist, medium plasticity. (ALLUVIUM) @ 71.5 to 72.3 feet: silty sand layer.		0	0
CB	0.0	1	None	6/10	70			70.0 to 80.0 feet: SILT (MH) , dark brownish gray, firm, moist, medium plasticity. (ALLUVIUM) @ 71.5 to 72.3 feet: silty sand layer.	0	0	100
	0.0	0	None					@ 77.0 to 78.6 feet: sand layer.	0	0	100
	0.0	1	None						75	0	0
	0.0	1	None					80		0	0

REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	5 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.7	0	None	3.2/10			80.0 to 130.0 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained, homogenous, strong "dirty gym sock" odor, variegated grain colors (mostly black, with gray, white, red and tan). (ALLUVIUM)				
					85		@ 80.3 to 80.8 feet: highly plastic, dark grayish brown silt layer.				
CB	0.3	1	None								
	0.7	2	None	10/10	90		@ 90.0 to 92.7 feet: occasional silt blebs.				
	0.6	1	None				@ 92.7 to 94.2 feet: highly plastic, dark grayish brown, firm silt layer.	0	0	100	
	1.0	1	None		95						
	1.2	2	None		100						

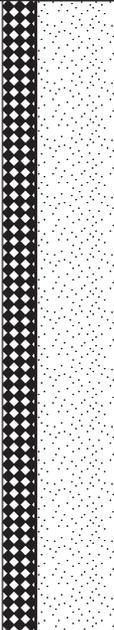
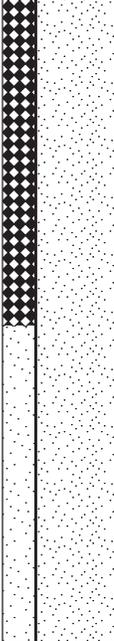
REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	6 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	13.1	0	None	10/10	105			80.0 to 130.0 feet: SAND (SP), as on previous page, medium grained. (ALLUVIUM)	0	100	0
	6.3	0	None								
	10.4	0	None								
	1.4	1	None								
CB	3.1	5	None	10/10	115			@ 114.8 to 117.0 feet: trace silt (~5 percent). @ 117.0 feet: wood fragments and silt laminations. @ 117.3 to 120.0 feet: occasional silt blebs, hard, light brown.	0	95	5
	3.1	8	None								
	2.6	7	None								
	1.2	1	None								

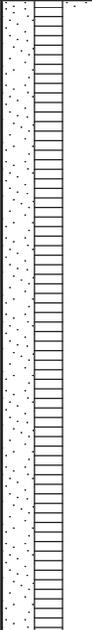
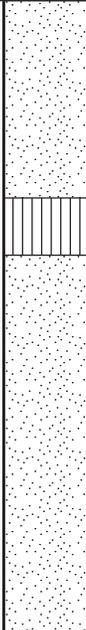
REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-130
LOCATION	Portland, Oregon	PAGE	7 of 7
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.3 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	131.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/2/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009302
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102832

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.9	4	None	10/10	125			80.0 to 130.0 feet: SAND (SP), as on previous page, medium grained. (ALLUVIUM)	0	100	0
	1.0	3	None		125			@ 123.1 to 124.0 feet: very wet, very soft, soupy, sandy silt layer, low plasticity.	0	30	70
	0.7	2	None		130			@ 128.1 to 129.4 feet: trace silt, medium dense.	0	95	5
	0.6	1	None		135			Total depth = 130.0 feet. Sampling stopped at 130.0 feet. Well materials to 131.1 feet during well installation.	0	0	0
WELL COMPLETION DETAILS 0 to 120.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe. 120.1 to 130.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 130.1 to 131.1 feet: 2-inch-diameter threaded end cap. 0 to 5.0 feet: Concrete. 5.0 to 115.0 feet: Bentonite grout with 10 percent organoclay by volume. 115.0 to 117.5 feet: 20-40 Colorado silica sand. 117.5 to 131.1 feet: 10-20 Colorado silica sand.											

REMARKS

¹ Dull orange swirls and specks of fluorescence, green fluorescent smearing on plastic sample bag. ² Trace orange fluorescence.



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-70
LOCATION	Portland, Oregon	PAGE	1 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.4 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	71.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/3/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009303
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102833

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					5 10 15 20			<p>See boring log for well MW-24-130 for geologic description.</p>			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-70
LOCATION	Portland, Oregon	PAGE	2 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.4 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	71.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/3/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009303
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102833

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25		30	<p>See boring log for well MW-24-130 for geologic description.</p>			
					35						
					40						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-70
LOCATION	Portland, Oregon	PAGE	3 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.4 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	71.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/3/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009303
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102833

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					45			See boring log for well MW-24-130 for geologic description.			
					50						
					55						
					60						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	MW-24-70
LOCATION	Portland, Oregon	PAGE	4 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	31.4 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	71.1 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/3/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009303
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102833

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					65	70	75	80			
See boring log for well MW-24-130 for geologic description.											
Total depth = 71.1 feet.											
WELL COMPLETION DETAILS											
0 to 60.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.											
60.1 to 70.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.											
70.1 to 71.1 feet: 2-inch-diameter threaded end cap.											
0 to 5.0 feet: Concrete.											
5.0 to 54.8 feet: Bentonite grout with 10 percent organoclay by volume.											
54.8 to 57.7 feet: 20-40 Colorado silica sand.											
57.7 to 71.1 feet: 10-20 Colorado silica sand.											

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	OW-8-28
LOCATION	Portland, Oregon	PAGE	1 of 2
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	23.79 ² feet
DRILL METHOD	Hollow-stem Augers	TOTAL DEPTH	29.0 feet
LOGGED BY	Matt Wilson	DATE COMPLETED	8/13/10
SAMPLING METHOD	2-foot split-spoon (SS)	PERMIT/STARTCARD NO.	1010937
BOREHOLE DIAMETER	8-inches	WATER RESOURCES WELL ID	L103383

SAMPLING METHOD	HYDROGEN CYANIDE HEADSPACE (ppm)	VOC HEADSPACE (ppm)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
SS	1	0.3	No	1.3/2.0	5 10 15 20	▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲ ▲	| | | | | | | | | | | |	0 to 10.9 feet: GRAVELLY SILT (ML) , dark brown to black, dry, hard, friable, nonplastic silt, angular, fine to coarse gravel. (FILL)	30	0	70
SS	1	0.0	No	1.0/2.0							
SS	NA	NA	NA	0.0/2.0				@ 4.0 to 6.0 feet: no recovery (gravel blocked sampler).			
SS	0	0.0	No	1.0/2.0				@ 6.0 feet: moist, trace yellow brown patches, low plasticity.			
SS	0	0.0	No	1.2/2.0				@ 8.4 to 9.0 feet: lampblack. @ 9.0 feet: color change to black.			
SS	0	0.0	No	1.4/2.0							
SS	1	0.0	No	0.8/2.0				10.9 to 17.2 feet: SAND (SP) , dark reddish brown, dry, loose, fine grained, poorly graded. (FILL) @ 12.0 to 14.0 feet: trace gravel.	0	100	0
SS	0	0.1	No	1.0/2.0				@ 14.0 feet: wet.			
SS	1	0.3	¹	1.5/2.0				@ 16.5 to 17.2 feet: sheen visible on sample.			
SS	0	0.1	¹	1.5/2.0				17.2 to 19.5 feet: SILT (MH) , dark grayish brown, medium plasticity, firm, wet, trace fine sand, trace rootlets. (ALLUVIUM) @ 19.5 feet: silty sand.	0	5	95
								19.5 to 25.0 feet: SILTY SAND AND SILT			

REMARKS

¹ Faint dull yellow fluorescence in soil. ² City of Portland Datum.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	OW-8-28
LOCATION	Portland, Oregon	PAGE	2 of 2
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	23.79 ² feet
DRILL METHOD	Hollow-stem Augers	TOTAL DEPTH	29.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	8/13/10
SAMPLING METHOD	2-foot split-spoon (SS)	PERMIT/STARTCARD NO.	1010937
BOREHOLE DIAMETER	8-inches	WATER RESOURCES WELL ID	L103383

SAMPLING METHOD	HYDROGEN CYANIDE HEADSPACE (ppm)	VOC HEADSPACE (ppm)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
SS	1	1.6	No	1.7/2.0			19.5 to 25.0 feet: SILTY SAND AND SILT (SM-MH) intermixed, dark brownish gray, soft, wet, slight hydrocarbon-like odor.	0	50-55	45-50	
SS	0	0.4	No	1.0/2.0			@ 23.0 to 23.7 feet: silt layer.	0	0	100	
SS	0	0.9	No	1.0/2.0	25		@ 23.7 to 24.4 feet: silty fine sand.	0	80	20	
SS	0	0.4	No	0.4/2.0			@ 24.4 to 25.0 feet: silt.	0	0	100	
SS	0	0.3	No	0.8/1.0			25.0 to 29.0 feet: SILTY SAND (SM) , dark brownish gray, wet, medium dense, fine-grained sand.	0	80	20	
					30			Total depth = 29.0 feet.			
					35		WELL COMPLETION DETAILS 0 to 23.1 feet: 2-inch-diameter Schedule 40 PVC blank riser pipe. 23.1 to 28.1 feet: 2-inch-diameter slotted PVC screen with 0.020-inch slots. 28.1 to 28.7 feet: 2-inch-diameter Schedule 40 PVC end cap. 0 to 2.0 feet: Concrete. 2.0 to 20.6 feet: Bentonite chips. 20.6 to 29.0 feet: 10-20 Colorado Silica Sand.				
					40						

REMARKS

¹ Faint dull yellow fluorescence in soil. ² City of Portland Datum.

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	OW-9-25
LOCATION	Portland, Oregon	PAGE	2 of 2
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.1 ft msl
DRILL METHOD	Rotosonic - AMS 17-C Compact Sonic	TOTAL DEPTH	25.3 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/8/10
SAMPLING METHOD	4-in. by 5-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009309
BOREHOLE DIAMETER	6-inches	WATER RESOURCES WELL ID	L102843

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25	30	35	40			
							40	<p>See boring log for well PW-9-92 for geologic description.</p> <p>Total depth = 25.3 feet.</p> <p>WELL COMPLETION DETAILS</p> <p>0 to 20.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.</p> <p>20.0 to 25.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>25.0 to 25.3 feet: 2-inch-diameter threaded end cap.</p> <p>0 to 2.0 feet: Concrete.</p> <p>2.0 to 17.7 feet: Granular bentonite.</p> <p>17.7 to 25.3 feet: 10-20 Colorado silica sand.</p>			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-7-93
LOCATION	Portland, Oregon	PAGE	1 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.2 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	96.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/22/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009306
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102837

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.4	0	None	2.8/5	5			0 to 0.9 foot: GRAVEL WITH SILT (GW) , dark gray, loose, wet, angular, well graded. (FILL)	90	0	10
	0.0	0	None					0.9 to 6.0 feet: GRAVELLY SILT (ML) , black with reddish brown patches, stiff, moist, low plasticity, grass fibers at 1.0 foot, gravel is coarse to cobble size, angular, trace red brick pieces. (FILL)	30	0	70
CB	0.1	0	None	2.7/5	10			6.0 to 9.8 feet: SILTY GRAVEL (GM) , light gray, dry, loose, dusty, concrete pieces, gravel is well graded, fine to cobble size, angular. (FILL)	80	0	20
	0.2	0	None								
CB	0.2	0	None	2.6/5	15			9.8 to 17.5 feet: SILTY GRAVEL WITH SAND (GM) , dark reddish brown, soft, moist, well graded, fine to cobble sized, angular gravel, low plasticity silt, fine to medium sand. (FILL)	50	20	30
	0.1	0	None					@ 11.2 feet: wet. @ 11.6 to 15.0 feet: very wet, light sheen on water, brown oil spots observed on plastic sampling bag.			
CB	0.3	0	None	4/5	20			@ 16.5 to 17.0 feet: sand layer, dark gray, loose, wet, poorly graded, fine to medium, no sheen.	0	100	0
	0.0	0	None					17.5 to 23.2 feet: SILT (MH) , dark olive gray, wet, very soft, medium to high plasticity, trace fine sand, no sheen, slight hydrocarbon-like odor. (ALLUVIUM)	0	0-5	95-100

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-7-93
LOCATION	Portland, Oregon	PAGE	2 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.2 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	96.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/22/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009306
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102837

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.2	0	None	4/10	25			17.5 to 23.2 feet: SILT (MH) , (ALLUVIUM), same as on previous page.	0	0-5	95-100
	0.4	0	None					23.2 to 43.6 feet: SAND (SP) , dark olive gray, loose, wet, poorly graded, fine to medium grained, <5 percent fines, slight hydrocarbon-like odor. (ALLUVIUM)	0	95-100	0-5
	0.5	0	None					@ 28.0 to 28.2 feet: silt layer. @ 28.2 feet: grain size change to fine.			
	0.5	0	None								
CB	0.3	0	None	7.2/10	30			@ 33.2 to 33.3 feet: sheen observed, moderate hydrocarbon-like odor.			
	0.7	0	None					@ 36.0 to 36.3 feet: silt layer.			
	1.0	0	None					@ 37.9 to 38.2 feet: silt layer.			
	0.9	0	None					@ 38.6 to 39.4 feet: silt layer.			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-7-93
LOCATION	Portland, Oregon	PAGE	3 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.2 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	96.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/22/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009306
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102837

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %		
CB	0.6	0	None	8.1/10	45	45		23.2 to 43.6 feet: SAND (SP) , as on previous page, fine to medium grained. (ALLUVIUM)	0	95-100	0-5		
	0.6	0	None					43.6 to 47.2 feet: SILT (MH) , dark grayish brown, moist, soft, highly plastic, <5 percent fine sand. (ALLUVIUM) @ 44.2 to 44.6 feet: sand layer.	0	0-5	95-100		
	0.9	0	None										
	0.5	0	None							47.2 to 55.4 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium grained, occasional silt blebs (up to cobble size). (ALLUVIUM) @ 49.5 to 50.0 feet: silt content increases, sand with silt, fine grained sand. @ 50.0 to 53.1 feet: medium grained, poorly graded sand, slight "dirty gym sock"/"onion" odor.	0	95-100	0-5
CB	1.5	0	None	6.7/10	50	50		@ 53.1 to 53.7 feet: silt with sand banding in 1-inch-thick bands, fine grained sand. @ 53.7 to 55.4 feet: fine grained sand with silt.	0	85-90	10-15		
	0.4	0	None								0	100	0
	0.4	0	None										
	0.5	0	None								55.4 to 59.4 feet: SILT (MH) , dark grayish brown, moist, soft, highly plastic, trace very thin sand partings (<1 mm). (ALLUVIUM)	0	0-5	95-100
					55	55		59.4 to 64.9 feet: SAND (SP) , next page.	0	95-100	0-5		
					60	60							

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-7-93
LOCATION	Portland, Oregon	PAGE	4 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.2 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	96.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/22/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009306
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102837

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.3	0	None	4.1/10	65			59.4 to 64.9 feet: SAND (SP) , dark gray, loose, wet, fine grained, poorly graded, trace fines. (ALLUVIUM) @ 60.0 to 63.4 feet: very loose, very wet, fine grained.	0	95-100	0-5
	0.9	4	None					@ 63.4 to 64.9 feet: SAND WITH SILT layer (SP-SM), fine grained, slightly cohesive, wet, ~5 to 10 percent fines, occasional silt blebs.	0	90-95	5-10
	0.7	0	None					64.9 to 69.0 feet: SILT (MH) , dark gray-brown, moist, soft, highly plastic, trace organic debris and shell fragments. (ALLUVIUM)	0	0	100
	1.1	0	None					@ 67.6 to 68.1 feet: sand layer.			
CB	1.8	1	None	8.7/10	70			69.0 to 69.5 feet: SAND (SP) , dark gray, slightly cohesive and compact, medium dense, wet, fine to medium grained, poorly graded. (ALLUVIUM)	0	95-100	0-5
	1.7	0	None					69.5 to 72.4 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium grained, trace fines. (ALLUVIUM)	0	95-100	0-5
	1.7	0	None					72.4 to 86.6 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained, little to no fines, slight "dirty gym sock/onion" odor, variegated grain colors (black, gray, white, tan, red). (ALLUVIUM)	0	100	0
	1.9	0	None					@ 77.7 to 78.6 feet: abundant silt blebs.			
					75						
					80						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-7-93
LOCATION	Portland, Oregon	PAGE	5 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.2 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	96.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/22/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009306
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102837

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %		
CB	0.5	1	None	8.9/10	85			72.4 to 80.6 feet: SAND (SP) , as on previous page, medium grained. (ALLUVIUM)	0	100	0		
	0.8	3	None					86.6 to 90.0 feet: SAND WITH SILT (SW-SM) , gray, dense, wet, well graded, fine to coarse, trace gravel, slight "gym sock/onion" odor. (ALLUVIUM)	5	85	10		
	1.4	12	None					90		90.0 to 95.0 feet: SAND (SP) , dark gray, loose, wet, well graded, medium grained, little to no fines, variegated grain colors (black, gray, white, tan, red, clear), slight "gym sock/onion" odor. (ALLUVIUM)	0	100	0
	1.3	6	None							Sampling terminated at 95.0 feet bgs. Borehole advanced to 96.5 feet because of washout from circulating water.			
CB	1.4	2	None	3/5	95			Sampling terminated at 95.0 feet bgs. Borehole advanced to 96.5 feet because of washout from circulating water.					
	1.9	6	None									WELL COMPLETION DETAILS 0 to 73.5 feet: 8-inch-diameter, flush-threaded, Schedule 40 carbon steel blank riser pipe. 73.5 to 93.5 feet: 8-inch-diameter, flush-threaded, stainless steel continuous wire-wrapped screen with 0.035-inch slots.	
					100								

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-7-93
LOCATION	Portland, Oregon	PAGE	6 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.2 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	96.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/22/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009306
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102837

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					105			93.5 to 95.5 feet: 8-inch-diameter stainless steel sump.			
					110			0 to 1.5 feet: Concrete.			
					115			1.5 to 69.5 feet: Bentonite grout with 10 percent organoclay by volume.			
					120			69.5 to 72.0 feet: 20-40 Colorado silica sand.			
								72.0 to 96.5 feet: 10-20 Colorado silica sand.			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PW-8-39
LOCATION	Portland, Oregon	PAGE	1 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	23.22 ³ feet
DRILL METHOD	Rotosonic and Hollow-stem Augers ²	TOTAL DEPTH	50.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	8/13/10
SAMPLING METHOD	10-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1010439
BOREHOLE DIAMETER	15-inches	WATER RESOURCES WELL ID	L103390

SAMPLING METHOD	HCN (ppm)	FID/PID (ppm)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	1	0.1	None	2.8/5	0			0 to 10.0 feet: SILT (ML) ; dark reddish brown with black patches, dry, gravelly silt, hard, no plasticity, trace concrete pieces, well-rounded gravel, fine to cobble size. (FILL)	25	0	75
	1	0.2	None								
CB	1	0.3	None	5/5	5			@ 5.0 feet: color change to black with patches of reddish brown, slightly moist, low plasticity, trace red brick and pink concrete.			
	0	0.2	None								
CB	1	0.4	None	4.8/5	10			10.0 to 14.4 feet: SAND (SP) ; dark brownish red, wet, fine to medium, poorly graded, loose, homogeneous.	0	100	0
	1	0.5	None								
CB	1	1.2	Yes ¹	5/5	15			14.4 to 16.1 feet: SAND (SP) ; gray to brown, wet, loose, fine to medium grained, poorly graded, sheen from 15.7 to 16.1 feet, slight petroleum hydrocarbon-like odor.	0	100	0
	2	1.4									
	1	0.8	Yes ¹					16.1 to 19.7 feet: SILT (MH) ; dark gray, moist, high plasticity, soft, trace fine sand, trace spotty sheen from 16.1 to 17.5 feet, trace petroleum hydrocarbon-like odor, trace rootlets and black organic material residue and small plant debris. @ 19.7 feet: increased sand content, sandy silt.	0	5	95
					20						

REMARKS

¹ Yellow and dull orange fluorescence. ² Boring was originally drilled and sampled with Rotosonic methods to 50.0 feet. Boring was then overdrilled with hollow-stem augers to 42.0 feet and well was installed. ³ City of Portland datum.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PW-8-39
LOCATION	Portland, Oregon	PAGE	2 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	23.22 ³ feet
DRILL METHOD	Rotosonic and Hollow-stem Augers ²	TOTAL DEPTH	50.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	8/13/10
SAMPLING METHOD	10-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1010439
BOREHOLE DIAMETER	15-inches	WATER RESOURCES WELL ID	L103390

SAMPLING METHOD	HCN (ppm)	FID/PID (ppm)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	1	0.4	None	7.5/10	25	30	35	<p>19.7 to 31.4 feet: SILTY SAND AND SILT (SM-MH); dark gray, wet, fine sand, moderately plastic silt, soft, trace hydrocarbon-like odor, trace gravel, sand and silt are intermixed, some thin sand layers can be discerned but there appears to be no stratification.</p> <p>@ 28.8 to 30.0 feet: silt layer.</p>	0	50-60	40-50
	1	0.4	None								
	1	0.4	None								
	1	0.2	None								
CB	1	0.5	None	8/10	30	35	40	<p>31.4 to 37.5 feet: SILTY SAND (SM); dark brownish gray, wet, very soft, fine sand and high plasticity silt, abundant silt blebs.</p> <p>37.5 to 43.0 feet: SAND (SP); dark gray, loose, wet, poorly graded, abundant high plasticity silt blebs, fine to medium sand, sand grains variegated in color (mostly black with gray, red, clear, tan, white).</p>	0	60	40
	1	0.4	None								
	1	0.6	None								
	1	0.6	None								

REMARKS

¹ Yellow and dull orange fluorescence. ² Boring was originally drilled and sampled with Rotosonic methods to 50.0 feet. Boring was then overdrilled with hollow-stem augers to 42.0 feet and well was installed. ³ City of Portland datum.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PW-8-39
LOCATION	Portland, Oregon	PAGE	3 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	23.22 ³ feet
DRILL METHOD	Rotosonic and Hollow-stem Augers ²	TOTAL DEPTH	50.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	8/13/10
SAMPLING METHOD	10-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1010439
BOREHOLE DIAMETER	15-inches	WATER RESOURCES WELL ID	L103390

SAMPLING METHOD	HCN (ppm)	FID/PID (ppm)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	1	0.4	None	7.5/10			37.5 to 43.0 feet: SAND (SP), as on previous page.		0	70	30
	1	0.0	None		45		43.0 to 50.0 feet: SAND (SP); dark gray with variegated sand grains color (mostly black with red, gray, white, clear, tan), loose, poorly graded, medium grained, wet.		0	100	0
	1	0.2	None				@ 49.0 to 50.0 feet: large silt bleb, sand with silt.		0	90	10
	1	0.2	None		50		Total depth = 50.0 feet.				
					55		WELL COMPLETION DETAILS 0 to 24.2 feet: 6-inch-diameter, flush-threaded, Schedule 40 low-carbon steel blank riser pipe. 24.2 to 39.2 feet: 6-inch-diameter, stainless steel, continuous wire-wrapped well screen with 0.035-inch slots. 39.2 to 42.2 feet: 6-inch-diameter stainless steel sump. 0 to 2.0 feet: Concrete. 2.0 to 23.0 feet: Bentonite chips. 23.0 to 42.2 feet: 10-20 Colorado Silica Sand. 42.2 to 50.0 feet: Bentonite.				
					60						

REMARKS

¹ Yellow and dull orange fluorescence. ² Boring was originally drilled and sampled with Rotosonic methods to 50.0 feet. Boring was then overdrilled with hollow-stem augers to 42.0 feet and well was installed. ³ City of Portland datum.

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-8-68
LOCATION	Portland, Oregon	PAGE	1 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	70.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/11/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009305
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102836

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.2	0	None	2.9/5	5			0 to 2.5 feet: GRAVEL WITH SILT (GW-GM) , dark grayish brown, loose, moist, fine to cobble, angular gravel. (FILL)	90	0	10
	0.2	0	None					2.5 to 7.0 feet: GRAVEL WITH SILT (GW-GM) , light gray, loose, dry, dusty, fine to cobble-sized angular gravel. (FILL)	90	0	10
CB	0.2	0	None	2/2			@ 5.0 feet: dark gray, brick and concrete rubble.				
CB	0.3	0	None	0.7/3			7.0 to 10.5 feet: GRAVEL WITH SILT (GW-GM) , mottled dark reddish brown and black, sticky, moist, well graded, fine to cobble-sized gravel, high plasticity silt, trace brick pieces. (FILL)	80	0	20	
CB	0.4	1	None	5/5	10		10.5 to 12.0 feet: SILTY SAND (SM) , brown, loose, moist to wet, fine to medium sand, trace brick pieces. (FILL)	0	80	20	
	2.0	1	None				12.0 to 13.0 feet: SANDY SILT (ML) , mottled reddish brown and gray, wet, firm (1.0 kg/cm ²), low plasticity, fine sand. (FILL)	0	40-50	50-60	
							13.0 to 14.0 feet: SAND WITH SILT (SP-SM) , reddish brown, very loose, wet, medium grained, poorly graded. (FILL)	0	90	10	
CB	5.9	1	None	1.2/5	15		14.0 to 15.8 feet: SAND (SP) , dark gray, very loose, wet, poorly graded, fine to medium grained, slight hydrocarbon-like odor, variegated grain colors (black, gray, white, clear, red). (FILL)	0	100	0	
							@ 15.0 feet: moderate hydrocarbon-like odor, trace oil, sheen present, crude oil odor.				
							15.8 to 20.0 feet: SILT (MH) , dark grayish brown, high plasticity, very soft, wet. (ALLUVIUM)	0	0	100	

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-8-68
LOCATION	Portland, Oregon	PAGE	2 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	70.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/11/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009305
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102836

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %			
CB	0.4	1	None	10/10	25			20.0 to 27.5 feet: SANDY SILT (ML) ; dark grayish brown, low plasticity, fine sand, no sheen, very soft, wet. (ALLUVIUM)	0	30	70			
	0.4	1	None											
	0.6	1	None								@ 26.0 to 27.5 feet: increasing sand content with depth.			
	0.3	0	None								27.5 to 30.0 feet: SAND WITH SILT (SP-SM) , dark gray, loose, wet, fine to medium grained, poorly graded, no sheen. (ALLUVIUM)	0	90	10
CB	0.8	1	None	8/10	35	30		30.0 to 35.1 feet: SAND (SP) , dark gray, very loose, very wet, fine to medium grained, poorly graded, no sheen. (ALLUVIUM)	0	100	0			
	0.4	0	None											
	0.6	1	None								35.1 to 38.9 feet: SILT (MH) , dark grayish brown, highly plastic, wet. (ALLUVIUM) @ 35.1 to 35.6 feet: sheen, moderate hydrocarbon-like odor. @ 35.6 to 35.8 feet: sand layer. @ 37.1 to 37.5 feet: sand layer. @ 37.9 to 38.0 feet: sand layer.	0	0	100
	0.4	0	None								38.9 to 46.0 feet: SAND (SP) , as on following page.	0	95-100	0-5

REMARKS

LOG OF EXPLORATORY BORING

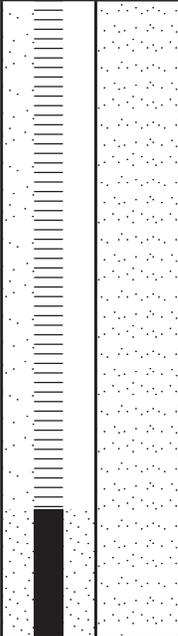
PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-8-68
LOCATION	Portland, Oregon	PAGE	3 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	70.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/11/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009305
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102836

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.6	0	None	8/10	45			38.9 to 46.0 feet: SAND (SP) , dark gray, very loose, very wet, fine to medium grained, poorly graded, no sheen, moderate hydrocarbon-like odor. (ALLUVIUM)	0	95-100	0-5
	0.4	0	None					46.0 to 46.9 feet: SILT (MH) , dark grayish brown, highly plastic, wet with organic debris laminations. (ALLUVIUM)	0	0	100
	0.3	0	None					46.9 to 70.0 feet: SAND (SP) , dark gray, very loose, wet, poorly graded, medium grained, <5 percent fines, variegated grain color (black with gray, white, red, clear). (ALLUVIUM)	0	100	0
	0.2	0	None					@ 49.0 to 49.3 feet: highly plastic silt layer.			
CB	0.2	1	None	9/10	50			@ 55.2 feet: no silt.			
	0.4	1	None					@ 57.3 to 57.8 feet: highly plastic silt layer.			
	0.2	0	None					@ 58.7 to 59.1 feet: highly plastic silt layer.			
	0.3	0	None					@ 59.5 to 60.0 feet: abundant silt blebs with organic debris.			

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-8-68
LOCATION	Portland, Oregon	PAGE	4 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	24.6 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	70.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	2/11/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009305
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102836

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.9	2	None	7.5/10	65		46.9 to 70.0 feet: SAND (SP), (ALLUVIUM), continued.	0	100	0	
	0.7	3	None		65						
	1.0	1	None		65						
	0.6	1	None		70						
					70		Total depth = 70.0 feet.				
					75		<p>WELL COMPLETION DETAILS</p> <p>0 to 48.0 feet: 8-inch-diameter, flush-threaded, Schedule 40 carbon steel riser pipe.</p> <p>48.0 to 68.0 feet: 8-inch-diameter, flush-threaded, Schedule 40 stainless steel continuous wire-wrapped screen with 0.035-inch slots.</p> <p>68.0 to 70.0 feet: 8-inch-diameter stainless steel sump.</p> <p>0 to 4.0 feet: Concrete.</p> <p>4.0 to 43.0 feet: Bentonite grout with 10 percent organoclay by volume.</p> <p>43.0 to 45.7 feet: 20-40 Colorado silica sand.</p> <p>45.7 to 70.0 feet: 10-20 Colorado silica sand.</p>				
					80						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-9-92
LOCATION	Portland, Oregon	PAGE	1 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.0 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	95.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/1/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009308
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102842

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
Hand Dug	NA	NA	None	NA				0 to 2.0 feet: SILTY GRAVEL (GW-GM) , dark brown, moist to wet, well graded, angular gravel, low plasticity silt. (FILL)	80	0	20
CB	0.2	0	None	3/3				2.0 to 15.8 feet: GRAVELLY SILT (ML) , dark gray to black, moist, sticky, low plasticity, well graded angular gravel, slight hydrocarbon-like odor, trace red brick pieces, fine to cobble size gravel. (FILL)	45-50	0	50-55
CB	0.3	0	None	2.9/5	5			@ 7.4 feet: color change to brown.			
	0.4	0	None								
CB	0.3	0	None	3.5/5	10						
	0.3	0	None								
CB	0.9	0	None	1.8/5	15			15.8 to 22.0 feet: GRAVELLY SAND WITH SILT (SW) , black, moist, abundant cobble size pieces of concrete, sooty (lampblack), well graded, fine to coarse sand, no sheen, moderate hydrocarbon-like odor (naphthalene) (core blockage, poor recovery). (FILL)	40	50	10
	0.7	0	None					@ 18.0 feet: wet; large chunks of lampblack, brick, and concrete.			
					20						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-9-92
LOCATION	Portland, Oregon	PAGE	2 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.0 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	95.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/1/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009308
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102842

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	1.1	0	None	4/5	25			15.8 to 22.0 feet: GRAVELLY SAND WITH SILT (SP) , (ALLUVIUM), continued.	40	50	10
	0	0	None					0	100	0	
CB	0.5	0	None	5/5	25			22.0 to 25.0 feet: SAND (SP) , brownish red, wet, loose, poorly graded, fine to medium sand. (ALLUVIUM) @ 22.2 to 22.3 feet: silt layer.	0	100	0
	0.5	0	None					0	45-50	50-55	
CB	0.5	0	None	6.6/10	30			26.3 to 27.6 feet: SANDY SILT (MH) , dark olive gray, soft, wet, fine sand, highly plastic silt with intermittent sand layers. (ALLUVIUM)	0	0-5	95-100
	0.5	0	None					27.6 to 29.1 feet: SILT (MH) , dark olive gray, soft, wet, highly plastic silt, trace fine sand, trace brown organic debris. (ALLUVIUM) @ 28.7 to 29.1 feet: sand layer.	0	50-55	45-50
CB	0.5	0	None	6.6/10	30			29.1 to 37.7 feet: SILTY SAND (SM) , dark olive gray, soft, wet, interbedded thin fine sand and high plasticity silt layers (0.1 to 0.2-feet thick), slightly cohesive. (ALLUVIUM)	0	70-80	20-30
	0.9	0	None					0	70-80	20-30	
CB	0.7	0	None	6.6/10	35			37.7 to 40.0 feet: SILTY SAND (SM) , dark olive gray, loose, very wet, fine sand, poorly graded. (ALLUVIUM)	0	70-80	20-30
	0.5	0	None					0	70-80	20-30	
					40						

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-9-92
LOCATION	Portland, Oregon	PAGE	3 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.0 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	95.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/1/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009308
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102842

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %			
CB	0.7	0	None	4.6/10	45	[Patterned]	[Patterned]	40.0 to 46.3 feet: SILT WITH SAND (ML) , dark grayish brown, very soft, very wet, low plasticity, fine sand, interspersed interbedded thin sand layers. (ALLUVIUM)	0	10	90			
	0.7	0	None					46.3 to 50.0 feet: SILTY SAND (SM) , dark brownish gray, medium dense, wet, cohesive, fine sand, low plasticity silt. (ALLUVIUM)	0	60	40			
	0.3	0	None						50	[Patterned]	[Patterned]	50.0 to 57.7 feet: SAND (SP) , dark brownish gray, very loose, very wet, poorly graded fine to medium grained sand, <5 percent fines, slight "dirty gym sock/onion" odor. (ALLUVIUM)	0	95-100	0-5
	0.4	0	None					57.7 to 64.0 feet: SILTY SAND (SM) , dark grayish brown, medium dense, wet, fine sand. (ALLUVIUM)				0	80	20
CB	1.3	0	None	9/10	55	[Patterned]	[Patterned]			60				
	0.9	0	None											
	1.1	0	None											
	0.6	0	None											

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-9-92
LOCATION	Portland, Oregon	PAGE	4 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.0 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	95.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/1/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009308
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102842

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %	
CB	NA	NA	None	2.3/10	65			57.7 to 64.0 feet: SILTY SAND (SM) , (ALLUVIUM), continued. (@ 60.0 to 67.7 feet: no recovery.)	0	80	20	
	NA	NA	None					64.0 to 70.0 feet: SAND (SW) , dark brownish gray, loose, wet, well graded, fine to coarse, coarse sand occurs in thin intermittent layers, majority of sand is fine grained, occasional silt blebs. (ALLUVIUM)	0	95-100	0-5	
	NA	NA	None					70	70.0 to 95.0 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained, homogenous, variegated grain colors (black, gray, white, clear, red, brown). (ALLUVIUM) @ 70.0 to 71.5 feet: trace fines.	0	95-100	0-5
	1.2	5	None					75	0	100	0	
CB	1.3	3	None	5.5/10	75			75	0	100	0	
	0.2	2	None					80	0	100	0	
	0.2	1	None					85	0	100	0	
	0.2	0	None					90	0	100	0	

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-9-92
LOCATION	Portland, Oregon	PAGE	5 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.0 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	95.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/1/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009308
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102842

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	NA	NA	None	3.8/10	85	|	|	0 to 95.0 feet: SAND (SP), (ALLUVIUM), continued. (@ 80.0 to 86.2 feet: no recovery.)	0	95-100	0-5
	NA	NA	None								
	0.3	3	None								
	0.7	42	None								
CB	0.3	13	None	5/5	90	|	|	@ 89.5 to 90.0 feet: medium dense, grayish brown compacted silty sand layer.	0	95-100	0-5
	0.3	5	None								
					95	|	|	Total depth of boring at 95.0 feet.			
					100	|	|	WELL COMPLETION DETAILS 0 to 72.6 feet: 8-inch-diameter, flush-threaded, Schedule 40 carbon steel blank riser pipe. 72.6 to 92.6 feet: 8-inch-diameter, flush-threaded, Schedule 40 stainless steel continuous wire-wrapped screen with 0.035-inchs slots. 92.6 to 94.6 feet: 8-inch-diameter stainless			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	NW Natural Gasco Site	BORING NO.	PW-9-92
LOCATION	Portland, Oregon	PAGE	6 of 6
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	33.0 ft msl
DRILL METHOD	Rotosonic - Speedstar 15K	TOTAL DEPTH	95.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	3/1/10
SAMPLING METHOD	4-in. by 10-ft. core barrel (CB)	PERMIT/STARTCARD NO.	1009308
BOREHOLE DIAMETER	12-inches	WATER RESOURCES WELL ID	L102842

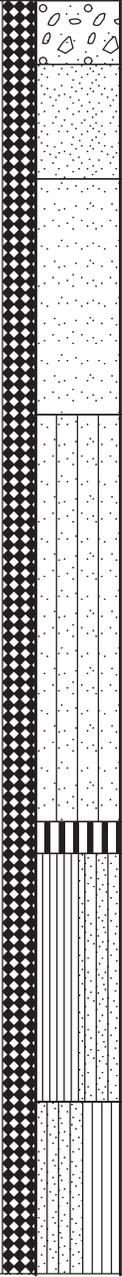
SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					105			steel sump.			
					110			0 to 1.0 foot: Concrete.			
					115			1.0 to 68.3 feet: Bentonite grout with 10 percent organoclay by volume.			
					120			68.3 to 70.8 feet: 20-40 Colorado silica sand.			
								70.8 to 94.6 feet: 10-20 Colorado silica sand.			
								94.6 to 95.0 feet: Native.			

REMARKS



LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ1-50
LOCATION	Portland, Oregon	PAGE	1 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.2 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	50.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/23/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008694
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99079

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.2	0	No	5/5	5			0 to 1.0 foot: SANDY GRAVEL (GW) , dark reddish-brown, very loose, moist, fine to cobble sized, medium graded, angular to rounded gravel, medium sand. (FILL)	60	40	0
	0.2	0	No	1.0 to 2.8 feet: SAND (SP) , dark reddish brown, loose, moist at 1.0 to 2.0 feet, wet at 2.0 feet, medium graded, poorly graded, no sheen. (FILL)				0	100	0	
CB	0.2	1	Yes ¹	1.5/1.5			2.8 to 6.5 feet: SAND (SP) , dark brownish red, loose, wet, poorly graded, fine to medium graded, no sheen. (FILL) @ 3.1 to 3.2 feet: 0.1 foot silt layer. @ 4.5 feet: 0.1 foot silt layer, no sheen.	0	95-100	0-5	
CB	0.5	0	Yes ¹	2.7/3.5			6.5 to 12.9 feet: SILTY SAND (SM) , dark gray, soft, wet, slight hydrocarbon-like odor, no sheen. (ALLUVIUM)	0	50-55	45-50	
CB	0.2	0	No	5/5	10			@ 10.6 feet: increased sand content.	0	70	30
	0.6	0	No	@ 12.3 feet: 0.1 foot sandy silt layer.				0	20	80	
	0.5	0	No	5/5	15			12.9 to 13.4 feet: SANDY SILT (MH) , medium plasticity, grayish-brown, soft, moist. (ALLUVIUM)	0	30	70
	0.6	0	No	13.4 to 17.3 feet: SANDY SILT (ML/SM) , dark gray, soft, wet, low plasticity, no sheen, numerous intermittent interbedded thin silty sand layers. (ALLUVIUM)				0	60-70	30-40	
					20			17.3 to 20.6 feet: SILTY SAND (SM/ML) , dark gray, soft, wet, with sandy silt interbeds, no sheen. (ALLUVIUM)	0	60-70	30-40

REMARKS

¹ Mildly fluorescent in silt nodules.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ1-50
LOCATION	Portland, Oregon	PAGE	2 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.2 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	50.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/23/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008694
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99079

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.4	0	No	5/5	25			17.3 to 20.6 feet: SILTY SAND (SM/ML) , continued.	0	20	80
	0.5	0	No	5/5				20.6 to 22.0 feet: SANDY SILT (ML) , with silty sand interbeds, dark gray, firm, wet, no sheen. (ALLUVIUM) @ 21.5 to 21.7 feet: sandy silt layer. 22.0 to 25.8 feet: SILTY SAND (SM) , dark gray, firm, wet, no sheen. (ALLUVIUM) @ 23.7 to 23.9 feet: silt layer, fine to medium sand. @ 24.6 to 24.8 feet: silt layer.	0	70	30
CB	0.5	0	No	5/5	30			25.8 to 30.0 feet: SAND WITH SILT (SP-SM) , dark gray, loose, wet, fine to medium sand, no sheen, poorly graded. (ALLUVIUM) @ 27.8 to 28.6 feet: silt layer, high plasticity.	0	80-90	10-20
	0.3	0	No	3.3/5				30.0 to 33.3 feet: SAND (SP) , dark gray, very loose, wet, soupy, poorly graded, no sheen, <5 percent fines. (ALLUVIUM)	0	95-100	0-5
CB	0.2	0	No	3.3/5	35			33.3 to 40.0 feet: SILT WITH SAND (MH) , dark grayish-brown, highly plastic, no sheen, firm. (ALLUVIUM)	0	10	90
	0.5	0	No	4.3/5				@ 35.2 to 35.9 feet: sand layer, poorly graded, fine to medium grained, dark gray. @ 37.9 to 38.1 feet: sand layer. @ 38.8 to 39.0 feet: sand layer.			
CB	0.1	0	No	4.3/5	40						
	0.1	0	No								

REMARKS

¹ Mildly fluorescent in silt nodules.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ1-50
LOCATION	Portland, Oregon	PAGE	3 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.2 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	50.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/23/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008694
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99079

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.3	0	No	4.6/5				40.0 to 43.7 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium sand, no sheen, <5 percent fines. (ALLUVIUM) @ 41.5 to 41.9 feet: highly plastic silt layer.	0	95-100	0-5
	0.5	0	No					43.7 to 50.5 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained sand with red, white, brown grains, <5 percent fines. (ALLUVIUM) @ 44.0 to 44.6 feet: highly plastic silt layer.	0	95-100	0-5
CB	0.5	0	No	4.1/5	45			@ 48.1 to 48.2 feet: silt layer. @ 48.4 to 48.5 feet: silt layer.			
	0.7	2	No		50			@ 49.7 to 49.8 feet: silt layer.			
					55			Total depth = 50.5 feet below mudline.			
					60			WELL COMPLETION DETAILS +27.5 to 45.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 steel blank riser pipe. 45.3 to 50.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 50.1 to 50.4 feet: 2-inch-diameter threaded end cap. 0 to 40.4 feet: Bentonite grout. 40.4 to 43.3 feet: 20-40 Colorado Silica Sand. 43.3 to 50.4 feet: 10-20 Colorado Silica Sand. 50.4 to 50.5 feet: Native.			

REMARKS

¹ Mildly fluorescent in silt nodules.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-43
LOCATION	Portland, Oregon	PAGE	1 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	43.8 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/3/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008697
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99082

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					5 10 15 20			See boring log PZ2-77 for lithologic description.			

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-43
LOCATION	Portland, Oregon	PAGE	2 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	43.8 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/3/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008697
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99082

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25						
					30						
					35						
					40						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-43
LOCATION	Portland, Oregon	PAGE	3 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	43.8 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/3/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008697
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99082

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					45	45	45	<p>Total depth = 43.8 feet below mudline.</p> <p>WELL COMPLETION DETAILS</p> <p>+34.2 to 38.5 feet: 2-inch-diameter, flush-threaded, Schedule 40 steel blank riser pipe.</p> <p>38.5 to 43.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>43.3 to 43.6 feet: 2-inch-diameter threaded end cap.</p> <p>0 to 33.5 feet: Bentonite grout with 10% organoclay.</p> <p>33.5 to 36.5 feet: 20-40 Colorado Silica Sand.</p> <p>36.5 to 43.6 feet: 10-20 Colorado Silica Sand.</p> <p>43.6 to 43.8 feet: Native.</p>			
					50	50	50				
					55	55	55				
					60	60	60				

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-77
LOCATION	Portland, Oregon	PAGE	1 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.1 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	80.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/2/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008698
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99083

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	1.2	1	No	2/3	5	5	5	<p>0 to 9.1 feet: SILTY SAND WITH WOOD CHIPS (SM), black, loose, wet, poorly graded, fine to medium grained with abundant small wood chips and wood fragments (approximately 75 percent of sample), strong hydrocarbon-like odor, spotty sheen with rainbow iridescence, oily from 0.7 to 3.0 feet, strong hydrocarbon-like odor.</p> <p>@ 5.0 feet: light spotty sheen.</p>	0	80	20
CB	1.4	0	No	2/2							
CB	13.6	0	Yes ²	2/5 ¹							
CB	16.5	7	Yes ²	3/3							
CB	4.1	1	No	5/5							
CB	6.1	1	Yes ²	5/5							
CB	1.1	1	Yes ²								
CB	0.8	0	No	5/5	15	15	<p>9.1 to 11.3 feet: SILT WITH WOOD CHIPS (ML), black, very soft, wet, low plasticity, with abundant small to large wood chips and fragments (approximately 35 to 50 percent of sample), heavy sheen, strong hydrocarbon-like odor, strong hydrogen sulfide-like odor.</p>	0	0	100	
							<p>11.3 to 14.5 feet: SILT (MH), gray-brown, soft, moist, highly plastic, occasional wood fragments and twig pieces, moderate hydrocarbon-like odor, moderate hydrogen sulfide-like odor, trace sand, no noticeable sheen. (ALLUVIUM)</p>	0	0-5	95-100	
CB	0.5	1	No		20	20	<p>14.5 to 21.9 feet: SAND (SP), dark gray, loose, wet, poorly graded, fine to medium sand, moderate hydrocarbon-like odor, moderate hydrogen sulfide-like odor. (ALLUVIUM)</p>	0	100	0	
							<p>@ 17.5 to 17.6 feet: silt layer.</p>				

REMARKS

¹ Wood chips plugged catcher in shoe. ² Yellow fluorescence consistent with wood chips.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-77
LOCATION	Portland, Oregon	PAGE	2 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.1 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	80.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/2/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008698
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99083

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.4	0	No	5/5	25			14.5 to 21.9 feet: SAND (SP) , continued.	0	100	0
								21.9 to 23.5 feet: SILT (MH) , dark gray-brown, soft, moist, high plasticity, trace organic debris, no sheen. (ALLUVIUM)	0	0	100
								23.5 to 33.5 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium grained, slight hydrocarbon-like odor, no sheen. (ALLUVIUM)	0	100	0
CB	1.0	0	No	5/5	30			33.5 to 35.0 feet: SANDY SILT (ML) , dark gray-brown, wet, fine to medium sand, low plasticity, no sheen. (ALLUVIUM)	0	20	80
								35.0 to 40.7 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained, variegated grain colors (red, brown, gray, black, white, tan), <5 percent fines, no sheen. (ALLUVIUM)	0	95-100	0-5
CB	0.9	5	No	5/5	35			@ 39.8 feet: silt blebs.			
								0.6	3	No	

REMARKS

¹ Wood chips plugged catcher in shoe. ² Yellow fluorescence consistent with wood chips.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-77
LOCATION	Portland, Oregon	PAGE	3 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.1 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	80.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/2/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008698
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99083

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.5	3	No	5/5	45		35.0 to 40.7 feet: SAND (SP), continued.				
							40.7 to 41.5 feet: SILT (MH), gray-brown, soft, wet, highly plastic, no sheen. (ALLUVIUM)	0	0	100	
							41.5 to 43.5 feet: SAND (SP), dark gray, loose, wet, medium grained, poorly graded, no sheen. (ALLUVIUM)	0	100	0	
							43.5 to 44.9 feet: SILT (MH), gray-brown, soft, moist, high plasticity, no sheen. (ALLUVIUM)	0	0	100	
CB	0.6	1	No	5/5	50		44.9 to 80.0 feet: SAND (SP), dark gray, loose, wet, poorly graded, medium grained, variegated grain colors, <5 percent fines, no sheen. (ALLUVIUM)	0	95-100	0-5	
							@ 47.9 to 48.8 feet: SILT (MH), high plasticity silt layer.	0	0	100	
CB	0.3	1	No	5/5	55						
											0.7	2	No
CB	0.5	1	No	5/5	60						
											0.5	0	No

REMARKS

¹ Wood chips plugged catcher in shoe. ² Yellow fluorescence consistent with wood chips.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-77
LOCATION	Portland, Oregon	PAGE	4 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.1 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	80.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/2/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008698
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99083

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.4	2	No	5/5			44.9 to 80.0 feet: SAND (SP), continued.	0	95-100	0-5	
	0.6	9	No		65		@ 68.0 feet: trace silt blebs.				
CB	0.5	6	No	5/5							
	0.5	8	No		70		@ 74.5 to 75.0 feet: dark gray-brown silty sand layer.				
CB	0.5	5	No	5/5							
	0.5	4	No		75						
CB	0.5	7	No	5/5							
	0.5	5	No		80						

REMARKS

¹ Wood chips plugged catcher in shoe. ² Yellow fluorescence consistent with wood chips.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ2-77
LOCATION	Portland, Oregon	PAGE	5 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	3.1 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	80.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/2/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008698
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99083

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %	
					<div style="display: flex; flex-direction: column; align-items: center;"> <div style="margin-bottom: 20px;">85</div> <div style="margin-bottom: 20px;">90</div> <div style="margin-bottom: 20px;">95</div> <div style="margin-bottom: 20px;">100</div> </div>			Total depth = 80.0 feet below mudline. WELL COMPLETION DETAILS +35.6 to 72.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 steel blank riser pipe. 72.1 to 76.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 76.9 to 77.2 feet: 2-inch-diameter threaded end cap. 0 to 66.8 feet: Bentonite grout (with 10% organoclay from 0 to 30.0 feet). 66.8 to 69.8 feet: 20-40 Colorado Silica Sand. 69.8 to 77.2 feet: 10-20 Colorado Silica Sand. 77.2 to 80.0 feet: Native.				

REMARKS

¹ Wood chips plugged catcher in shoe. ² Yellow fluorescence consistent with wood chips.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ3-33
LOCATION	Portland, Oregon	PAGE	1 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-15.5 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	36.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/25/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008696
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99081

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	7.7	0	Yes ¹	2.7/3	5 10 15 20	5	5	0 to 8.9 feet: SILT (ML) , dark grayish-brown with black staining, very soft, wet, low plasticity, abundant rootlets, strong hydrocarbon-like odor (naphthalene), strong sheen with rainbow iridescence. (ALLUVIUM) @ 1.0 to 1.5 feet: black sticky oil like substance. Much anthropogenic material: wood fragments, a magnet, cardboard. @ 4.0 to 4.1 feet: heavy sheen and oil. @ 4.1 to 8.9 feet: no sheen. @ 7.0 to 7.1 feet: coarse sand layer. @ 7.5 feet: cardboard fragments, twigs.	0	0-5	95-100
CB	5.3	0	Yes ¹	5/5							
CB	4.9	0	Yes ¹	5/5							
CB	2.0	0	Yes ²	5/5							
CB	1.5	0	No	5/5							
CB	1.4	0	Yes ²	5/5							
CB	0.6	0	No	4/5			8.9 to 15.5 feet: SAND (SP) , very dark gray, loose, wet, poorly graded, fine to medium grained, occasional silt blebs, trace spotty sheen. (ALLUVIUM) @ 12.8 to 13.0 feet: SILT layer, medium plasticity. 15.5 to 18.0 feet: SAND (SP) , very dark gray, loose, wet, poorly graded, medium grained, occasional silt blebs, no sheen. (ALLUVIUM)	0	95-100	0-5	
CB	0.7	1	No	4/5			18.0 to 23.8 feet: SAND WITH SILT (SP-SM) , dark grayish-brown, very loose, wet, soupy, occasional silt blebs, poorly graded fine sand, no sheen. (ALLUVIUM)	0	85-90	10-15	

REMARKS

¹ Specks of green, orange, and yellow fluorescence. ² Trace fluorescence.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ3-33
LOCATION	Portland, Oregon	PAGE	2 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-15.5 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	36.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/25/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008696
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99081

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.6	0	No	4/5				18.0 to 23.8 feet: SAND WITH SILT (SP-SM), continued.	0	85-90	10-15
CB	0.5	0	No	5/5				@ 23.5 to 23.7 feet: sandy silt layer.	0	20	80
	0.6	1	No		25			23.8 to 24.8 feet: SANDY SILT (MH), grayish brown, soft, wet, medium plasticity silt, fine sand, no sheen. (ALLUVIUM)	0	100	0
CB	0.8	3	Yes ²	5/5				24.8 to 32.4 feet: SAND (SP), very dark gray, loose, wet, poorly graded, medium grained, variegated grain colors from gray, white, black, red, and tan, no sheen. (ALLUVIUM)			
	0.6	1	No		30			32.4 to 33.4 feet: SANDY SILT (MH), dark grayish-brown, soft, wet, highly plastic, no sheen, medium sand. (ALLUVIUM)	0	20	80
CB	0.6	2	No	3/3				33.4 to 36.0 feet: SAND (SP), dark grayish brown, loose, wet, poorly graded, fine to medium sand, no sheen. (ALLUVIUM)	0	95-100	0-5
					35			@ 34.1 to 34.3 feet: silt layer. @ 34.6 to 35.0 feet: silt layer.			
					40			Total depth = 36.0 feet below mudline.			
								See Page 3 for Well Completion Details.			

REMARKS

¹ Specks of green, orange, and yellow fluorescence. ² Trace fluorescence.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ3-33
LOCATION	Portland, Oregon	PAGE	3 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-15.5 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	36.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/25/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008696
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99081

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					45			<p>WELL COMPLETION DETAILS</p> <p>+42.5 to 27.7 feet: 2-inch-diameter, flush-threaded, Schedule 40 steel blank riser pipe.</p> <p>27.7 to 32.5 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>32.5 to 32.8 feet: 2-inch-diameter threaded end cap.</p> <p>0 to 23.5 feet: Bentonite grout.</p> <p>23.5 to 25.5 feet: 20-40 Colorado Silica Sand.</p> <p>25.5 to 32.8 feet: 10-20 Colorado Silica Sand.</p> <p>32.8 to 36.0 feet: Native.</p>			
					50						
					55						
					60						

REMARKS

¹ Specks of green, orange, and yellow fluorescence. ² Trace fluorescence.

LOG OF EXPLORATORY BORING

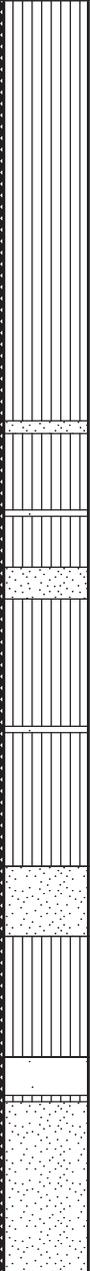
PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ4-12
LOCATION	Portland, Oregon	PAGE	2 of 2
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-8.6 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	16.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	12/4/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008699
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99084

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25			<p>WELL COMPLETION DETAILS</p> <p>+43.3 to 6.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 steel blank riser pipe.</p> <p>6.9 to 11.7 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>11.7 to 12.0 feet: 2-inch-diameter threaded end cap.</p> <p>0 to 4.7 feet: Bentonite chips.</p> <p>4.7 to 13.0 feet: 10-20 Colorado Silica Sand.</p> <p>13.0 to 16.5 feet: Bentonite chips.</p>			
					30						
					35						
					40						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ4-41
LOCATION	Portland, Oregon	PAGE	1 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-8.3 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	42.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/24/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008695
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99080

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	1.1	0	Yes ¹	4/5	5			0 to 13.6 feet: SILT (ML) , grayish brown to dark gray, very soft, wet, low plasticity, trace sand and gravel (<5 percent), spotty sheen, slight hydrocarbon-like odor. (ALLUVIUM)	0-5	0-5	95-100
	1.0	0		@ 1.1 to 1.3 feet: black, tarry-like interval.							
	1.3	0	Yes ²	@ 3.5 to 3.6 feet: slightly tarry, trace rootlets.							
CB	0.5	0	Yes ²	5/5	10			@ 5.6 to 5.8 feet: black laminations.	0	100	0
	0.2	0	Yes ²	@ 6.6 to 6.8 feet: sand layer with spotty sheen.							
	0.4	0	Yes ²	@ 8.0 to 8.1 feet: sand layer, spotty sheen.							
CB				5/5	15			@ 8.9 to 9.4 feet: sand layer, spotty sheen (in PZ4-12 1.3 feet layer of sand).	0	0	100
	0.4	0	Yes ³	@ 11.4 to 11.5 feet: sand layer.							
CB	0.6	0	Yes ³	4.5/5	20			13.6 to 14.7 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium grained, no sheen, gray, brown, white and red sand grains. (ALLUVIUM)	0	95-100	0-5
	0.4	0	No	14.7 to 16.6 feet: SILT (ML) , grayish-brown, soft, moist, low plasticity. (ALLUVIUM)							
								@ 15.8 feet: thin sand parting (<1 cm).			
								16.6 to 25.0 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium grained with silt blebs. (ALLUVIUM)			
								@ 17.2 to 17.3 feet: silt layer.			

REMARKS

¹ Green, yellow, and orange fluorescent specks and droplets. ² Heavy green, yellow, and orange fluorescent droplets. ³ Trace fluorescent droplets. ² Trace fluorescent sheen.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ4-41
LOCATION	Portland, Oregon	PAGE	2 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-8.3 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	42.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/24/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008695
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99080

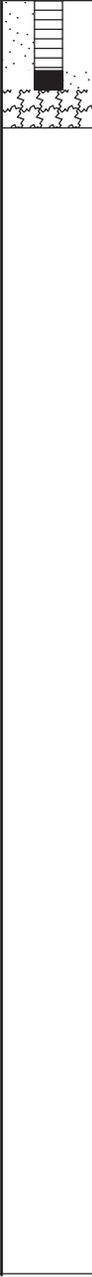
SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.3	0	No	4.5/5				16.6 to 25.0 feet: SAND (SP), continued. @ 20.8 feet: brown, hard, silt blebs. @ 21.3 feet: brown, hard, silt blebs. @ 22.2 to 22.5 feet: silt layer. @ 23.0 feet: increased silt content, sand with silt.	0	95-100	0-5
CB	0.6	0	No	4.9/5	25			25.0 to 33.5 feet: SAND (SP), very dark gray, loose, wet, poorly graded, medium grained, gray, black, white, brown and red grains, occasional silt blebs, no sheen. (ALLUVIUM)	0	95-100	0-5
CB	0.4	0	No	5/5	30			33.5 to 35.0 feet: INTERBEDDED SANDY SILT AND SILTY SAND (SM/ML), dark grayish-brown and dark gray, soft, wet, interbeds are approximately 1- to 2-inches thick, medium plasticity silt, fine to medium grained sand, no sheen. (ALLUVIUM)	0	60	40
CB	0.8	1	No	5/5	35			35.0 to 42.0 feet: SAND (SP), very dark gray, loose, wet, poorly graded, medium grained, gray, black, white, brown sand grains, no sheen, occasional silt blebs. (ALLUVIUM)	0	95-100	0-5
	0.4	1	No		40						

REMARKS

¹ Green, yellow, and orange fluorescent specks and droplets. ² Heavy green, yellow, and orange fluorescent droplets. ³ Trace fluorescent droplets. ² Trace fluorescent sheen.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ4-41
LOCATION	Portland, Oregon	PAGE	3 of 3
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	-8.3 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	42.0 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/24/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008695
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99080

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.2	0	Yes ⁴	2/2			35.0 to 42.0 feet: SAND (SP), continued. Total depth = 42.0 feet below mudline. WELL COMPLETION DETAILS +41.4 to 36.3 feet: 2-inch-diameter, flush-threaded, Schedule 40 steel blank riser pipe. 36.3 to 41.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 41.1 to 41.4 feet: 2-inch-diameter threaded end cap. 0 to 32.3 feet: Bentonite grout. 32.3 to 34.3 feet: 20-40 Colorado Silica Sand. 34.3 to 41.4 feet: 10-20 Colorado Silica Sand. 41.4 to 42.0 feet: Native.	0	95-100	0-5	

REMARKS

¹ Green, yellow, and orange fluorescent specks and droplets. ² Heavy green, yellow, and orange fluorescent droplets. ³ Trace fluorescent droplets. ⁴ Trace fluorescent sheen.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-20
LOCATION	Portland, Oregon	PAGE	2 of 2
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	20.3 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/20/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008692
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99034

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25			<p>Total depth = 20.3 feet.</p> <p>WELL COMPLETION DETAILS</p> <p>+5.5 to 15.2 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.</p> <p>15.2 to 20.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>20.0 to 20.3 feet: 2-inch-diameter threaded end cap.</p> <p>+0.3 to 1.0 foot: Cement.</p> <p>1.0 to 12.9 feet: Bentonite chips.</p> <p>12.9 to 20.3 feet: 10-20 Colorado Silica Sand.</p>			
					30						
					35						
					40						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-5
LOCATION	Portland, Oregon	PAGE	1 of 1
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.7 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	5.4 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/20/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008693
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99035

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					5	10	15	20			
								See boring log PZ5-85 for lithologic description.			
								Total depth = 5.4 feet. WELL COMPLETION DETAILS +5.5 to 3.8 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe. 3.8 to 4.8 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots. 4.8 to 5.0 feet: 2-inch-diameter threaded end cap. +0.5 to 0 feet: Concrete. 0 to 2.8 feet: Bentonite chips. 2.8 to 5.0 feet: 10-20 Colorado Silica Sand. 5.0 to 5.4 feet: Native.			

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-55
LOCATION	Portland, Oregon	PAGE	1 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	55.3 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/20/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008691
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99033

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					5 10 15 20	Δ Δ Δ		See boring log PZ5-85 for lithologic description.			

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-55
LOCATION	Portland, Oregon	PAGE	2 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	55.3 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/20/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008691
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99033

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					25	30	35				
					40						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-55
LOCATION	Portland, Oregon	PAGE	3 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	55.3 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/20/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008691
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99033

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					45		50				
					55			Total depth = 55.3 feet.			
					60			See Page 4 for Well Completion Details.			

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-55
LOCATION	Portland, Oregon	PAGE	4 of 4
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	55.3 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/20/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008691
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99033

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
					65			<p>WELL COMPLETION DETAILS</p> <p>+5.5 to 50.2 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.</p> <p>50.2 to 55.0 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>55.0 to 55.3 feet: 2-inch-diameter threaded end cap.</p> <p>+0.3 to 1.0 foot: Concrete.</p> <p>1.0 to 6.0 feet: Bentonite chips.</p> <p>6.0 to 45.2 feet: Bentonite grout.</p> <p>45.2 to 48.0 feet: 100 Colorado Silica Sand.</p> <p>48.0 to 55.3 feet: 10-20 Colorado Silica Sand.</p>			
					70						
					75						
					80						

REMARKS

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-85
LOCATION	Portland, Oregon	PAGE	1 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	85.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/18/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008690
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99032

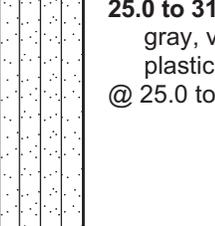
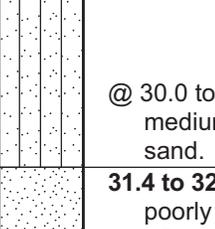
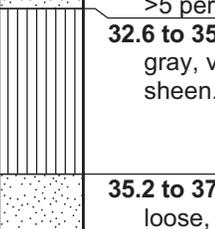
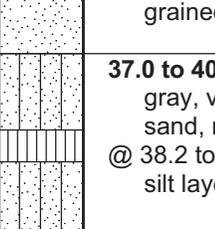
SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.0	NA	No	1/1				0 to 2.3 feet: SANDY GRAVEL WITH SILT (GW-GM) , dark brown and dark gray, moist, loose, fine to coarse angular gravel, fine to medium sand, well graded. (FILL)	60	30	10
CB	0.1	NA	No	1/4				@ 2.0 feet: wet, no sheen.			
	0.6	NA	No					2.3 to 6.8 feet: SAND (SP) , dark gray, loose, wet, poorly graded, light hydrocarbon-like odor. (FILL)	0	100	0
								@ 4.0 feet: large chunks of wood and wood debris.	0	100	0
CB				1/1	5			@ 6.2 feet: light sheen observed.			
CB	0.5	NA	No	4/4				6.8 to 20.0 feet: INTERBEDDED SILTY SAND AND SANDY SILT (SM/ML) , dark gray, loose, wet, fine sand, poorly graded, sand mixed with two separate fractions (interbedded). (ALLUVIUM)	0	50-60	40-50
	0.3	NA	No					@ 7.5 feet: light sheen (spotty), light hydrocarbon-like odor.			
	0.1	NA	No					@ 11.0 to 11.7 feet: poorly graded, fine to medium sand layer.			
CB				5/5	10			@ 13.2 to 13.6 feet: sandy silt layer.	0	20	80
	0.2	NA	No					@ 14.5 to 15.0 feet: sandy silt, trace rootlets and organic debris.	0	20	80
CB	0.0	NA	No	5/5	15			@ 16.0 to 16.4 feet: sandy silt layer.	0	20	80
	0.6	NA	No					@ 16.9 to 18.0 feet: sandy silt layer.			
								@ 18.0 feet: increased sand content.	0	80	20

REMARKS

NA = Not Analyzed.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-85
LOCATION	Portland, Oregon	PAGE	2 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	85.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/18/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008690
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99032

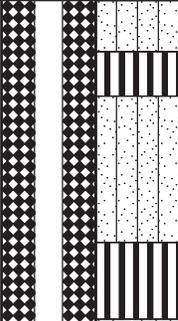
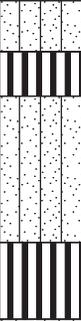
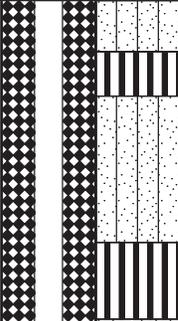
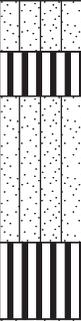
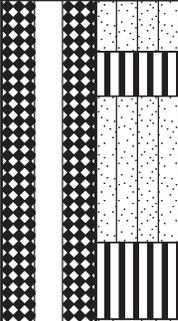
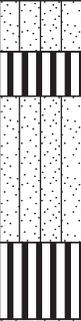
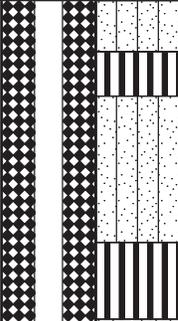
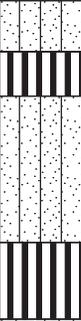
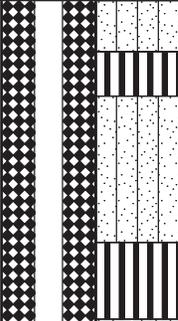
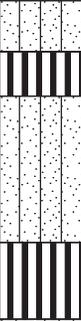
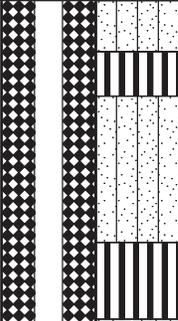
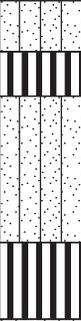
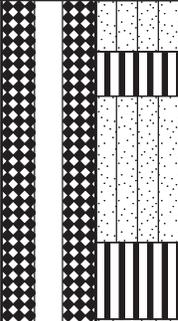
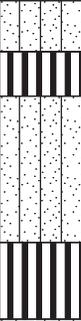
SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %		
CB	NA	NA	NA	3.8/5	25			20.0 to 25.0 feet: SANDY SILT (ML) , dark gray, wet, very soft, low plasticity silt, fine sand, trace wood pieces, trace gravel (<5 percent), no sheen. (ALLUVIUM)	0-5	20	80		
	0.1	NA	No										
CB	0.1	NA	No	5/5	30			25.0 to 31.4 feet: SILTY SAND (SM) , dark gray, very loose, wet, soupy, fine sand, low plasticity silt. (ALLUVIUM) @ 25.0 to 31.4 feet: no sheen.	0	55	45		
CB	0.0	NA	No	5/5						@ 30.0 to 31.4 feet: alternating layers of medium plasticity silt and medium grained sand.			
	0.1	NA	No							31.4 to 32.6 feet: SAND (SP) , dark gray, poorly graded, wet, loose, medium grained, >5 percent fines, no sheen. (ALLUVIUM)	0	95-100	0-5
	0.2	NA	No		35			32.6 to 35.2 feet: SANDY SILT (ML) , dark gray, very soft, wet, low plasticity, no sheen. (ALLUVIUM)	0	20	80		
CB	0.0	NA	No	5/5						35.2 to 37.0 feet: SAND (SP) , dark gray, loose, wet, poorly graded, fine to medium grained, no sheen. (ALLUVIUM)	0	95	5
					40			37.0 to 40.8 feet: SILTY SAND (SM) , dark gray, very soft, wet, fine to medium grained sand, no sheen. (ALLUVIUM) @ 38.2 to 38.7 feet: medium plasticity sandy silt layer, no sheen.	0	60	40		

REMARKS

NA = Not Analyzed.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-85
LOCATION	Portland, Oregon	PAGE	3 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	85.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/18/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008690
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99032

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.1	NA	No	5/5	45			37.0 to 40.8 feet: SILTY SAND (SM) , continued.	0	60	40
								40.8 to 41.5 feet: SILT (MH) , dark gray, highly plastic, soft, wet, no sheen. (ALLUVIUM)	0	0	100
CB	0.3	NA	No	5/5	45			41.5 to 43.8 feet: SILTY SAND (SM) , dark gray, loose, wet, intermittent thin silt layers, fine to medium grained sand, no sheen. (ALLUVIUM)	0	70	30
								43.8 to 45.0 feet: SANDY SILT (MH) , dark gray, moist, very stiff, medium plasticity, medium grained sand, no sheen. (ALLUVIUM)	0	30	70
CB	0.2	NA	No	5/5	45			45.0 to 48.1 feet: SAND (SP) , dark gray, loose, wet, poorly graded, <5 percent fines, medium grained, no sheen. (ALLUVIUM)	0	95-100	0-5
								48.1 to 49.0 feet: SAND AND SILT (MH/SP) , dark gray, alternating lenses. (ALLUVIUM)	0	50	50
CB	0.1	NA	No	5/5	50			49.0 to 49.8 feet: SILT WITH SAND (MH) , dark gray, very soft, wet, highly plastic, no sheen. (ALLUVIUM)	0	10	90
								49.8 to 85.5 feet: SAND (SP) , dark gray, loose, wet, poorly graded, medium grained, no sheen. (ALLUVIUM)	0	95-100	0-5
CB	0.1	NA	No	5/5	55			@ 54.0 feet: two coarse-size (2-inches diameter) pieces of gravel.			
CB	0.0	NA	No	5/5	55						
CB	0.1	NA	No	5/5	60						

REMARKS

NA = Not Analyzed.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-85
LOCATION	Portland, Oregon	PAGE	4 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	85.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/18/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008690
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99032

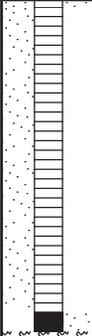
SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUOR-ESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHO-LOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.0	NA	No	5/5				49.8 to 85.5 feet: SAND (SP), continued.	0	95-100	0-5
	0.0	NA	No								
CB	0.1	NA	No	5/5	65						
	0.0	NA	No								
CB	0.0	NA	No	5/5	70			@ 70.0 to 85.5 feet: moderate "dirty gym sock" odor.			
	0.0	NA	No								
CB	0.0	NA	No	5/5	75						
	0.1	NA	No								
					80						

REMARKS

NA = Not Analyzed.

LOG OF EXPLORATORY BORING

PROJECT NAME	Gasco Seg 2 Capture Zone Test	BORING NO.	PZ5-85
LOCATION	Portland, Oregon	PAGE	5 of 5
DRILLED BY	Cascade Drilling, Inc.	GROUND SURFACE ELEVATION	10.8 ft msl
DRILL METHOD	Rotosonic - AMS C-17 Rig	TOTAL DEPTH	85.5 ft.
LOGGED BY	Matt Wilson	DATE COMPLETED	11/18/09
SAMPLING METHOD	5-foot by 4-inch core barrel (CB)	PERMIT/STARTCARD NO.	1008690
BOREHOLE DIAMETER	6-inch	WATER RESOURCES WELL ID	L99032

SAMPLING METHOD	VOC HEAD-SPACE (ppm)	HCN (PPM)	ULTRA-VIOLET FLUORESCENCE	RECOVERY (FEET)	DEPTH IN FEET	WELL DETAILS	LITHOLOGIC COLUMN	LITHOLOGIC DESCRIPTION	GRA %	SAND %	SLT %
CB	0.0	NA	No	2/5	85			49.8 to 85.5 feet: SAND (SP), continued.	0	95-100	0-5
	0.0	NA	No		85			Total depth = 85.5 feet.			
					90			<p>WELL COMPLETION DETAILS</p> <p>+6.0 to 80.1 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC blank riser pipe.</p> <p>80.1 to 84.9 feet: 2-inch-diameter, flush-threaded, Schedule 40 PVC well screen with 0.020-inch machined slots.</p> <p>84.9 to 85.2 feet: 2-inch-diameter threaded end cap.</p> <p>+0.3 to 1.0 foot: Concrete.</p> <p>1.0 to 16.5 feet: Bentonite chips.</p> <p>16.5 to 75.8 feet: Bentonite grout.</p> <p>75.8 to 80.1 feet: 100 Colorado Silica Sand.</p> <p>80.1 to 85.2 feet: 10-20 Colorado Silica Sand.</p> <p>85.2 to 85.5 feet: Native.</p>			
					95						
					100						

REMARKS

NA = Not Analyzed.

APPENDIX B
WELL DEVELOPMENT RECORDS AND
FIELD SAMPLING DATA SHEETS

Project No.	000029-02.23	Date:	3/2/10	Well:	PW-7
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	96.31	Final DTB:	96.95
Name:	GASCO, Capture Zone Field Test	Initial DTW:	16.25	Final DTW:	18.64
Development Method:	Water per-pump Air lift	Casing Volume:	80.56'		210.10
Total Water Removed:	3450 gal	Casing Diameter:	8" = 2.608 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well		50 gpm	OWRD#: L102837		
Gal/ft = (dia./2) ² x 0.163	1"=0.041	2"=0.163	3"=0.367	4"=0.653	6"=1.469
					8"=2.608
					10"=4.080
					12"=5.875

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments	
0800	0	-	-	-	-	-	Set up to develop - air lift/surge	
0934	0	-	-	-	-	-	Started surging only	
0945	0	-	-	-	-	-	Started air lifting / surging	
0950	~20	4	A	-	-	-	dark brown cloudy - slight sheen	
1000	200	900	B	155.9	166	8.10	17.53 dark brown cloudy stopped	
1025	400	-	-	-	-	21.52	stopped to add 1 length piping -	
-	-	-	-	-	-	-	could not reach bottom @ 4' from	
-	-	-	-	-	-	-	bottom.	
1040	400	250	C	15.06	227	7.56	-	Restarted - dark brown milky
1051	700	9	A	15.12	371	7.51	22.97	light brown cloudy
1109	1000	2.5	B	14.09	451	7.41	22.20	very light brown - stopped to
-	-	-	-	-	-	-	-	pump clean tank
1147	1000	-	-	-	-	-	-	Restart surging
1157	1100	-	-	-	-	19.82	-	
1212	1500	<1	A	14.93	564	7.57	25.90	light brown (tan) cloudy
1223	1700	<1	B	14.94	591	7.57	26.28	very light tan-orange cloudy
1236	1950	<1	A	14.55	608	7.53	26.33	very light tan-orange cloudy
1241	2050	-	-	-	-	-	-	Stopped to pump clean tank & set
-	-	-	-	-	-	-	-	up to run w/ sub. groundfos pump
1446	2050	-	-	-	-	18.76	DTB=96.95'	STARTED 50 gpm
1447	-	-	-	-	-	-	-	Stopped - hole in hose
1449	2050	-	-	-	-	18.75	-	Restart w/ 50 gpm groundfos
1459	2850	-	-	-	-	18.75	-	Restarted again after more repairs
1504	2300	<0.5	A	15.08	654	7.56	42.73	very light tan cloudy
1509	2550	<0.5	B	14.55	709	7.58	43.06	almost clear - 50 gpm via bucket
1514	2800	<0.5	C	15.09	756	7.50	43.80	clear
1519	3050	<0.5	A	14.78	763	7.56	44.23	clear
1527	3450	<0.5	B	14.92	771	7.52	44.40	clear, stopped development
1553							18.64	DTB = 96.95'

* -> stopped to remove section of fine hose & allow more flow

Project No.	000029-02.23	Date:	3/1/10	Well:	PW-8
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	72.20 (120)	Final DTB:	72.43'
Name:	GASCO, Capture Zone Field Test	Initial DTW:	17.50 @ 1206	Final DTW:	18.50
Development Method:	Water per pump Air lift	Casing Volume:	52.70' = 137.44		
Total Water Removed:	1500	Casing Diameter:	8" = 2.608 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:		7-10 gal/ft*	OWRD#:	L102836	
Gal/ft = (dia./2) ² x 0.163	1"=0.041	2"=0.163	3"=0.367	4"=0.653	6"=1.469
				8"=2.608	10"=4.080
					12"=5.875

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1325	0	-	-	-	-	-	Commenced air lift
1335	50	70	16.75	850	7.6	-	
1340	60	-	-	-	-	-	dark brown/grey
1350	600	-	-	-	-	-	stopped air lift & surging only
1400	800	7	16.65	704	7.51	24.89	very light cloudy w/ coarse sand
1410	2100	<1	16.49	728	7.46	-	almost clear, running ~20 gpm
1420	~1300	<1	16.62	726	7.52	24.56	clear, recalculate - 30-40 gpm
1428	~1500	<1	16.60	725	7.48	-	clear, stopped/finished development

3/9/10

0905	1500	-	-	-	-	17.93	DTB=72.43' Set up to continue
-	-	-	-	-	-	-	develop w/ 50 gpm hand for pup
0915	1500	-	-	-	-	-	Start pumping
0917	1600	<1	15.96	697	7.37	-	very light tan/orange cloudy
0920	1750	<1	16.71	710	7.61	25.69	almost clear
0925	2000	<1	16.69	713	7.62	25.83	clear
0930	2250	<1	16.09	709	7.64	25.95	clear
0935	2500	<1	16.78	715	7.66	26.09	clear / performed bucket test
0940	2750	<1	16.93	715	7.64	26.14	clear
0942	2850	-	-	-	-	-	Completed development
0944	-	-	-	-	-	18.45	recovery
0945	-	-	-	-	-	18.36	recovery
1027	-	-	-	-	-	18.50	DTB=72.43'

* - 7-10 gal/min/foot

Project No.	000029-02.23	Date:	3/3/10	Well:	PW-9			
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	96.97	Final DTB:	97.47			
Name:	GASCO, Capture Zone Field Test	Initial DTW:	26.48	Final DTW:	26.88			
Development Method:	Water-peri-pump <i>air lift / Gravel</i>	Casing Volume:	70.49 gal = 183.84 gal					
Total Water Removed:	8310 gal	Casing Diameter:	8" = 2.608 gal/ft					
Water Contained?	YES	Meter #:	23069					
Estimate of specific capacity or recharge to well:	50 gpm	OWRD#:	6102842					
Gal/ft = (dia./2) ² x 0.163	1"=0.041	2"=0.163	3"=0.367	4"=0.653	6"=1.469	8"=2.608	10"=4.080	12"=5.875

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1404	0	-	-	-	-	26.48	Sparging with surge block only
1415	0	-	-	-	-	-	Start air lift along w/ sparging
1420	100	16/900 ^A	15.34	187	8.04	-	dark brown, milky
1428	300	4/500 ^B	14.98	273	7.42	-	dark brown, milky
1451	500	<1/9 ^C	14.75	511	7.58	62.32	brown cloudy - air lift only
1514	700	2 ^A	14.62	603	7.64	59.81	lighter brown cloudy, ≈ 8.7 gpm
-	-	-	-	-	-	-	- air lift only after surge cycle
1535	900	3 ^C	15.03	635	7.57	52.34	light brown cloudy - surge of air lift
1556	1100	<1 ^A	14.95	701	7.48	56.05	very light tan cloudy
1518	1350	<1 ^B	14.95	708	7.49	53.86	almost clear ≈ 16.4 gpm
1523	1400	-	-	-	-	-	stopped development
1525	-	-	-	-	-	42.30	recovery
1526	-	-	-	-	-	39.50	↓
1528	-	-	-	-	-	34.32	↓
1650	-	-	-	-	-	28.61	DTB = 97.11'
3/4/10							
0815	1400	-	-	-	-	-	Set up w/ Gravel for pump
0919	1400	-	-	-	-	26.25	Start pump test - throttled to 50 gpm
0924	4450	-	-	-	-	42.00	
0927	≈ 1500	<1 ^A	14.91	730	7.22	56.87	very light tan cloudy, ≈ 15 gpm
0933	≈ 1800	-	-	-	-	61.78	throttled to 50 gpm
0938	2050	<1 ^B	15.52	740	7.10	63.35	almost clear
0945	2400	<1 ^C	15.35	739	7.14	63.84	clear
0951	2700	<1	15.53	739	7.11	64.23	clear
0957	3000	<1	15.62	736	7.10	64.43	clear
0958	1003 3300	<1	15.40	738	6.84	64.52	clear
1009	3600	<1	15.64	739	7.06	64.56	clear, may increase flow
1015	3900	-	-	-	-	64.91	continue @ 50 gpm
1021	4200	<1	15.47	734	7.09	65.06	clear - development ok, pump function down
1027	4500	-	-	-	-	65.13	
1033	4800	-	-	-	-	65.28	clear
1039	5100	<1	15.44	727	7.08	65.42	

Project No.	000029-02.23	Date:	3/4/10	Well:	PW-9
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	96.97	Final DTB:	97.47'
Name:	GASCO, Capture Zone Field Test	Initial DTW:	26.48	Final DTW:	28.88'
Development Method:	Water-peri-pump <i>Grainfos</i>	Casing Volume:			
Total Water Removed:	9310 gal	Casing Diameter:	8" = 2.608 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well: 50 gpm		OWRD#: L 102843			
Gal/ft = (dia./2) ² x 0.163	1"=0.041	2"=0.163	3"=0.367	4"=0.653	6"=1.469
					8"=2.608
					10"=4.080
					12"=5.875

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1045	5400	—	—	—	65.43	65.43	—
1051	5700	<1	8.60	731	7.05	65.48	clear
1057	6000	—	—	—	—	65.77	} continuous well measurement
1103	6300	—	—	—	—	65.71	
1105	6400	—	—	—	—	65.87	
1107	6500	—	—	—	—	65.76	
1109	6600	—	—	—	—	65.94	
1111	6700	—	—	—	—	65.96	
1113	6800	—	—	—	—	66.04	
1115	6900	—	—	—	—	66.04	
1117	7000	—	—	—	—	66.06	
1119	7100	<1	15.59	726	7.07	66.08	clear
1121	7200	—	—	—	—	66.11	Pump at full open
1122	—	—	—	—	—	69.40	
1123	—	—	—	—	—	72.60	
1124	—	—	—	—	—	74.00	Pump off, start recovery
1125	—	—	—	—	—	58.55	Recovery
1126	—	—	—	—	—	45.70	
1128	—	—	—	—	—	33.20	- started
1133	—	—	—	—	—	27.52	Restart after repairs
1136	7290	—	—	—	—	32.92	at flow rate @ 30 gpm 34.41 @ 1138
1140	7410	—	—	—	—	34.78	34.98 @ 1142
1145	7560	—	—	—	—	35.09	35.12 @ 1147
1150	7710	—	—	—	—	35.15	35.16 @ 1152
1155	7860	—	—	—	—	35.20	35.22 @ 1157
1200	8010	—	—	—	—	35.24	35.26 @ 1202
1205	8160	—	—	—	—	35.30	
1210	8310	<1	15.24	737	7.19	35.34	clear, development complete
1513	—	—	—	—	—	28.88	DTB = 97.47'

Project No.	000029-02.23	Date:	3/5/10	Well:	OW-7
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	18.32	Final DTB:	19.96
Name:	GASCO, Capture Zone Field Test	Initial DTW:	14.59	Final DTW:	14.64
Development Method:	Waterria peri-pump	Casing Volume:	3.73' @ 0.61 gal		
Total Water Removed:	60	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:	> 2 gpm	OWRD#:	L 102838		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
0937	-	-	-	-	-	14.59	Setup to develop w/ surge block
1005	-	-	-	-	-	-	Start manually surging
1020	0	-	-	-	-	-	Start waterria - pump/surge
1025	1	950 A	-	-	-	14.66	*dark chocolate brown milky @ 3.5' FB
1029	2	-	-	-	-	14.73	*dark brown milky, moved to 2.5' FB
1036	4	-	-	-	-	14.65	*dark brown milky, moved to 1.5' FB
1040	6	-	-	-	-	14.72	*dark brown milky, moved to 0.5' FB
1045	8	13/800 B	20.96	324	7.88	14.70	*dark brown milky, moved to bottom
1054	13	-	-	-	-	-	dark brown milky, remove surge block & placed @ 2.5' FB
1100	15	2100 ² / ₁₀₀ C	20.72	274	7.51	-	dark brown cloudy
1104	17.5	3 A	21.07	264	7.27	14.71	mid brown cloudy
1111	21	1 B	20.82	258	7.44	14.73	lighter brown cloudy, moved to bottom
1119	25	-	-	-	-	14.73	dark brown milk to brown cloudy
1127	30	10/2 C	21.04	236	7.50	14.78	brown/grey cloudy - clean sump
1133	34	-	21.68	229	7.21	14.75	light brown/grey cloudy
1142	40	1.5 A	21.73	227	7.48	14.77	light brown/grey cloudy
1150	45	0.6 C	21.69	226	7.49	-	lighter brown/grey cloudy
1156	48	-	21.88	225	7.48	14.76	lighter brown/grey cloudy
1200	51	<0.5 B	21.06	282	7.46	-	very light grey/brown cloudy
1206	54	<0.5 C	21.64	225	7.51	14.78	very light grey/brown cloudy
1210	56	<0.5 A	22.07	223	7.54	-	very light grey/brown cloudy
1214	60	<0.5 B	22.04	222	7.46	14.80	very light grey/brown cloudy
1320	-	-	-	-	-	14.64	DTB = 19.96

FB = From bottom

* - slight sheen

Project No.	000029-02.23	Date:	2/18/10	Well:	OW-8
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	17.15 @ 1355	Final DTB:	17.19 @ 1558
Name:	GASCO, Capture Zone Field Test	Initial DTW:	14.24' @ 1353	Final DTW:	14.28' @ 1555
Development Method:	Waterra peri-pump	Casing Volume:	2.91' = 0.474		
Total Water Removed:	25 gal	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:	~0.6 gpm	OWRD#:	102835		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1357	0	-	-	-	-	14.24	Start manually surging w/ block and road
1415	0	-	-	-	-		Stopped surging, set-up to pump
1424	0	-	-	-	-	14.14	Start surging w/ waterra & check vlv
1428	8.02	-	-	-	-	14.48	Moved vlv to 1' from bottom
-	-	-	-	-	-	-	dark brown milky, increased speed
1433	0.5	850 A	-	-	-	14.72	dark brown milky, increased speed
1437	1.5	-	-	-	-	15.10	" " "
1440	3	-	15.34	560	7.02	15.25	" " "
1445	5	44 B	14.94	551	6.76	15.34	cloudy, brown
1450	7.5	41 C	15.06	549	6.72	15.34	light tan cloudy
1458	10	41 A	14.99	554	6.67	15.36	almost clear, move vlv to 1" off bottom
1500	11	67 C	-	-	-	-	dark cloudy, brown
1503	12.5	-	15.22	552	6.65	15.57	med cloudy brown
1508	15	1 A	15.12	554	6.67	15.23	almost clear
1514	17.5	41 B	15.17	550	6.75	15.24	almost clear
1520	20	20.5 C	14.79	553	6.62	15.22	clear
1525	25	-	-	-	-	15.20	stopped, clear. Recovery
1526	25	-	-	-	-	14.67	Recovery
1527	25	-	-	-	-	14.48	
1528	25	-	-	-	-	14.39	
1529	25	-	-	-	-	14.37	
1530	25	-	-	-	-	14.34	

2' fr bottom
1430
1435

Note - Sand/Silt at 20-25 gals = approx. 3 ml / 5 gal

Project No.	000029-02.23	Date:	2/9/10	Well:	OW-9
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	27.58 @ 1255	Final DTB:	27.60'
Name:	GASCO, Capture Zone Field Test	Initial DTW:	25.55 @ 1253	Final DTW:	25.58'
Development Method:	Water/peri-pump	Casing Volume:	2.03 ft ³ = 0.33 gal		
Total Water Removed:	30 gal	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained ?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:	<0.5 gpm	OWRD#:	L 102843		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1305	0	-	-	-	-	25.55	Start manually surging
1327	132 ^{gal}	-	-	-	-	-	Start Water/ surge block 1.5' FB
1330	1	25.8 ^{gal}	-	-	-	25.85	black/brown muddy, move to 0.5' FB
1332	2	-	-	-	-	26.15	black/brown milky, move to Bottom
1335	3	-	-	-	-	26.54	black/brown milky, move to 1' FB
1345	7	200 A	-	-	-	-	black/brown milky, remove surge block
1351	10	-	12.99	106	6.57	26.33	black/brown dark cloudy, left @ 1' FB
1355	12	<0.5 B	10.90	93	8.64	26.17	brown/grey lighter cloudy, move to bottom
1400	15	<0.5 C	12.08	133	8.80	26.74	very light brown cloudy, stop to recharge
1402	15	-	-	-	-	25.75	Restart @ bottom
1406	17	<0.5 A	13.30	160	6.31	26.75	almost clear
1410	20	<0.5 B	15.98	225	6.55	26.81	clear, stop to recharge
1412	20	-	-	-	-	25.70	restart @ bottom
1415	22	<0.5 C	16.47	239	6.59	26.68	clear
1419	25	<0.5 A	16.51	240	6.64	26.72	clear, stop to allow recharge
1423	25	<0.5 A	-	-	-	25.61	restart @ bottom
1427	27	<0.5 C	17.63	256	6.65	26.62	clear
1432	30	<0.5 A	18.31	271	6.64	26.68	clear, end development
1502	-	-	-	-	-	25.58	DTB = 27.60'

Project No.	000029-02.23	Date:	2/19/10	Well:	MW-22-80
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	82.44 @ 1038	Final DTB:	83.20
Name:	GASCO, Capture Zone Field Test	Initial DTW:	28.23 @ 1035	Final DTW:	29.46
Development Method:	Waterra peri-pump	Casing Volume:	54.21' = 8.84 gal		
Total Water Removed:	100 gal	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained?	Y	Meter #:	23069		
Estimate of specific capacity or recharge to well:	> 1 gpm	OWRD#:	L102834		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1035	-	-	-	-	-	-	Setup, installing tubing w/ check valve / surge block
1055	0	-	-	-	-	28.23	Started at 1' BTS, slow
1108	0	-	-	-	-	-	Increased pump speed
1110	2	50 A	16.92	586	7.20	-	Dark grey, cloudy
1115	5	-	-	-	-	28.85	grey cloudy, moved to 3' BTS,
1117	6	-	-	-	-	-	muddy dark grey, consistency of milk
1121	10	-	-	-	-	29.00	dark grey cloudy, moved to 5' BTS
1123	12	175 B	17.12	604	6.61	-	dark grey cloudy, milky
1127	15	-	-	-	-	29.07	dark grey cloudy, milky; moved to 7' BTS
1133	20	-	-	-	-	28.95	dark grey cloudy, moved to 9' BTS
1138	25	-	17.50	657	6.55	-	dark grey cloudy, moved to 2" off bottom
1140	27	180 C	-	-	-	-	dark grey milky
1145	30	-	17.22	660	6.57	28.80	dark grey cloudy, some surge
-	-	-	-	-	-	-	block ? placed at 1' BTS
1151	35	17 A	17.16	672	6.60	-	mid cloudy grey
1156	40	-	17.66	676	6.61	28.95	almost clear, moved to 3' BTS
1205	50	<0.5 B	17.98	672	6.69	28.98	clear, moved to 5' BTS
1215	60	<0.5 C	17.83	686	6.75	29.16	clear, moved to 7' BTS, stopped to empty buckets / lunch.
1330	60	-	-	-	-	29.09	restarted, light grey cloudy @ 1 gal
1340	70	<0.5 A	17.73	694	6.57	29.46	almost clear, moved to 9' BTS
1349	80	<0.5 B	17.41	694	6.51	29.53	almost clear, moved to bottom
1356	85	34* C	-	-	-	-	operated valve by hand moved bottom
-	-	-	-	-	-	-	dark grey cloudy, sandy
1400	90	0.6 A	17.31	692	6.52	-	light grey cloudy
1410	100	B	17.54	690	6.55	29.53	clear, stop development
-	-	-	-	-	-	-	Complete
1420	-	-	-	-	-	29.32	Recovery
1430	-	-	-	-	-	29.36	↓
1448	-	-	-	-	-	29.46	↓

BTS = below top of screen

* 18-sand, 16-silt

Project No.	000029-02.23	Date:	2/24/10	Well:	MW-23-27
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	30.11 @ 1235	Final DTB:	30.29 @ 1620
Name:	GASCO, Capture Zone Field Test	Initial DTW:	25.18 @ 1234	Final DTW:	25.67 @ 1618
Development Method:	Waterra peri-pump	Casing Volume:	4.63 = 0.75 gal		
Total Water Removed:	12 gal	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained?	Yes	Meter #:	23069		
Estimate of specific capacity or recharge to well:	20.25 gpm	OWRD#:	L102841		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1305	0	—	—	—	—	—	Manually surged well
1320	0	—	—	—	—	—	Started w/ surge block @ 4' ^{net} BTFS from
1323	1	—	—	—	—	—	bottom of well
1323	1	—	—	—	—	—	no water, move to 3' from bottom
1327	2	400 A	—	—	—	26.35	run out of water, moved to 7' from bottom
—	—	—	—	—	—	—	all water is very dark grey milky
1334	3	600 B	—	—	—	27.25	cycling pumps, moved to 1' off bottom
—	—	—	—	—	—	—	very dark grey milky, low pumps speed
1338	4	—	—	—	—	28.27	still cycling pumps, moved to bottom
—	—	—	—	—	—	—	very dark grey milky, lower pumps speed
1350	5	500 ^c	14.48	607	6.93	29.16	very dark grey milky, slight stream
—	—	—	—	—	—	—	remove surge block, move to 2' from bottom
1358	5	—	—	—	—	27.34	no water after starting, move to 1' from bottom
1401	6	—	—	—	—	—	intermittent pumping, light grey cloudy
1408	7	22 A	13.80	607	7.22	—	lighter grey cloudy, moved to bottom
1412	8	64 B	—	—	—	—	very dark grey cloudy, intermittent pump
1420	9	50 C	14.52	614	7.07	29.34	grey cloudy, stopped to recharge
1433	9	—	—	—	—	26.05	Restart @ bottom - no flow
1439	9	—	—	—	—	25.45	make repair to check valve, restart
1442	9.5	30 A	14.53	593	6.90	—	grey cloudy
1445	10	8 B	14.17	588	7.02	29.67	light grey cloudy, stopped to recharge
1550	10	—	—	—	—	25.81	Restart at bottom
1553	11	20.5 A	14.30	584	7.08	—	clear
1557	12	0.8 B	14.50	579	7.21	29.48	clear, stop development

Project No.	000029-02.23	Date:	2/24/10	Well:	MW-23-75
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	77.69 @ 0155	Final DTB:	78.15 @ 1621
Name:	GASCO, Capture Zone Field Test	Initial DTW:	28.40 @ 0850	Final DTW:	27.10 @ 1417
Development Method:	Waterra peri-pump	Casing Volume:	49.29 = 8.03 gal		
Total Water Removed:	95 gal	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:	> 1 gpm	OWRD#:	L102840		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1005	0	-	-	-	-	28.40	Started @ 1' BTS with surge block
1008	5	-	-	-	-	-	moved to 3' BTS, very dark clay grey
1019	10	11 A	15.12	840	7.51	-	dark grey cloudy, moved to 5' BTS
1024	15	-	-	-	-	28.36	dark grey cloudy, moved to 7' BTS
1028	20	19 B	15.25	751	7.32	-	dark grey cloudy, moved to 9' BTS
1037	25	-	-	-	-	-	very dark grey cloudy, moved to bottom
1041	30	100 C	-	-	-	-	very dark grey milky
1045	35	-	14.89	684	7.35	27.91	started clear, incl light grey cloudy
-	-	-	-	-	-	-	stopped to remove surge block
1108	35	-	-	-	-	27.32	after exceeding, restarted at 1'
1112	40	-	-	-	-	-	almost clear
1116	45	<0.5 A	15.24	630	7.30	27.36	clear, moved to 3' BTS
1127	55	<0.5 A	15.29	628	7.30	27.28	clear, moved to 5' BTS
1132	60	-	-	-	-	-	stopped to empty buckets, lunch
1232	60	-	-	-	-	-	restarted, still at 5' BTS
65' 1239	70	<0.5	15.44	614	7.20	-	clear, moved to 7' BTS
75' 1248	75	<0.5	15.43	624	7.22	-	clear, moved to 9' BTS
1255	85'	<0.5	15.19	647	7.20	26.47	clear, moved to bottom
1303	95'	<0.5	15.41	656	7.18	-	clear, end development

Project No.	000029-02.23	Date:	Well: MW-23-123
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	119.79 @ 0850 Final DTB: 121.47 @ 1001 7/24
Name:	GASCO, Capture Zone Field Test	Initial DTW:	28.81 @ 0842 Final DTW: 28.51 @ 0922 2/24
Development Method:	Waterra peri-pump	Casing Volume:	90.98' = 14.83
Total Water Removed:	155 gal	Casing Diameter:	2" = 0.163 gal/ft
Water Contained?	YES	Meter #:	23069
Estimate of specific capacity or recharge to well:	21 gpm	OWRD#:	L 102839

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
0830	-	-	-	-	-	-	Setting up
0915	0	-	-	-	-	-	started @ 1' BTS, surge block installed
0917	1.5	-	14.05	213	7.00	-	light cloudy tan
0921	5	37 A	-	-	-	-	very cloudy, grey
0930	10	2 B	14.23	355	6.80	28.70	mid cloudy grey, moved to 3' BTS
0945	20	-	13.18	363	7.34	28.47	lighter cloudy grey, moved to 5' BTS
0958	30	<0.5 C	14.89	355	7.43	28.46	very light cloudy grey, moved to 7' BTS
1011	40	<0.5 A	14.84	352	7.39	27.98	very light cloudy grey, moved to 9' BTS
1014	42	42 B	-	-	-	-	very dark grey, milky
1023	50	3 C	14.73	355	7.50	28.01	grey cloudy
1025	52	62 A	-	-	-	-	very dark grey, milky
1037	60	17 B	15.11	355	7.58	-	dark grey, cloudy - stopped to empty buckets, remove surge block
1101	60	-	-	-	-	27.14	Restarted, valve at 1' BT'S
1114	75	<0.5 C	14.96	356	7.16	27.81	clear, moved to 3' BTS
1122	85	<0.5	14.34	358	7.50	-	clear, moved to 5' BTS
1133	100	<0.5	15.31	369	7.37	27.66	clear, moved to 7' BTS
1144	115	<0.5	15.24	384	7.48	27.76	clear, moved to 9' BTS
1148	120	1.5	15.20	385	7.53	-	almost clear, very light grey. Stopped to empty buckets, lunch.
1335	120	-	-	-	-	27.37	Restarted, still at 9' BTS
1342	130	<0.5	14.45	386	7.44	-	clear, moved to bottom,
1407	140	-	14.84	388	7.60	-	almost clear, had check valve problem
1414	145	<0.5	15.06	395	7.57	-	clear
1423	155	<0.5	15.18	397	7.69	28.38	clear, stopped, over

Project No.	000029-02.23	Date:	2/9/10	Well:	MW-24-70
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	72.77	Final DTB:	72.55
Name:	GASCO, Capture Zone Field Test	Initial DTW:	22.17'	Final DTW:	25.96
Development Method:	Waterra peri-pump	Casing Volume:	45.62' = 7.44 gal		
Total Water Removed:	90 gal	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:	4.1 gpm	OWRD#:	122833		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
1049						22.17	Manual DTW/DTB, initial
1108	0						started w/ surge block @ 1' BTS
1114	3	250	13.94	277	5.10		cloudy brown/gray
1116	4						lighter brown/gray, moved to 3' BTS
1120	6	150					dark gray cloudy
1125	8		14.01	546	6.81	41.10	dark gray cloudy, moved to 5' BTS
1133	12					42.11	dark gray cloudy, moved to 7' BTS
1139	16	125					dark gray cloudy, moved to 9' BTS
1146	20		14.49	1038	7.08		dark gray cloudy, moved to 10' BTS (bottom)
1152	25	500					dark gray cloudy, removed surge block
-	-	-	-	-	-	-	red plug at 1' BTS, started grey cloudy
1200	30		14.46	751	7.19		light grey cloudy
1206	35	3	14.48	835	7.13	43.67	very light cloudy
1212	40	11					stopped to empty buckets, moved to 3' BTS
1224	-						restricted @ 3' BTS, very light cloudy
1235	50	1.5	14.70	838	7.29	44.59	almost clear, moved to 5' BTS
1239	55					45	light cloudy
1245	60	3	14.54	813	7.08	45.61	almost clear, moved to 7' BTS
1248	65						almost clear
1252	70	4	14.55	822	6.90	46.28	almost clear, moved to 9' BTS
1259	75	2	14.63	810	7.26		almost clear, moved to bottom (10' BTS)
1310	80						cloudy grey, adjusted to bottom
1315	85	2	14.56	781	7.29		almost clear
1326	90	2	14.39	787	7.37		clear stopped
1450	-	-	-	-	-	25.96	Final DTW

Project No.	000029-02.23	Date:	2/16/10	Well:	MW-24-130
Site Location:	7900 NW St. Helens Rd., Portland	Initial DTB:	131.74	Final DTB:	133.5 @ 1421
Name:	GASCO, Capture Zone Field Test	Initial DTW:	25.55'	Final DTW:	27.11 @ 1421
Development Method:	Waterra peri-pump	Casing Volume:	106.19' = 17.31 gal		
Total Water Removed:	190 gallons	Casing Diameter:	2" = 0.163 gal/ft		
Water Contained ?	YES	Meter #:	23069		
Estimate of specific capacity or recharge to well:	21 gpm	OWRD#:	102832		

Time	Cum. Vol. Removed	Sand/Silt (ml/1000ml)	Temp.	EC	pH	DTW (TOC)	Appearance/Comments
0840	0	-	-	-	-	25.55	Initial DTW, set-up surge block
0922	0	-	-	-	-	-	started, set @ 1' BTS*
0925	2	-	14.25	367	7.09	-	light cloudy brown/grey
0929	5	300 A	-	-	-	-	dark, muddy grey
0939	10	-	-	-	-	37.43	dark, mud grey, move to 3' BTS
0944	13	400 B	-	-	-	-	very cloudy, dark grey
0954	20	-	14.41	196	6.70	37.00	mud chunky grey, move to 5' BTS
0957	23	500 C	-	-	-	-	very cloudy, grey
1009	30	39 A	14.44	1260	6.72	39.37	mud chunky grey, move to 7' BTS
1013	33	250 B	-	-	-	-	very dark cloudy grey
1024	40	34 C	14.47	1184	6.75	39.43	lighter mud chunky grey, move to 9' BTS
1028	43	400 A	-	-	-	-	very dark, muddy grey
1039	50	*	14.34	1157	6.75	39.94	light cloudy grey, move to 2" off bottom
1043	53	950 B	-	-	-	-	dark grey mud w/ chunks
1056	60	76 A	14.17	1163	6.72	-	mud light cloudy, grey, move to 6' BTS
-	-	-	-	-	-	-	2 bags sand to slow to empty buckets
1113	65	1 B	14.22	981	6.80	-	milky grey, stopped to remove
-	-	-	-	-	-	-	surge block, resistant at 1' BTS-1118
1126	75	1 A	14.25	966	6.78	-	light grey chunky
1134	85	21 B	14.27	944	6.77	42.93	clear, moved to 3' BTS
1139	95	<1 C	-	-	-	43.09	almost clear
1147	105	21 B	14.38	938	6.79	43.59	clear, moved to 5' BTS
1155	115	<1 C	14.29	917	6.78	-	almost clear
1159	120	<1 A	14.28	914	6.77	44.61	clear, stopped to empty buckets
1250	130	-	-	-	-	-	moved to 7' BTS, started pumping
1300	130	<1 A	14.67	887	6.89	-	almost clear
1308	140	<1 B	14.57	899	6.79	41.14	clear, moved to 9' BTS
1316	150	<1 C	14.44	903	6.78	-	almost clear
1324	160	<1 A	14.47	899	6.78	42.36	clear, moved to 1" off bottom
1332	170	<1 B	14.34	890	6.79	-	very light chunky
1335	175	<1 C	14.29	911	6.78	-	almost clear
1338	180	<1 A	14.27	896	6.79	-	clear
1341	185	<1 B	14.19	895	6.79	42.34	clear
1345	190	<1 C	14.17	898	6.79	-	clear, stop development

* - BTS = below top of screen

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333

Portland, OR 97224

Office: (503) 670-1108

Fax: (503) 670-1128

PROJECT NAME: Gosco - Seg 2 CZ

WELL ID: PW-7-93

SITE ADDRESS: 7900 NW St Helens Rd Portland

BLIND ID: GS-110810-1

DUP ID:

NA

WIND FROM:	N	NE	E	SE	<u>S</u>	SW	W	NW	<u>LIGHT</u>	MEDIUM	HEAVY
WEATHER:	SUNNY		<u>CLOUDY</u>		RAIN		?		TEMPERATURE: °F <u>50</u> °C		

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness]

[Water Column]

(Circle appropriate units)

[Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)	
11/08/10	11:02	<u>93.0</u>	<u>19.16</u>	19.16	19.16	<u>76.84</u>	X1 <u>200.55</u>	
11/08/10	11:56	<u>96.0</u>	<u>19.46</u>	19.46	19.46	<u>76.54</u>	X3 <u>601.66</u>	
Gal/ft = (dia./2) ² x 0.163		1" = 0.041	2" = 0.163	3" = 0.367	4" = 0.653	6" = <u>2.269</u>	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 = G-Sub

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	/ /	:		<u>40 ml</u>	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/08/10	12:30	<u>G</u>	<u>250, 500, 1L</u>	<u>None</u>	<u>YES</u>	<u>NO</u>	<u>NA</u>	<u>X</u>
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/08/10	12:30	<u>G</u>	<u>250, 500, 1L</u>	<u>NaOH</u> ^{YES}	<u>YES</u>	<u>NO</u>	-	<u>X</u>
Red Total Poly	11/08/10	12:30	<u>G</u>	<u>250, 500, 1L</u>	<u>HNO₃</u>	<u>YES</u>	<u>NO</u>	-	<u>X</u>
Red Diss. Poly	11/08/10	12:30	<u>G</u>	<u>250, 500, 1L</u>	<u>HNO₃</u>	<u>YES</u>	<u>YES</u>	-	<u>X</u>
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate-count): 5

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-HClD) (NWTPH-Dx) (TPH-418.1) (Oil & Grease) (8081A)
	WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO ₃ /CO ₃) (Cl) (SO ₄) (NO ₃) (NO ₂) (F) <u>(R)</u>
	YELLOW - Poly	(COD) (TOC) (Total PO ₄) (Total Keldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) <u>Free, total, weak-acid dissociable</u>
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) Hardness) (Silica)	

WATER QUALITY DATA

Purge Start Time: 12:00

ORP

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		.	.	.	.		.
2		.	.	.	.		.
1	<u>F</u>	<u>981.0</u>	<u>7.14</u>	<u>802</u>	<u>16.33</u>	<u>37.2</u>	<u>0.34</u>	<u>clear, colorless</u>
0	...	<u>0.00</u>	.	.	.		.

[Casing]

[Select A-G]

[Cumulative Total]

[Circle units]

[Clarity, Color]

Starting Totalizer Reading 303069 - 0 G
~~303092~~ ~~303135~~
 1200

Pump Test started at
 1200 on 11/08/10

SAMPLER:

Matt Wilson / J Benda
 (PRINTED NAME)

Matt Wilson
 (SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333

Portland, OR 97224

Office: (503) 670-1108

Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 CZ

WELL ID: PW-8-68

SITE ADDRESS: 7900 NW St Helens Rd Portland OR

BLIND ID: GS-110810-2

DUP ID:

NA

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY	
WEATHER:	SUNNY	(CLOUDY)			RAIN				?	TEMPERATURE:	°F <u>50</u>	°C

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness]

[Water Column]

[Circle appropriate unit]
[Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)	
11/08/10	11:02	68.0	—	19.55	—	51.45	X1 134.28	
11/08/10	11:55	71.0	—	19.84	—		X3 402.84	
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = Growth 8 ± 2.61

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	✓
VOA Glass	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/08/10	12:20	G-2	(250, 500, 1L)	(None)	(YES)	(NO)	(NA)	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/08/10	12:20	G-1	(250, 500, 1L)	(NaOH)	(YES)	(NO)	—	X
Red Total Poly	11/08/10	12:20	G-1	(250, 500, 1L)	HNO ₃	(YES)	(NO)	—	X
Red Diss. Poly	11/08/10	12:20	G-1	(250, 500, 1L)	HNO ₃	(YES)	(YES)	—	X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) - free, total, weak-acid dissociable
	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: <u>12:00</u>			Pump/Bailor Inlet Depth: <u>61.7</u>		
Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.	.	.	.
3		.	.	.	.	.	.	.
2		.	.	.	.	.	.	.
1	F	577.0	7.06	767	17.22	57.8	2.33	clear, colorless
0		0.00	.	.	.	.	.	.

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

Starting Totalizer recording → Totalizer - 06 ~~302343~~ - Totalizer
 Pump test started at ~~1200~~ on 11/08/10

SAMPLER: Matt Wilson
 (PRINTED NAME)

Matthew Wilson
 (SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gosco Segment 2 CZ

WELL ID: PW-8-39

SITE ADDRESS: 7900 NW 1st Helens Rd Portland OR

BLIND ID: 65-110810-3

DUP ID: NA

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY	
WEATHER:	SUNNY	(CLOUDY)			RAIN				?	TEMPERATURE:	°F <u>50.</u>	°C

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/08/10	11:02	39.0	-	17.51	-	24.49	X1 35.98
11/08/10	11:55	42.0	-	17.95	-		X3 107.94

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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = Grav ~~84-276~~

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

Bottle Type	Date	Time	Method	Amount & Volume mL	Preservative	Ice	Filter	pH	✓
VOA Glass	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/08/10	13:00	G	2 (250, 500) 1L	(None)	(YES)	(NO)	(NA)	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/08/10	13:00	G	1 (250, 500) 1L	(NaOH)	(YES)	(NO)	-	X
Red Total Poly	11/08/10	13:00	G	1 (250, 500) 1L	(HNO ₃)	(YES)	(NO)	-	X
Red Diss. Poly	11/08/10	13:00	G	1 (250, 500) 1L	(HNO ₃)	(YES)	(YES)	-	X

Total Bottles (include duplicate count): 5

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) (8061A)
	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 ₂ /NO ₃)
	GREEN - Poly	(Cyanide) - <u>Total, free, weak-acid dissociable</u>
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA			Purge Start Time: <u>12:00</u>	ORP	Pump/Bailor Inlet Depth:			
Meas.	Method	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.	.	.	.
3		.	.	.	.	.	.	.
2		.	.	.	.	.	.	.
1	G	110.0	7.26	982	17.04	34.2	0.19	clear, colorless
0		0.00	.	.	.	.	.	.

Starting Totalizer Readings →

#1 ~~18842~~ ~~18808~~ 18868
 #2 ~~15254~~ ~~15278~~ 15278
 Pump test started at 1200 on 11/08/10

SAMPLER: Matt Wilson, Daffoon
(PRINTED NAME)

Matt Wilson
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333

Portland, OR 97224

Office: (503) 670-1108

Fax: (503) 670-1128

PROJECT NAME: Wesco Segment 2 GZ

WELL ID: PW-9-92

SITE ADDRESS: 7400 NW St Helens Rd Portland OR

BLIND ID: GS-110810-4

DUP ID:

NA

WIND FROM:	N	NE	E	SE	<u>(S)</u>	SW	W	NW	<u>(LIGHT)</u>	MEDIUM	HEAVY	
WEATHER:	SUNNY	<u>(CLOUDY)</u>			<u>(RAIN)</u>			?	TEMPERATURE: °F <u>50.</u> °C			

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness]

[Water Column]

[Circle appropriate unit] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/08/10	11:08	96.0	—	28.35	—	67.65	X1 176.6
11/08/10	11:56	96.0	—	28.65	—	67.35	X3 529.8

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 = Gross 8' 52.61

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	/ /	12:20		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/08/10	12:25	G-2	250, 500, 1L	None	YES	NO	NA	—
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/08/10	12:25	G-1	250, 500, 1L	NaOH	YES	NO	—	X
Red Total Poly	11/08/10	12:25	G-1	250, 500, 1L	HNO ₃	YES	NO	—	X
Red Diss. Poly	11/08/10	12:25	G-1	250, 500, 1L	HNO ₃	YES	YES	—	X

Total Bottles (include duplicate count): 5

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)
	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) - <u>Total, free, weak-acid dissociable</u>
	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: 12:00

ORP

Pump/Bailer Inlet Depth:

Meas.	Method	Purged (gal)	pH	E Cond (µS)	°F Temp °C	ORP	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.	.	.
3		.	.	.	.	.	.
2		.	.	.	.	.	.
1	F	540.0	7.05	719	15.87	735	0.99	clear, colorless
0		0.00	.	.	.	.	.

[Casing]

[Select A-G]

[Cumulative Totals]

[Circle units]

[Clarity, Color]

Starting Totalizer Readings →

totalizer ~~3051.8~~ 0.0
Pump test started at 1200 on 11/08/10

SAMPLER: Medulson / Tstone

(PRINTED NAME)

Matthew Wilh

(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gosco Seg 2 Capture Zone WELL ID: Willamette River

SITE ADDRESS: 7900 NW St. Helens Rd Portland OR BLIND ID: GS-110810-5

DUP ID: NA

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY	
WEATHER:	SUNNY	CLOUDY			RAIN			?	TEMPERATURE: °F <u>50</u> °C			

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column]

[Circle appropriate units] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
/ /	:	X 1 NA
/ /	:	X 3 RIVER
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = G-rab

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	/ /	<u>13:30</u>		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	<u>11/08/10</u>	<u>13:30</u>	<u>G-2</u>	<u>250, 500, 1L</u>	<u>None</u>	<u>YES</u>	<u>NO</u>	<u>NA</u>	<u>X</u>
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	<u>11/08/10</u>	<u>13:30</u>	<u>G-1</u>	<u>250, 500, 1L</u>	<u>NaOH</u>	<u>YES</u>	<u>NO</u>	-	<u>X</u>
Red Total Poly	<u>11/08/10</u>	<u>13:30</u>	<u>G-1</u>	<u>250, 500, 1L</u>	<u>HNO₃</u>	<u>YES</u>	<u>NO</u>	-	<u>X</u>
Red Diss. Poly	<u>11/08/10</u>	<u>13:30</u>	<u>G-1</u>	<u>250, 500, 1L</u>	<u>HNO₃</u>	<u>YES</u>	<u>YES</u>	-	<u>X</u>
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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) (BTX) (NWTPH-Gx)
	AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil & Grease) (8081A)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) - total, free, weak-acid dissociable
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Cr) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: NA

Pump/Bailor Inlet Depth:

Meas.	Method [§]	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.	.	.
3		.	.	.	.	.	.
2		.	.	.	.	.	.
1	<u>G</u>	<u>NA</u>	<u>7.32</u>	<u>78</u>	<u>12.22</u>	<u>130.8</u>	<u>9.98</u>	<u>sl. cloudy, h. pale tint</u>
0		<u>0.00</u>	.	.	.	.	.

[Casing]

[Select A-G]

[Cumulative Totals]

[Circle units]

[Clarity, Color]

8 River surface water sample collected in FMM boat house
Pump test started at 1200 on 11/08/10

SAMPLER: M. Wilson, P. Laffoon
(PRINTED NAME)

Mark Dil
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: PW-7-93

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: 65-11010-6

DUP ID:

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	SUNNY	(CLOUDY)			RAIN			?	TEMPERATURE: °F 45 °C		

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/10/10	07:34	96.0	-	24.80	-	-	X1 NA (see below)
/ /	07:29	96.0	-	24.80	-	71.2	X3

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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = Grab

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

Bottle Type	Date	Time	Method	Amount & Volume mL	Preservative	Ice	Filter	pH	√ if used
VOA Glass	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/10/10	07:30	G (2)	250, 500, 1L	(None)	YES	NO	NA	-
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	07:30	G (1)	250, 500, 1L	(NaOH)	YES	NO	-	X
Red Total Poly	11/10/10	07:30	G (1)	250, 500, 1L	(HNO ₃)	YES	NO	-	X
Red Diss. Poly	11/10/10	07:30	G (1)	250, 500, 1L	(HNO ₃)	YES	YES	-	X

Total Bottles (include duplicate count): 5

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-HClD) (NWTPh-Dx) (TPH-418.1) (Oil & Grease) (8081 A)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₂ /NO ₃)
	GREEN - Poly	(Cyanide) - Total, Free, weak-acid dissociable
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: 1200: 11/08/10

OMP

Pump/Bailor Inlet Depth:

Meas.	Method	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4								
3								
2	F	65780	7.09	848	15.92	-8.4	0.36	↑ clear, colorless
1	F	65772						clean
0		0.00						

[Casing] [Select A-G] [Cumulative Totals]

[Circle units]

[Clarity, Color]

Pump has been in operation for ~~35~~ 44 hours at 25 gpm
Mid Test Sample

SAMPLER: Matt Wilson / D. Loffoon
(PRINTED NAME)

Matt Wilson
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test WELL ID: PW-8-68

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR BLIND ID: 65-111010-7

DUP ID:

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	SUNNY	(CLOUDY)			RAIN			?	TEMPERATURE: °F 45 °C		

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft) [Product Thickness] [Water Column] (Circle appropriate unit) [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/10/10	07:34	71.00	---	22.39	---	48.61	X 1 NA - See
/ /	:	.	.	.	.	.	X 3 Below

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 = Grab (8" = 2.61)

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/10/10	07:35	G	(2) 250, 500, 1L	(None)	(YES)	(NO)	NA	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	07:35	G	(1) 250, 500, 1L	(NaOH)	(YES)	(NO)	-	X
Red Total Poly	11/10/10	07:35	G	(1) 250, 500, 1L	(HNO ₃)	(YES)	(NO)	-	X
Red Diss. Poly	11/10/10	07:35	G	(1) 250, 500, 1L	(HNO ₃)	(YES)	(YES)	-	X

Total Bottles (include duplicate count): 5

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) (NWT/PH-Cx)
AMBER - Glass	(PAH) (TPH-HCID) (NWT/PH-Dx) (TPH-418.1) (Oil & Grease) (8081A)	
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 Kjeldahl Nitrogen) (NH ₃) (NO ₂ /NO ₃)	
GREEN - Poly	(Cyanide) (Total Free weak-acid dissociable)	
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: 1200 11/08/10 ORP 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								
2	F	65.472.0	7.05	711	16.12	2.6	0.51	↑ 1
1	F	65.472.0	7.06	712	16.48	7.4	0.58	clear, colorless
0		0.00						

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

Well has been pumping for 44 hours at 25 gpm
Mid Test sample

SAMPLER: Matt Wilson / O'Leary
(PRINTED NAME)

Matt Wilson
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: PW-8-39

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: 65-111010-8

DUP ID: 65-111010-9 (0750)

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY	
WEATHER:	SUNNY			CLOUDY			RAIN			?		
										TEMPERATURE:	°F 45.	°C

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column]

[Circle appropriate unit] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)	
11/10/10	07:44	42.0	—	33.98	—	8.02	X1 NA See	
/ /	:	.	.	.	.	.	X3 Below
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = G-rubb

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/10/10	07:45	G-2	250, 500, 1L	None	YES	NO	NA	✓
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	07:45	G-1	250, 500, 1L	NaOH	YES	NO		X
Red Total Poly	11/10/10	07:45	G-1	250, 500, 1L	HNO ₃	YES	NO		X
Red Diss. Poly	11/10/10	07:45	G-1	250, 500, 1L	HNO ₃	YES	YES		X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 8 (10)

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)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₂ /NO ₃)
	GREEN - Poly	(Cyanide) (Total Free, weak-acid dissociable)
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: 1200 11/08/10

ORP

Pump/Bailor Inlet Depth:

Meas.	Method	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.	.	.
3		.	.	.	.	.	.
2		5167.0	.	.	.	.	.
1	F	3.5	7.15	844	17.06	10.4	0.28	clear, colorless
0		0.00	.	.	.	.	.

[Casing]

[Select A-G]

[Cumulative Totals]

[Circle units]

[Clarity, Color]

pump has been in operation at 2 GPM for 44 hours
 Totalizer readings #2 20455
 #1 24088
 Mid Test Sample
 SAMPLER: McWilson / O'Leary
 (PRINTED NAME) Matthew Wil
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: PW-9-92

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: 65-111010-10

DUP ID:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY	CLOUDY	RAIN	?	TEMPERATURE: °F 45 °C						

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column]

[Circle appropriate unit] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/10/10	08:05	95.0	—	39.84	—	55.16	X1 NA See
/ /	:	.	.	.	.	.	X3 Below

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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other: GRAB 8" = 2.61

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/10/10	08:10	G (2)	250, 500, 1L	None	YES	NO	NA	✓
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	08:10	G (1)	250, 500, 1L	NaOH	YES	NO		X
Red Total Poly	11/10/10	08:10	G (1)	250, 500, 1L	HNO ₃	YES	NO		X
Red Diss. Poly	11/10/10	08:10	G (1)	250, 500, 1L	HNO ₃	YES	YES		X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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)
	WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) (HCO ₃ /CO ₃) (Cl) (SO ₄) (NO ₃) (NO ₂) (P)
	YELLOW - Poly	(COD) (TOC) (Total PO ₄) (Total Kjeldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) (Total Free weak-acid dissociable)
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: 1200 11/08/10

ORP

Pump/Bailor Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.		.
3		.	.	.	.		.
2		.	.	.	.		.
1	F	66362.0	7.13	702	15.60	9.1	0.24	clean, colorless
0		0.00	.	.	.		.

[Casing]

[Select A-C]

[Cumulative Totals]

[Circle units]

[Clarity, Color]

*pump has been in operation at 25 GPM for 44 hours
Mid Test Sample*

SAMPLER: M. Wilson / D. Laffoon
(PRINTED NAME)

Matthew Wilson
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333

Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: FIELD BLANK

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: GS-111010-11

DUP ID:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY			CLOUDY		RAIN		?		TEMPERATURE: °F 45 °C	

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness]

[Water Column]

[Circle appropriate unit] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
/ /	:	X 1
/ /	:	X 3
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other POUR GPAIS

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

Sample Depth: [N if used]

Bottle Type	Date	Time	Method	Amount & Volume mL	Preservative [circle]	Ice	Filter	pH	✓
VOA Glass	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/10/10	08:30	B	(2) 250, 500, 1L	(None)	YES	NO	NA	✓
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	08:30	B	(1) 250, 500, 1L	(NaOH)	YES	NO		X
Red Total Poly	11/10/10	08:30	B	(1) 250, 500, 1L	(HNO ₃)	YES	NO		X
Red Diss. Poly	11/10/10	08:30	B	(1) 250, 500, 1L	(HNO ₃)	YES	YES		X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) (Total Free Weak-acid dissociable)
	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: NA

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		.	.	.	.		.
2		.	.	.	.		.
1	B	NA	5.37	1	9.23	227.1	10.13	clear, colorless
0		0.00	.	.	.		.

[Casing] [Select A-G] [Cumulative Totals]

[Circle units]

[Clarity, Color]

Sample collected by pumping laboratory provided deionized water through a new, clean section of Pharmed tubing with a peristaltic pump into sample bottles

SAMPLER: M. Wilson / D. Laffoon
(PRINTED NAME)

Matthew Weil
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test WELL ID: WILLAMETTE RIVER

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR BLIND ID: GS-11010-12

DUP ID:

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	SUNNY	CLOUDY			RAIN	?			TEMPERATURE:	°F 95	°C

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)	
/ /	:	X 1 NA	
/ /	:	X 3	
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = GRAB

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

Bottle Type	Date	Time	Method	Amount & Volume mL	Preservative (circle)	Ice	Filter	pH	√
VOA Glass	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/10/10	09:00	B	(2) 250, 500, 1L	(None)	YES	NO	NA	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	09:00	B	(1) 250, 500, 1L	NaOH	YES	NO		X
Red Total Poly	11/10/10	09:00	B	(1) 250, 500, 1L	HNO ₃	YES	NO		X
Red Diss. Poly	11/10/10	09:00	B	(1) 250, 500, 1L	HNO ₃	YES	YES		X

Total Bottles (include duplicate count): 5

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)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) (Total Free weak-acid dissociable)
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	CRP	Pump/Bailor Inlet Depth:	Water Quality
4		.	.	.	.
3		.	.	.	.
2		.	.	.	.
1	B	NA	7.16	80	11.30	3a.6	11.62	sl. cloudy, L brown tint
0		0.00	.	.	.			

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

Sample collected from boathouse on Olympic Tug floating dock.
Mid Test Sample

SAMPLER: M. Wilson / D. Coffey
(PRINTED NAME)

Matthew Webb
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: ~~M2~~ PW-8-68

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: GS-11110-13

DUP ID:

WIND FROM:	N	NE	E	SE	S	SW	W	NW	LIGHT	MEDIUM	HEAVY
WEATHER:	SUNNY	CLOUDY			RAIN			?	TEMPERATURE: °F 50. °C		

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column]

(Circle appropriate unit) [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
10/11/10	11:49	71.0	—	23.18	—	47.82	X 1 See below
/ /	:	.	.	.	.	.	X 3 NA

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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = Gravel 8" = 2.61

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/11/10	11:50	G (2)	250, 500, 1L	None	YES	NO	NA	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/10/10	11:50	G (1)	250, 500, 1L	NaOH	YES	NO	—	X
Red Total Poly	11/11/10	11:50	G (2)	250, 500, 1L	HNO ₃	YES	NO	—	X
Red Diss. Poly	11/11/10	11:50	G (1)	250, 500, 1L	HNO ₃	YES	YES	—	X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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) (NWTPII-Gx)
	AMBER - Glass	(PAH) (TPH-HClD) (NWTPII-Dx) (TPH-418.1) (Oil & Grease) (8081A)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	(Cyanide) - Total, Free, weak-acid dissociable
	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 DISSOLVBD - 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: 1200 11/08/10 ORP Pump/Bailor Inlet Depth:

Meas.	Method	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.		.		.
3		.	.		.		.
2		.	.		.		.
1	F	107797.0	7.32	710	17.12	26.6	0.16	clear, colorless
0		0.00	.		.		.	

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

Pump has been operating at 25 GPM for 72 hours
Ending Totalizer Reading 109055 Gallons

SAMPLER: Matt Wilson
(PRINTED NAME)

Matt Wilson
(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: PW-8-39

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: GS-11110-14

DUP ID:

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	SUNNY	CLOUDY			RAIN		?	TEMPERATURE:		°F 50.	°C

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column] [Circle appropriate units] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)	
11/10/10	12:09	42.0	—	34.16	—	7.84	X 1 See below	
/ /	:	.	.	.	.	.	X 3
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other **G-RAB**

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/11/10	12:10	G-2	(250, 500, 1L)	(None)	YES	NO	NA	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/11/10	12:10	G-1	(250, 500, 1L)	(NaOH)	YES	NO	—	X
Red Total Poly	11/11/10	12:10	G-2	(250, 500, 1L)	(HNO ₃)	YES	NO	—	X
Red Diss. Poly	11/11/10	12:10	G-1	(250, 500, 1L)	(HNO ₃)	YES	YES	—	X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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) (BTX) (NWTPH-Gx)
	AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil & Grease) (8081A)
	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) - Total, Free, weak-acid dissociable
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: 1200: 11/08/10 **DPF** Pump/Bailor Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.	.	.		.
3		.	.	.	.		.
2		.	.	.	.		.
1	F	8457	7.32	827	17.22	42.6	0.13	clear, colorless
0		0.00	.	.	.		.

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

Pump has been in operation for 72 hours at 2 GPM

Findings
Totalizer Readings
#1 Totalizer 23735
#2 Totalizer 27412
SAMPLER: Matt Wilson
(PRINTED NAME)

23789 Total Gallons Purged
27468
Matt Wilson
(SIGNATURE)

8511 G-T#1
8600 G-T#2

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333

Portland, OR 97224

Office: (503) 670-1108

Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: PW-7-93

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: 65-11110-15

DUP ID:

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	SUNNY		CLOUDY		RAIN		?		TEMPERATURE: °F 50 °C		

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/10/10	12:18	96.0	---	26.00	---	70.00	X1 See below
/ /	:	.	.	.	.	.	X3

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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = GRAB (8" = 2.61)

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/11/10	12:20	G- (2)	250, 500, 1L	None	YES	NO	NA	+
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/11/10	12:20	G- (1)	250, 500, 1L	NaOH	YES	NO	---	X
Red Total Poly	11/11/10	12:20	G- (1)	250, 500, 1L	HNO ₃	YES	NO	---	X
Red Diss. Poly	11/11/10	12:20	G- (1)	250, 500, 1L	HNO ₃	YES	YES	---	X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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-Cx)
	AMBER - Glass	(PAH) (TPH-HCID) (NWTPH-Dx) (TPH-418.1) (Oil & Grease) (8081A)
	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) - Total, Free, weak-acid dissociable
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (TI) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (TI) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA Purge Start Time: 1200 11/08/10 ORP Pump/Bailor Inlet Depth:

Meas.	Method	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.		.		.
3		.	.		.		.
2		.	7.34	860	15.97	25.1	0.18	↑ ↑
1	F	108912.0	7.35	860	15.97		0.25	clear, colorless
0		0.00	.		.		.	

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

Well has been pumping for 70 hours at 25 GPM
 Final Totalizer Reading = 109063 G

SAMPLER: Math Wilson Math Wilson
 (PRINTED NAME) (SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: WILLAMETTE RIVER

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: 65-11110-16

DUP ID:

WIND FROM:	N	NE	E	SE	<u>S</u>	SW	W	NW	<u>LIGHT</u>	MEDIUM	HEAVY
WEATHER:	SUNNY		<u>CLOUDY</u>		RAIN		?		TEMPERATURE: °F <u>50</u> °C		

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column]

[Circle appropriate unit] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
/ /	:	X 1 NA - RIVER
/ /	:	X 3
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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other: SEA

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	<u>NO</u>		
White Poly	11/11/10	13:10	B	<u>(2)</u> 250, 500, 1L	<u>None</u>	<u>YES</u>	<u>NO</u>	<u>NA</u>	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/11/10	13:10	B	<u>(1)</u> 250, 500, 1L	<u>NaOH</u>	<u>YES</u>	<u>NO</u>	-	X
Red Total Poly	11/11/10	13:10	B	<u>(1)</u> 250, 500, 1L	<u>HNO₃</u>	<u>YES</u>	<u>NO</u>	-	X
Red Diss. Poly	11/11/10	13:10	B	<u>(1)</u> 250, 500, 1L	<u>HNO₃</u>	<u>YES</u>	<u>YES</u>	-	X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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)
	WHITE - Poly	(pH) (Conductivity) (TDS) (TSS) (BOD) (Turbidity) (Alkalinity) <u>(HCO₃/CO₃) (Cl) (SO₄) (NO₃) (NO₂) (F)</u>
	YELLOW - Poly	(COD) (TOC) <u>(Total-PO₄) (Total Kjeldahl Nitrogen)</u> (NH ₃) (NO ₃ /NO ₂)
	GREEN - Poly	<u>(Cyanide) - Total, Free, weak-acid dissociable</u>
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) <u>(Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)</u>
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) <u>(Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)</u> (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: NA

ORP

Pump/Bailor Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	<u>ORP</u>	Diss O ₂ (mg/l)	Water Quality
4		.	.		.		.
3		.	.		.		.
2		.	.		.		.
1	<u>B</u>	<u>NA</u>	<u>7.08</u>	<u>78</u>	<u>10.84</u>	<u>198.3</u>	<u>12.33</u>	<u>sl. cloudy, L brown tint</u>
0		<u>0.00</u>	.		.		.	

[Casing]

[Select A-G]

[Cumulative Totals]

[Circle units]

[Clarity, Color]

Sample collected from FAMM bathhouse on floating dock

SAMPLER:

Matt Wilson

(PRINTED NAME)

Matt Wilson

(SIGNATURE)

FIELD SAMPLING DATA SHEET



6650 SW Redwood Lane, Suite 333
Portland, OR 97224

Office: (503) 670-1108 Fax: (503) 670-1128

PROJECT NAME: Gasco Segment 2 Capture Zone Field Test

WELL ID: PW-9-92

SITE ADDRESS: 7900 NW St. Helens Rd, Portland OR

BLIND ID: GS-11110-17

DUP ID:

WIND FROM:	N	NE	E	SE	(S)	SW	W	NW	(LIGHT)	MEDIUM	HEAVY
WEATHER:	SUNNY	(CLOUDY)		RAIN				?	TEMPERATURE:	°F 45.	°C

HYDROLOGY/LEVEL MEASUREMENTS (Nearest 0.01 ft)

[Product Thickness] [Water Column]

[Circle appropriate unit] [Water Column x Gal/ft]

Date	Time	DT-Bottom	DT-Product	DT-Water	DTP-DTW	DTB-DTW	Volume (gal)
11/11/10	11:19	95.0	—	40.90	—	54.10	X 1 See Below
/ /	:	.	.	.	.	.	X 3

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 Bailor (D) PVC/Teflon Bailor (E) Dedicated Bailor (F) Dedicated Pump (G) Other = GPAB 8" = 2.61

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	/ /	:		40 ml	HCl	YES	NO		
Amber Glass	/ /	:		250, 500, 1L	(None) (HCl) (H ₂ SO ₄)	YES	NO		
White Poly	11/11/10	11:20	G-2	250, 500, 1L	(None)	YES	NO	NA	X
Yellow Poly	/ /	:		250, 500, 1L	H ₂ SO ₄	YES	NO		
Green Poly	11/11/10	:	G-1	250, 500, 1L	(NaOH)	YES	NO	—	X
Red Total Poly	11/11/10	:	G-1	250, 500, 1L	(HNO ₃)	YES	NO	—	X
Red Diss. Poly	11/11/10	:	G-1	250, 500, 1L	(HNO ₃)	YES	YES	—	X
	/ /	:		250, 500, 1L		YES			

Total Bottles (include duplicate count): 5

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)
	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 Kjeldahl Nitrogen) (NH ₃) (NO ₂ /NO ₃)
	GREEN - Poly	(Cyanide) - Total, Free, weak-acid dissociable
	RED TOTAL - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na)
	RED DISSOLVED - Poly	(As) (Sb) (Ba) (Be) (Ca) (Cd) (Co) (Cr) (Cu) (Fe) (Pb) (Mg) (Mn) (Ni) (Ag) (Se) (Ti) (V) (Zn) (Hg) (K) (Na) (Hardness) (Silica)

WATER QUALITY DATA

Purge Start Time: 12:00 11/08/10

CRP

Pump/Bailor Inlet Depth:

Meas.	Method §	Purged (gal)	pH	E Cond (µS)	°F Temp °C	Other	Diss O ₂ (mg/l)	Water Quality
4		.	.		.		.
3		.	.		.		.
2		.	.		.		.
1	F	107167.0	7.16	703	15.78	92.4	0.18	clear, colorless
0		0.00	.		.		.	

[Casing] [Select A-G] [Cumulative Totals]

[Circle units]

[Clarity, Color]

Well has been pumping for 72 hours at 25 GPM
Final Totalizer Reading = 109109 G

SAMPLER: Matt Wilson
(PRINTED NAME)

Matt Wilson
(SIGNATURE)

APEX LABS

CHAIN OF CUSTODY

COC 1 of 1

Lab # _____

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Anchor QEA Project Mgr: John Renda Project Name: Gosco Sea 2 CZ Project # 000029-02,2833
 Address: 6650 SW Redwood Ln # 333 Portland OR 97224 Phone: 5036701108 Fax: 5036701128 Email: J.Renda@anchoragea.com

Sampled by: Matt Wilson 9.2.10 ANALYSIS REQUEST

SAMPLE ID	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Metals (8)	Priority Metals (13)	Al, Sb, As, Ba, Be, Cd, Cr, Cu, Fe, Pb, Hg, Mn, Mo, Ni, Se, Ag, Na, Ti, V, Zn	TCLP Metals (8)	1200- COLS	1200-Z	Free Cyanide	Total Cyanide	Wash-and-a-stress Cyanide	Sulfate, Chloride, bicarbonate, carbonate, Nitrate	
																										Other: _____	Site Location: OR WA
GS-111010-6		11/10/10	0730	W	5													X					X	X	X	X
GS-111010-7			0735	W	5													X					X	X	X	X
GS-111010-8			0745	W	5													X					X	X	X	X
GS-111010-9			0750	W	5													X					X	X	X	X
GS-111010-10			0810	W	5													X					X	X	X	X
GS-111010-11			0830	W	5													X					X	X	X	X
GS-111010-12			0900	W	5													X					X	X	X	X

Normal Turn Around Time (TAT) = 7-10 Business Days YES NO

TAT Requested (circle): 24 HR, 48 HR, 72 HR, 4 DAY, 5 DAY, Other: _____

SAMPLES ARE HELD FOR 30 DAYS

SPECIAL INSTRUCTIONS:
 Total and Dissolved metals.
 Dissolved Metals, and Cations & Anions filtered
 in the field.
 Cyanide → 48 hr hold time

RELINQUISHED BY: RECEIVED BY:

Signature: Matt Wilson Date: 11/10/10 Signature: Dennis Smith Date: 11/10/10
 Printed Name: Matt Wilson Time: 1040 Printed Name: Dennis Smith Time: 10:40

Company: Anchor QEA Company: Apex

RELINQUISHED BY: RECEIVED BY:

Signature: _____ Date: _____ Signature: _____ Date: _____
 Printed Name: _____ Time: _____ Printed Name: _____ Time: _____

Company: _____ Company: _____

APEX LABS

CHAIN OF CUSTODY

COC 1 of 1

Lab # _____

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Anchor OEA Project Mgr: John Renda Project Name: Gooco Sea 2 CZ Project # 100029-02.28 3A
 Address: 6650 SW Redwood Ln #333 Portland OR 97224 Phone: 5036701108 Fax: 5036701108 Email: JRenda@anchoroea.com

Sampled by: Matthew Wilson ANALYSIS REQUEST

Site Location: <u>OR</u> WA Other: _____	LAB ID #	DATE	TIME	MATRIX	# OF CONTAINERS	NTPH-HCID	NTPH-DX	NTPH-CX	BTEX	8260 RBDM VOCs	8260 Halo VOCs	8260 VOCs	8270 SIM PAHs	8082 PCBs	8081 Chlor. Pest	RCRA Metals (8)	Priority Metals (13) Al, Sb, As, Ba, Be, Bi, Cd, Cr, Cu, Fe, Hg, Mn, Ni, Pb, Se, Ag, Na, Ti, V, Zn	TCLP Metals (8)	1200-COLS	1200-Z	Total Cyanide	Free Cyanide	Wet-oxid digestion cyanide	Sulfate, Chloride, bicarbonate, carbonate, Nitrate	
																									SAMPLE ID
		<u>11/11/10</u>	<u>1150</u>	<u>W</u>	<u>5</u>												<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
			<u>1210</u>	<u>W</u>	<u>5</u>												<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
			<u>1220</u>	<u>W</u>	<u>5</u>												<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
			<u>1310</u>	<u>W</u>	<u>5</u>												<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	
		<u>↓</u>	<u>1120</u>	<u>W</u>	<u>5</u>												<u>X</u>				<u>X</u>	<u>X</u>	<u>X</u>	<u>X</u>	

Normal Turn Around Time (TAT) = 5-10 Business Days

TAT Requested (circle):
 24 HR 48 HR 72 HR
 4 DAY 5 DAY Other: _____

SPECIAL INSTRUCTIONS:
Cyanide 48 hour hold time
Total and dissolved Metals
Dissolved metals & cations & anions filtered in field

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY: Signature: <u>Matthew Wilson</u> Printed Name: <u>Matthew Wilson</u> Company: <u>Anchor OEA</u>	Date: <u>11/11/10</u> Time: <u>1500</u>	RECEIVED BY: Signature: <u>Jennifer Smith</u> Printed Name: <u>Jennifer Smith</u> Company: <u>Apex</u>	RELINQUISHED BY: Signature: _____ Printed Name: _____ Company: _____	Date: _____ Time: _____	RECEIVED BY: Signature: _____ Printed Name: _____ Company: _____
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APPENDIX C
DATA CD

APPENDIX D
LABORATORY REPORTS

Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

Friday, December 3, 2010

John Renda
Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

RE: GASCO-1DW-SEQ 2 C 2 / 000029-02

Enclosed are the results of analyses for work order A10K140, which was received by the laboratory on 11/8/2010 at 3:30:00PM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: dthomas@apex-labs.com, or by phone at 503-718-2323.

Apex Laboratories



The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02
Project Manager: John Renda

Reported:
12/03/10 10:28

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GS-110810-1	A10K140-01	Water	11/08/10 12:30	11/08/10 15:30
GS-110810-2	A10K140-02	Water	11/08/10 12:20	11/08/10 15:30
GS-110810-3	A10K140-03	Water	11/08/10 13:00	11/08/10 15:30
GS-110810-4	A10K140-04	Water	11/08/10 12:25	11/08/10 15:30
GS-110810-5	A10K140-05	Water	11/08/10 13:30	11/08/10 15:30

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011177			
Chloride	7.08	1.00	1.00	mg/L	1	11/09/10 14:45	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250	"	"	"	"	
Sulfate	ND	1.00	1.00	"	"	"	"	
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011177			
Chloride	17.1	1.00	1.00	mg/L	1	11/09/10 15:46	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250	"	"	"	"	
Sulfate	ND	1.00	1.00	"	"	"	"	
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011177			
Nitrate-Nitrogen	ND	0.250	0.250	mg/L	1	11/09/10 16:07	300.0/9056A	
Sulfate	28.5	1.00	1.00	"	"	"	"	
GS-110810-3 (A10K140-03RE1)			Matrix: Water		Batch: 1011225			
Chloride	79.9	5.00	5.00	mg/L	1	11/12/10 01:38	300.0/9056A	
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011177			
Chloride	25.4	1.00	1.00	mg/L	1	11/09/10 16:27	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250	"	"	"	"	
Sulfate	ND	1.00	1.00	"	"	"	"	
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011177			
Chloride	4.65	1.00	1.00	mg/L	1	11/09/10 16:48	300.0/9056A	
Nitrate-Nitrogen	0.536	0.250	0.250	"	"	"	"	
Sulfate	3.53	1.00	1.00	"	"	"	"	

Apex Laboratories



Darwin Thomas, Business Development Director

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Cyanide - Total (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.100	0.00250	0.00500	mg/L	1	11/17/10 15:41	EPA 335.4	
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.122	0.00250	0.00500	mg/L	1	11/17/10 15:43	EPA 335.4	
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.0788	0.00250	0.00500	mg/L	1	11/17/10 15:52	EPA 335.4	
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.150	0.00250	0.00500	mg/L	1	11/17/10 15:53	EPA 335.4	
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.0225	0.00250	0.00500	mg/L	1	11/17/10 15:55	EPA 335.4	
GS-110810-5 (A10K140-05RE1)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.0251	0.00250	0.00500	mg/L	1	11/17/10 16:17	EPA 335.4	

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0282	0.00500	0.0100	mg/L	1	11/16/10 16:49	SM 4500-CN (I/E)	R-08
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0209	0.00500	0.0100	mg/L	1	11/16/10 16:53	SM 4500-CN (I/E)	R-08
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0198	0.00500	0.0100	mg/L	1	11/16/10 16:55	SM 4500-CN (I/E)	R-08
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0309	0.00500	0.0100	mg/L	1	11/16/10 16:56	SM 4500-CN (I/E)	R-08
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0297	0.00500	0.0100	mg/L	1	11/16/10 17:01	SM 4500-CN (I/E)	R-08

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Cyanide - Free (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011198			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/10/10 16:05	ASTM D 4282	
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011198			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/10/10 16:07	ASTM D 4282	
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011198			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/10/10 16:07	ASTM D 4282	
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011198			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/10/10 16:12	ASTM D 4282	
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011198			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/10/10 16:12	ASTM D 4282	

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting		Units	Dilution	Date Analyzed	Method	Notes
			Limit						
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011233				
Calcium	71.6	0.250	1.00		mg/L	10	11/12/10 16:00	EPA 6020	
Iron	40.5	0.100	0.500						
Magnesium	26.3	0.100	0.500						
Manganese	3.01	0.00333	0.0100						
Potassium	6.23	0.100	1.00						
Sodium	17.2	0.200	1.00						
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011233				
Calcium	54.1	0.250	1.00		mg/L	10	11/12/10 16:18	EPA 6020	
Iron	43.0	0.100	0.500						
Magnesium	39.0	0.100	0.500						
Manganese	1.96	0.00333	0.0100						
Potassium	3.90	0.100	1.00						
Sodium	19.7	0.200	1.00						
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011233				
Calcium	58.5	0.250	1.00		mg/L	10	11/12/10 16:21	EPA 6020	
Iron	31.1	0.100	0.500						
Magnesium	29.2	0.100	0.500						
Manganese	2.60	0.00333	0.0100						
Potassium	2.71	0.100	1.00						
Sodium	76.8	0.200	1.00						
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011233				
Calcium	56.2	0.250	1.00		mg/L	10	11/12/10 16:24	EPA 6020	
Iron	43.5	0.100	0.500						
Magnesium	29.1	0.100	0.500						
Manganese	3.29	0.00333	0.0100						
Potassium	3.29	0.100	1.00						
Sodium	15.3	0.200	1.00						
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011233				
Calcium	6.13	0.0250	0.100		mg/L	1	11/12/10 16:27	EPA 6020	
Iron	0.383	0.0100	0.0500						
Magnesium	2.08	0.0100	0.0500						
Manganese	0.0181	0.000333	0.00100						
Potassium	0.938	0.0100	0.100						
Sodium	4.92	0.0200	0.100						

Apex Laboratories



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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting		Units	Dilution	Date Analyzed	Method	Notes
			Limit						
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011223				
Calcium	77.2	0.250	1.00		mg/L	10	11/12/10 14:01	EPA 6020 (Diss)	
Iron	42.2	0.100	0.500						
Magnesium	27.9	0.100	0.500						
Manganese	3.15	0.00333	0.0100						
Potassium	6.45	0.0100	0.100			1	11/11/10 16:45		
Sodium	18.2	0.200	1.00			10	11/12/10 14:01		
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011223				
Calcium	57.7	0.250	1.00		mg/L	10	11/12/10 14:07	EPA 6020 (Diss)	
Iron	42.5	0.100	0.500						
Magnesium	39.9	0.100	0.500						
Manganese	2.05	0.00333	0.0100						
Potassium	3.89	0.0100	0.100			1	11/11/10 16:54		
Sodium	20.1	0.200	1.00			10	11/12/10 14:07		
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011223				
Calcium	62.7	0.250	1.00		mg/L	10	11/12/10 14:10	EPA 6020 (Diss)	
Iron	31.9	0.100	0.500						
Magnesium	30.8	0.100	0.500						
Manganese	2.75	0.00333	0.0100						
Potassium	2.80	0.0100	0.100			1	11/11/10 16:57		
Sodium	81.2	0.200	1.00			10	11/12/10 14:10		
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011223				
Calcium	58.8	0.250	1.00		mg/L	10	11/12/10 14:30	EPA 6020 (Diss)	
Iron	43.4	0.100	0.500						
Magnesium	30.0	0.100	0.500						
Manganese	3.34	0.00333	0.0100						
Potassium	3.32	0.0100	0.100			1	11/11/10 17:00		
Sodium	15.6	0.200	1.00			10	11/12/10 14:30		
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011223				
Calcium	6.68	0.0250	0.100		mg/L	1	11/11/10 17:06	EPA 6020 (Diss)	
Iron	0.156	0.0100	0.0500						
Magnesium	2.15	0.0100	0.0500						
Manganese	0.0111	0.000333	0.00100				11/12/10 14:33		
Potassium	1.04	0.0100	0.100				11/11/10 17:06		
Sodium	5.22	0.0200	0.100						

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

ANALYTICAL SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting		Units	Dilution	Date Analyzed	Method	Notes
			Limit						
GS-110810-1 (A10K140-01)			Matrix: Water		Batch: 1011197				
Total Alkalinity	374	20.0	20.0		mg CaCO3/L	1	11/10/10 11:30	SM 2320 B	
Bicarbonate Alkalinity	374	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-110810-2 (A10K140-02)			Matrix: Water		Batch: 1011197				
Total Alkalinity	359	20.0	20.0		mg CaCO3/L	1	11/10/10 11:30	SM 2320 B	
Bicarbonate Alkalinity	359	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-110810-3 (A10K140-03)			Matrix: Water		Batch: 1011197				
Total Alkalinity	353	20.0	20.0		mg CaCO3/L	1	11/10/10 11:30	SM 2320 B	
Bicarbonate Alkalinity	353	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-110810-4 (A10K140-04)			Matrix: Water		Batch: 1011197				
Total Alkalinity	299	20.0	20.0		mg CaCO3/L	1	11/10/10 11:30	SM 2320 B	
Bicarbonate Alkalinity	299	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-110810-5 (A10K140-05)			Matrix: Water		Batch: 1011197				
Total Alkalinity	27.6	20.0	20.0		mg CaCO3/L	1	11/10/10 11:30	SM 2320 B	
Bicarbonate Alkalinity	27.6	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02
Project Manager: John Renda

Reported:
12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011177 - Method Prep: Aq						Water						
Blank (1011177-BLK1)						Prepared: 11/09/10 12:23 Analyzed: 11/09/10 14:04						
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	---	---	---	---	---	---
Nitrate-Nitrogen	ND	0.250	0.250			---	---	---	---	---	---	---
Sulfate	ND	1.00	1.00			---	---	---	---	---	---	---
LCS (1011177-BS1)						Prepared: 11/09/10 12:23 Analyzed: 11/09/10 14:25						
300.0/9056A												
Chloride	3.74	1.00	1.00	mg/L	1	4.00	---	94	90-110%	---	---	---
Nitrate-Nitrogen	0.919	0.250	0.250			1.00	---	92		---	---	---
Sulfate	4.10	1.00	1.00			4.00	---	102		---	---	---
Duplicate (1011177-DUP1)						Prepared: 11/09/10 12:23 Analyzed: 11/09/10 15:06						
QC Source Sample: GS-110810-1 (A10K140-01)												
300.0/9056A												
Chloride	7.06	1.00	1.00	mg/L	1	---	7.08	---	---	0.3	15%	
Nitrate-Nitrogen	ND	0.250	0.250			---	ND	---	---		15%	
Sulfate	ND	1.00	1.00			---	ND	---	---		15%	
Matrix Spike (1011177-MS1)						Prepared: 11/09/10 12:23 Analyzed: 11/09/10 15:26						
QC Source Sample: GS-110810-1 (A10K140-01)												
300.0/9056A												
Chloride	11.3	1.11	1.11	mg/L	1	4.44	7.08	95	80-120%	---	---	
Nitrate-Nitrogen	1.05	0.278	0.278			1.11	ND	95		---	---	
Sulfate	4.62	1.11	1.11			4.44	ND	104		---	---	
Batch 1011225 - Method Prep: Aq						Water						
Blank (1011225-BLK1)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 01:58						
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	---	---	---	---	---	---
Nitrate-Nitrogen	ND	0.250	0.250			---	---	---	---	---	---	---
Sulfate	ND	1.00	1.00			---	---	---	---	---	---	---
LCS (1011225-BS1)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 02:19						
300.0/9056A												
Chloride	3.67	1.00	1.00	mg/L	1	4.00	---	92	90-110%	---	---	
Nitrate-Nitrogen	0.908	0.250	0.250			1.00	---	91		---	---	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
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Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011225 - Method Prep: Aq						Water						
LCS (1011225-BS1)						Prepared: 11/11/10 11:39		Analyzed: 11/12/10 02:19				
Sulfate	4.33	1.00	1.00	mg/L		4.00	---	108		---	---	
Duplicate (1011225-DUP1)						Prepared: 11/11/10 11:39		Analyzed: 11/12/10 02:40				
QC Source Sample: Other (A10K151-01RE1)												
300.0/9056A												
Chloride	31.7	5.00	5.00	mg/L	1	---	31.6	---	---	0.5	15%	
Nitrate-Nitrogen	2.50	1.25	1.25			---	2.50	---	---	0.2	15%	
Sulfate	110	5.00	5.00			---	110	---	---	0.3	15%	
Duplicate (1011225-DUP2)						Prepared: 11/11/10 11:39		Analyzed: 11/12/10 04:02				
QC Source Sample: Other (A10K177-06)												
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	ND	---	---		15%	
Nitrate-Nitrogen	ND	0.250	0.250			---	ND	---	---		15%	
Sulfate	ND	1.00	1.00			---	ND	---	---		15%	
Matrix Spike (1011225-MS1)						Prepared: 11/11/10 11:39		Analyzed: 11/12/10 03:00				
QC Source Sample: Other (A10K151-01RE1)												
300.0/9056A												
Chloride	51.4	5.00	5.00	mg/L	1	20.0	31.6	99	80-120%	---	---	
Nitrate-Nitrogen	7.20	1.25	1.25			5.00	2.50	94		---	---	
Sulfate	130	5.00	5.00			20.0	110	97		---	---	
Matrix Spike (1011225-MS2)						Prepared: 11/11/10 11:39		Analyzed: 11/12/10 04:22				
QC Source Sample: Other (A10K177-06)												
300.0/9056A												
Chloride	4.23	1.11	1.11	mg/L	1	4.44	ND	95	80-120%	---	---	
Nitrate-Nitrogen	1.04	0.278	0.278			1.11	ND	94		---	---	
Sulfate	4.88	1.11	1.11			4.44	ND	110		---	---	

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Anchor QEA, LLC Portland
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 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Total (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011322 - Latchat Micro Dist - aqueous						Water						
Blank (1011322-BLK2)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 15:47						
EPA 335.4												
Cyanide, Total	ND	0.00250	0.00500	mg/L	1	---	---	---	---	---	---	
LCS (1011322-BS1)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 15:29						
EPA 335.4												
Cyanide, Total	0.189	0.00250	0.00500	mg/L	1	0.200	---	95	90-110%	---	---	
Duplicate (1011322-DUP2)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 15:59						
QC Source Sample: Other (A10K200-02)												
EPA 335.4												
Cyanide, Total	0.0826	0.00250	0.00500	mg/L	1	---	0.0839	---	---	2	10%	
Duplicate (1011322-DUP3)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 16:16						
QC Source Sample: Other (A10K132-01)												
EPA 335.4												
Cyanide, Total	0.0450	0.00250	0.00500	mg/L	1	---	0.0456	---	---	1	10%	
Matrix Spike (1011322-MS2)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 16:01						
QC Source Sample: Other (A10K200-02)												
EPA 335.4												
Cyanide, Total	0.268	0.00255	0.00510	mg/L	1	0.204	0.0839	90	90-110%	---	---	
Matrix Spike (1011322-MS3)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 16:14						
QC Source Sample: Other (A10K132-01)												
EPA 335.4												
Cyanide, Total	0.179	0.00255	0.00510	mg/L	1	0.204	0.0456	66	90-110%	---	---	Q-01

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Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011304 - Latchat Micro Dist - aqueous						Water						
Blank (1011304-BLK1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:46						
SM 4500-CN (I/E)												
Cyanide, WAD	ND	0.00500	0.0100	mg/L	1	---	---	---	---	---	---	R-08
LCS (1011304-BS2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:32						
SM 4500-CN (I/E)												
Cyanide, WAD	0.214	0.0300	0.0600	mg/L	6	0.200	---	107	90-110%	---	---	R-08
Duplicate (1011304-DUP1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:50						
QC Source Sample: GS-110810-1 (A10K140-01)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.0190	0.00500	0.0100	mg/L	1	---	0.0282	---	---	39	10%	Q-17, R-08
Duplicate (1011304-DUP2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:29						
QC Source Sample: Other (A10K200-05)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.0339	0.00500	0.0100	mg/L	1	---	0.0387	---	---	13	10%	Q-17, R-08
Matrix Spike (1011304-MS1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:52						
QC Source Sample: GS-110810-1 (A10K140-01)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.210	0.00521	0.0104	mg/L	1	0.208	0.0282	87	80-120%	---	---	R-08
Matrix Spike (1011304-MS2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:31						
QC Source Sample: Other (A10K200-05)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.227	0.00521	0.0104	mg/L	1	0.208	0.0387	90	80-120%	---	---	R-08

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 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02
 Project Manager: John Renda

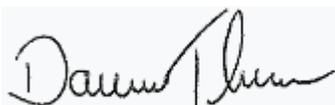
Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Free (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011198 - Microdiffusion						Water						
Blank (1011198-BLK1)						Prepared: 11/10/10 10:30 Analyzed: 11/10/10 16:00						
ASTM D 4282												
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	---	---	---	---	---	---	
LCS (1011198-BS1)						Prepared: 11/10/10 10:30 Analyzed: 11/10/10 16:00						
ASTM D 4282												
Cyanide, Free	0.0643	0.00200	0.00500	mg/L	1	0.0667	---	96	85-115%	---	---	
Duplicate (1011198-DUP1)						Prepared: 11/10/10 10:30 Analyzed: 11/10/10 16:06						
QC Source Sample: GS-110810-1 (A10K140-01)												
ASTM D 4282												
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	---	ND	---	---			20%
Matrix Spike (1011198-MS1)						Prepared: 11/10/10 10:30 Analyzed: 11/10/10 16:06						
QC Source Sample: GS-110810-1 (A10K140-01)												
ASTM D 4282												
Cyanide, Free	0.0604	0.00200	0.00500	mg/L	1	0.0667	ND	91	80-120%	---	---	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02
Project Manager: John Renda

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12/03/10 10:28

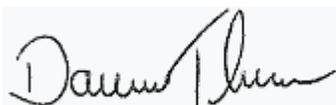
QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011233 - EPA 3015A						Water						
Blank (1011233-BLK1)						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 15:19						
EPA 6020												
Calcium	0.0336	0.0250	0.100	mg/L	1	---	---	---	---	---	---	J
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	ND	0.0100	0.100			---	---	---	---	---	---	
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
LCS (1011233-BS1)						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 15:22						
EPA 6020												
Calcium	5.59	0.0250	0.100	mg/L	1	5.56	---	101	80-120%	---	---	
Iron	5.58	0.0100	0.0500			---	---	100		---	---	
Magnesium	5.61	0.0100	0.0500			---	---	101		---	---	
Manganese	0.0526	0.000333	0.00100			0.0556	---	95		---	---	
Potassium	5.63	0.0100	0.100			5.56	---	101		---	---	
Sodium	5.58	0.0200	0.100			---	---	100		---	---	
Duplicate (1011233-DUP1)						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 16:12						
QC Source Sample: GS-110810-1 (A10K140-01)												
EPA 6020												
Calcium	73.5	0.250	1.00	mg/L	10	---	71.6	---	---	3	20%	
Iron	41.9	0.100	0.500			---	40.5	---	---	3	20%	
Magnesium	27.2	0.100	0.500			---	26.3	---	---	3	20%	
Manganese	3.11	0.00333	0.0100			---	3.01	---	---	3	20%	
Potassium	6.36	0.100	1.00			---	6.23	---	---	2	20%	
Sodium	17.8	0.200	1.00			---	17.2	---	---	3	20%	
Matrix Spike (1011233-MS1)						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 16:15						
QC Source Sample: GS-110810-1 (A10K140-01)												
EPA 6020												
Calcium	78.6	0.250	1.00	mg/L	10	5.56	71.6	126	75-125%	---	---	Q-03
Iron	46.7	0.100	0.500			---	40.5	112		---	---	
Magnesium	32.4	0.100	0.500			---	26.3	110		---	---	
Manganese	3.10	0.00333	0.0100			0.0556	3.01	154		---	---	Q-02
Potassium	12.0	0.100	1.00			5.56	6.23	103		---	---	
Sodium	23.1	0.200	1.00			---	17.2	105		---	---	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
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 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011233 - EPA 3015A						Water						
Matrix Spike (1011233-MS2)						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 16:52						
QC Source Sample: Other (A10K177-01)												
EPA 6020												
Calcium	83.5	0.250	1.00	mg/L	10	5.56	76.5	126	75-125%	---	---	Q-03
Iron	48.4	0.100	0.500				42.4	107		---	---	
Magnesium	34.6	0.100	0.500				28.5	110		---	---	
Manganese	3.32	0.00333	0.0100			0.0556	3.24	152		---	---	Q-03
Potassium	12.5	0.100	1.00			5.56	6.69	104		---	---	
Sodium	24.0	0.200	1.00				18.2	104		---	---	
Post Spike (1011233-PS1)						Prepared: 11/12/10 16:58 Analyzed: 11/12/10 17:26						
QC Source Sample: GS-110810-1 (A10K140-01)												
EPA 6020												
Calcium	84200			ug/L	10	23300	60000	104	75-125%		---	
Post Spike (1011233-PS2)						Prepared: 11/12/10 16:58 Analyzed: 11/12/10 17:31						
QC Source Sample: Post Spike (A10K177-01)												
EPA 6020												
Calcium	84400			ug/L	10	22200	61200	104	75-125%		---	
Manganese	3470					889	2590	99	80-120%		---	
Post Spike (1011233-PS3)						Prepared: 11/15/10 21:40 Analyzed: 11/15/10 21:45						
QC Source Sample: GS-110810-1 (A10K140-01)												
EPA 6020												
Manganese	2060			ug/L	10	1000	1350	71	80-120%		---	Q-02

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6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02
Project Manager: John Renda

Reported:
12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011223 - EPA 3015A - Dissolved						Water						
Blank (1011223-BLK1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:18						
EPA 6020 (Diss)												
Calcium	ND	0.0250	0.100	mg/L	1	---	---	---	---	---	---	
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	0.0157	0.0100	0.100			---	---	---	---	---	---	J
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
Blank (1011223-BLK2)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:21						
EPA 6020 (Diss)												
Calcium	ND	0.0250	0.100	mg/L	1	---	---	---	---	---	---	
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	0.0196	0.0100	0.100			---	---	---	---	---	---	J
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
LCS (1011223-BS1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:24						
EPA 6020 (Diss)												
Calcium	5.50	0.0250	0.100	mg/L	1	5.56	---	99	80-120%	---	---	
Iron	5.44	0.0100	0.0500			---	---	98		---	---	
Magnesium	5.63	0.0100	0.0500			---	---	101		---	---	
Manganese	0.0515	0.000333	0.00100			0.0556	---	93		---	---	
Potassium	5.70	0.0100	0.100			5.56	---	102	85-115%	---	---	
Sodium	5.61	0.0200	0.100			---	---	101	80-120%	---	---	
Duplicate (1011223-DUP1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:39						
QC Source Sample: Other (A10K043-04)												
EPA 6020 (Diss)												
Calcium	3.52	0.0250	0.100	mg/L	1	---	3.42	---	---	3	20%	
Iron	0.0382	0.0100	0.0500			---	0.0432	---	---	12	20%	J
Magnesium	3.17	0.0100	0.0500			---	3.09	---	---	3	20%	
Manganese	0.0127	0.000333	0.00100			---	0.0126	---	---	1	20%	
Potassium	0.839	0.0100	0.100			---	0.810	---	---	4	20%	
Sodium	2.73	0.0200	0.100			---	2.66	---	---	2	20%	

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011223 - EPA 3015A - Dissolved						Water						
Matrix Spike (1011223-MS1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:42						
QC Source Sample: Other (A10K043-04)												
EPA 6020 (Diss)												
Calcium	9.05	0.0250	0.100	mg/L	1	5.56	3.42	101	75-125%	---	---	
Iron	5.51	0.0100	0.0500				0.0432	98		---	---	
Magnesium	8.75	0.0100	0.0500				3.09	102		---	---	
Manganese	0.0642	0.000333	0.00100			0.0556	0.0126	93		---	---	
Potassium	6.53	0.0100	0.100			5.56	0.810	103	70-130%	---	---	
Sodium	8.30	0.0200	0.100				2.66	101	75-125%	---	---	
Matrix Spike (1011223-MS2)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 17:46						
QC Source Sample: Other (A10K177-07)												
EPA 6020 (Diss)												
Iron	5.53	0.0100	0.0500	mg/L	1	5.56	0.132	97	75-125%	---	---	
Magnesium	7.80	0.0100	0.0500				2.07	103		---	---	
Manganese	0.0624	0.000333	0.00100			0.0556	0.0116	91		---	---	
Potassium	6.96	0.0100	0.100			5.56	1.04	106	70-130%	---	---	
Sodium	10.6	0.0200	0.100				4.88	102	75-125%	---	---	
Matrix Spike (1011223-MS3)						Prepared: 11/11/10 10:04 Analyzed: 11/12/10 14:57						
QC Source Sample: Other (A10K177-07)												
EPA 6020 (Diss)												
Calcium	12.0	0.125	0.500	mg/L	5	5.56	6.55	97	75-125%	---	---	Q-16

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

QUALITY CONTROL (QC) SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011197 - Method Prep: Aq						Water						
Blank (1011197-BLK1)						Prepared: 11/10/10 09:44 Analyzed: 11/10/10 11:30						
SM 2320 B												
Total Alkalinity	ND	20.0	20.0	mg CaCO3/L	1	---	---	---	---	---	---	---
Bicarbonate Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	---
Carbonate Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	---
Hydroxide Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	---
LCS (1011197-BS1)						Prepared: 11/10/10 09:44 Analyzed: 11/10/10 11:30						
SM 2320 B												
Total Alkalinity	239	20.0	20.0	mg CaCO3/L	1	236	---	101	85-115%	---	---	---
Bicarbonate Alkalinity	ND	20.0	20.0			0.00100	---		0-200%	---	---	---
Carbonate Alkalinity	238	20.0	20.0			236	---	101		---	---	---
Hydroxide Alkalinity	ND	20.0	20.0			0.00100	---			---	---	---
Duplicate (1011197-DUP1)						Prepared: 11/10/10 09:44 Analyzed: 11/10/10 11:30						
QC Source Sample: Other (A10K155-07)												
SM 2320 B												
Total Alkalinity	39.4	20.0	20.0	mg CaCO3/L	1	---	47.0	---	---	18	20%	
Bicarbonate Alkalinity	39.4	20.0	20.0			---	47.0	---	---	18	20%	
Carbonate Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Hydroxide Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02
Project Manager: John Renda

Reported:
12/03/10 10:28

SAMPLE PREPARATION INFORMATION

Anions by EPA 300.0/9056A (Ion Chromatography)

Prep: Method Prep: Ag

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011177							
A10K140-01	Water	300.0/9056A	11/08/10 12:30	11/09/10 13:31	10mL/10mL	10mL/10mL	1.00
A10K140-02	Water	300.0/9056A	11/08/10 12:20	11/09/10 13:31	10mL/10mL	10mL/10mL	1.00
A10K140-03	Water	300.0/9056A	11/08/10 13:00	11/09/10 13:31	10mL/10mL	10mL/10mL	1.00
A10K140-04	Water	300.0/9056A	11/08/10 12:25	11/09/10 13:31	10mL/10mL	10mL/10mL	1.00
A10K140-05	Water	300.0/9056A	11/08/10 13:30	11/09/10 13:31	10mL/10mL	10mL/10mL	1.00
Batch: 1011225							
A10K140-03RE1	Water	300.0/9056A	11/08/10 13:00	11/11/10 11:39	2mL/10mL	10mL/10mL	5.00

Cyanide - Total (Aqueous)

Prep: Latchat Micro Dist - aqueous

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011322							
A10K140-01	Water	EPA 335.4	11/08/10 12:30	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K140-02	Water	EPA 335.4	11/08/10 12:20	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K140-03	Water	EPA 335.4	11/08/10 13:00	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K140-04	Water	EPA 335.4	11/08/10 12:25	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K140-05	Water	EPA 335.4	11/08/10 13:30	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K140-05RE1	Water	EPA 335.4	11/08/10 13:30	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Prep: Latchat Micro Dist - aqueous

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011304							
A10K140-01	Water	SM 4500-CN (I/E)	11/08/10 12:30	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K140-02	Water	SM 4500-CN (I/E)	11/08/10 12:20	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K140-03	Water	SM 4500-CN (I/E)	11/08/10 13:00	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K140-04	Water	SM 4500-CN (I/E)	11/08/10 12:25	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K140-05	Water	SM 4500-CN (I/E)	11/08/10 13:30	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00

Cyanide - Free (Aqueous)

Prep: Microdiffusion

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011198							
A10K140-01	Water	ASTM D 4282	11/08/10 12:30	11/10/10 10:30	3mL/3mL	3mL/3mL	1.00

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02
Project Manager: John Renda

Reported:
12/03/10 10:28

SAMPLE PREPARATION INFORMATION

Cyanide - Free (Aqueous)

Prep: Microdiffusion

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A10K140-02	Water	ASTM D 4282	11/08/10 12:20	11/10/10 10:30	3mL/3mL	3mL/3mL	1.00
A10K140-03	Water	ASTM D 4282	11/08/10 13:00	11/10/10 10:30	3mL/3mL	3mL/3mL	1.00
A10K140-04	Water	ASTM D 4282	11/08/10 12:25	11/10/10 10:30	3mL/3mL	3mL/3mL	1.00
A10K140-05	Water	ASTM D 4282	11/08/10 13:30	11/10/10 10:30	3mL/3mL	3mL/3mL	1.00

Total Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011233							
A10K140-01	Water	EPA 6020	11/08/10 12:30	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K140-02	Water	EPA 6020	11/08/10 12:20	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K140-03	Water	EPA 6020	11/08/10 13:00	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K140-04	Water	EPA 6020	11/08/10 12:25	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K140-05	Water	EPA 6020	11/08/10 13:30	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00

Dissolved Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A - Dissolved

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011223							
A10K140-01	Water	EPA 6020 (Diss)	11/08/10 12:30	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K140-02	Water	EPA 6020 (Diss)	11/08/10 12:20	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K140-03	Water	EPA 6020 (Diss)	11/08/10 13:00	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K140-04	Water	EPA 6020 (Diss)	11/08/10 12:25	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K140-05	Water	EPA 6020 (Diss)	11/08/10 13:30	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00

Conventional Chemistry Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011197							
A10K140-01	Water	SM 2320 B	11/08/10 12:30	11/10/10 09:44	50mL/50mL	50mL/50mL	NA
A10K140-02	Water	SM 2320 B	11/08/10 12:20	11/10/10 09:44	50mL/50mL	50mL/50mL	NA
A10K140-03	Water	SM 2320 B	11/08/10 13:00	11/10/10 09:44	50mL/50mL	50mL/50mL	NA
A10K140-04	Water	SM 2320 B	11/08/10 12:25	11/10/10 09:44	50mL/50mL	50mL/50mL	NA
A10K140-05	Water	SM 2320 B	11/08/10 13:30	11/10/10 09:44	50mL/50mL	50mL/50mL	NA

Apex Laboratories

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02
Project Manager: John Renda

Reported:
12/03/10 10:28

Notes and Definitions

Qualifiers:

- J Estimated Result . Result detected below the lowest point of the calibration curve, but above the specified MDL.
- Q-01 Percent recovery and/or RPD is outside acceptance limits.
- Q-02 Spike recovery is outside of established control limits due to sample matrix interference.
- Q-03 Percent recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
- Q-16 Reanalysis of an original Batch QC sample.
- Q-17 RPD between original and duplicate sample is outside of established control limits.
- R-08 Reporting level raised due to potential high bias associated with the low end of the calibration curve.

Notes and Conventions:

- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry'designation are not dry weight corrected.
- RPD Relative Percent Difference
- MDL If MDL is not listed, data has been evaluated to the Method Reporting Limit only.
- WMSC Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.
- Batch QC In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.
- Blank Policy Apex assesses blank data for potential high bias down to a level equal to 1/2 the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses.

For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor.

Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL.

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02
 Project Manager: John Renda

Reported:
 12/03/10 10:28

APEX LABS COOLER RECEIPT FORM

Client: Anchor Element WO#: A10 K140

Project/Project #: GASCO Seg 2 C2 / 000029-02

Delivery info:

Date/Time Received: 11/8/10 @ 15:30 By: JS

Delivered by: Apex Courier Client FedEx UPS DHL Other
 Courier/Client Name or Air Bill # _____

Cooler Inspection Inspected by: JS @ 17:05

Chain of Custody:

Included? Yes No Signed/Dated by Client? Yes No

Signed/Dated by Apex Personnel? Yes No

Coolers: No. of Coolers: 1

	<u>Cooler #1</u>	<u>Cooler #2</u>	<u>Cooler #3</u>	<u>Cooler #4</u>
Temperature (deg. C)	<u>4.1</u>	<u>5.7</u>		
Received on Ice? (Y/N)	<u>y</u>	<u>y</u>		
Temp. Blanks? (Y/N)	<u>N</u>	<u>N</u>		
Ice Type: (Gel/Real/Other)	<u>Real</u>	<u>real</u>		
Condition:	<u>frozen ice</u>	<u>frozen ice</u>		

Samples Inspection: Inspected by: JS @ 17:30

All Samples Intact? Yes No Comments: _____

Bottle Labels/COCs agree? Yes No Comments: _____

Containers Appropriate for Analysis? Yes No Comments: _____

Do VOA Vials have Visible Headspace? Yes No NA

Comments: _____

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA

Comments: _____

Additional Information:



Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

Wednesday, December 15, 2010

John Renda
Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

RE: GASCO-1DW-SEQ 2 C 2 / 000029-02.28 3A

Enclosed are the results of analyses for work order A10K17Z, which was received by the laboratory on 11/10/2010 at 10:40:00AM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: dthomas@apex-labs.com, or by phone at 503-718-2323.

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GS-111010-6	A10K177-01	Water	11/10/10 07:30	11/10/10 10:40
GS-111010-7	A10K177-02	Water	11/10/10 07:35	11/10/10 10:40
GS-111010-8	A10K177-03	Water	11/10/10 07:45	11/10/10 10:40
GS-111010-9	A10K177-04	Water	11/10/10 07:50	11/10/10 10:40
GS-111010-10	A10K177-05	Water	11/10/10 08:10	11/10/10 10:40
GS-111010-11	A10K177-06	Water	11/10/10 08:30	11/10/10 10:40
GS-111010-12	A10K177-07	Water	11/10/10 09:00	11/10/10 10:40

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

ANALYTICAL CASE NARRATIVE

Work Order: A10K177

-- Total Metals --

Sample GS-111010-12 has two sets of results reported for total metals.

Two nitric acid preserved 250 mL poly bottles were received for this sample, and Apex was unable to determine which bottle had been field filtered for dissolved metals. The dissolved metals for this sample are reported from a lab filtered bottle. Both of the nitric bottles received were digested and analyzed for total metals, and the results from both tests are reported. One result reflects total metals, the other field filtered dissolved metals. A comparison with the lab filtered dissolved metals indicates that results reported as A10K177-07RE1 are probably from the field filtered bottle.

Evan Holloway
QA Manager
December 3, 2010

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

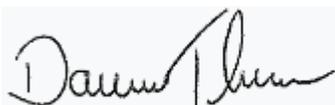
Reported:
12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111010-6 (A10K177-01)			Matrix: Water	Batch: 1011225				
Chloride	7.30	1.00	1.00	mg/L	1	11/11/10 15:11	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	24.2	1.00	1.00					
GS-111010-7 (A10K177-02)			Matrix: Water	Batch: 1011225				
Chloride	8.01	1.00	1.00	mg/L	1	11/11/10 15:32	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	ND	1.00	1.00					
GS-111010-8 (A10K177-03)			Matrix: Water	Batch: 1011225				
Nitrate-Nitrogen	ND	0.250	0.250	mg/L	1	11/11/10 16:15	300.0/9056A	
Sulfate	13.0	1.00	1.00					
GS-111010-8 (A10K177-03RE1)			Matrix: Water	Batch: 1011225				
Chloride	54.2	5.00	5.00	mg/L	1	11/12/10 05:23	300.0/9056A	
GS-111010-9 (A10K177-04)			Matrix: Water	Batch: 1011225				
Nitrate-Nitrogen	ND	0.250	0.250	mg/L	1	11/11/10 16:35	300.0/9056A	
Sulfate	13.0	1.00	1.00					
GS-111010-9 (A10K177-04RE1)			Matrix: Water	Batch: 1011225				
Chloride	53.7	5.00	5.00	mg/L	1	11/12/10 05:44	300.0/9056A	
GS-111010-10 (A10K177-05)			Matrix: Water	Batch: 1011225				
Chloride	17.6	1.00	1.00	mg/L	1	11/11/10 16:56	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	ND	1.00	1.00					
GS-111010-11 (A10K177-06)			Matrix: Water	Batch: 1011225				
Chloride	ND	1.00	1.00	mg/L	1	11/11/10 17:16	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	ND	1.00	1.00					
GS-111010-12 (A10K177-07)			Matrix: Water	Batch: 1011225				
Chloride	4.29	1.00	1.00	mg/L	1	11/11/10 18:18	300.0/9056A	
Nitrate-Nitrogen	0.572	0.250	0.250					
Sulfate	3.44	1.00	1.00					

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

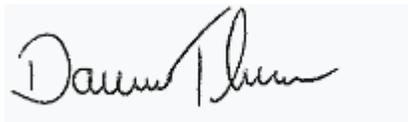
Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Cyanide - Total (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111010-6 (A10K177-01)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.0742	0.00500	0.00500	mg/L	1	11/19/10 15:43	EPA 335.4	
GS-111010-7 (A10K177-02)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.0877	0.00500	0.00500	mg/L	1	11/19/10 15:45	EPA 335.4	
GS-111010-8 (A10K177-03)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.0709	0.00500	0.00500	mg/L	1	11/19/10 15:46	EPA 335.4	
GS-111010-9 (A10K177-04)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.0659	0.00500	0.00500	mg/L	1	11/19/10 15:48	EPA 335.4	
GS-111010-10 (A10K177-05)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.165	0.00500	0.00500	mg/L	1	11/19/10 15:49	EPA 335.4	
GS-111010-11 (A10K177-06)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.00820	0.00500	0.00500	mg/L	1	11/19/10 15:57	EPA 335.4	
GS-111010-12 (A10K177-07)			Matrix: Water		Batch: 1011398			
Cyanide, Total	0.00760	0.00500	0.00500	mg/L	1	11/19/10 15:58	EPA 335.4	

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111010-6 (A10K177-01)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0141	0.00500	0.0100	mg/L	1	11/16/10 17:02	SM 4500-CN (I/E)	R-08
GS-111010-7 (A10K177-02)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0249	0.00500	0.0100	mg/L	1	11/16/10 17:07	SM 4500-CN (I/E)	R-08
GS-111010-8 (A10K177-03)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0278	0.00500	0.0100	mg/L	1	11/16/10 17:08	SM 4500-CN (I/E)	R-08
GS-111010-9 (A10K177-04)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0334	0.00500	0.0100	mg/L	1	11/16/10 17:10	SM 4500-CN (I/E)	R-08
GS-111010-10 (A10K177-05)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0416	0.00500	0.0100	mg/L	1	11/16/10 17:11	SM 4500-CN (I/E)	R-08
GS-111010-11 (A10K177-06)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0273	0.00500	0.0100	mg/L	1	11/16/10 17:13	SM 4500-CN (I/E)	R-08
GS-111010-12 (A10K177-07)			Matrix: Water	Batch: 1011304				
Cyanide, WAD	0.0351	0.00500	0.0100	mg/L	1	11/16/10 17:14	SM 4500-CN (I/E)	R-08

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Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Cyanide - Free (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111010-6 (A10K177-01)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:03	ASTM D 4282	
GS-111010-7 (A10K177-02)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:11	ASTM D 4282	
GS-111010-8 (A10K177-03)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:11	ASTM D 4282	
GS-111010-9 (A10K177-04)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:11	ASTM D 4282	
GS-111010-10 (A10K177-05)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:12	ASTM D 4282	
GS-111010-11 (A10K177-06)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:19	ASTM D 4282	
GS-111010-12 (A10K177-07)			Matrix: Water		Batch: 1011230			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/11/10 19:20	ASTM D 4282	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting		Units	Dilution	Date Analyzed	Method	Notes
			Limit						
GS-111010-6 (A10K177-01)			Matrix: Water		Batch: 1011233				
Calcium	76.5	0.250	1.00		mg/L	10	11/12/10 16:48	EPA 6020	
Iron	42.4	0.100	0.500						
Magnesium	28.5	0.100	0.500						
Manganese	3.24	0.00333	0.0100						
Potassium	6.69	0.100	1.00						
Sodium	18.2	0.200	1.00						
GS-111010-7 (A10K177-02)			Matrix: Water		Batch: 1011233				
Calcium	64.1	0.250	1.00		mg/L	10	11/12/10 16:55	EPA 6020	
Iron	41.1	0.100	0.500						
Magnesium	23.9	0.100	0.500						
Manganese	4.25	0.00333	0.0100						
Potassium	5.17	0.100	1.00						
Sodium	15.9	0.200	1.00						
GS-111010-8 (A10K177-03)			Matrix: Water		Batch: 1011233				
Calcium	55.7	0.250	1.00		mg/L	10	11/12/10 16:58	EPA 6020	
Iron	20.9	0.100	0.500						
Magnesium	33.3	0.100	0.500						
Manganese	1.96	0.00333	0.0100						
Potassium	3.03	0.100	1.00						
Sodium	54.8	0.200	1.00						
GS-111010-9 (A10K177-04)			Matrix: Water		Batch: 1011233				
Calcium	56.1	0.250	1.00		mg/L	10	11/12/10 17:01	EPA 6020	
Iron	20.5	0.100	0.500						
Magnesium	33.2	0.100	0.500						
Manganese	1.94	0.00333	0.0100						
Potassium	3.03	0.100	1.00						
Sodium	54.8	0.200	1.00						
GS-111010-10 (A10K177-05)			Matrix: Water		Batch: 1011233				
Calcium	56.2	0.250	1.00		mg/L	10	11/12/10 17:03	EPA 6020	
Iron	41.1	0.100	0.500						
Magnesium	28.2	0.100	0.500						
Manganese	3.16	0.00333	0.0100						
Potassium	3.46	0.100	1.00						
Sodium	15.3	0.200	1.00						

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111010-11 (A10K177-06)			Matrix: Water	Batch: 1011233				
Calcium	0.0478	0.0250	0.100	mg/L	1	11/12/10 17:07	EPA 6020	J
Iron	ND	0.0100	0.0500					
Magnesium	ND	0.0100	0.0500					
Manganese	ND	0.000333	0.00100					
Potassium	0.0139	0.0100	0.100					J
Sodium	0.0461	0.0200	0.100					J
GS-111010-12 (A10K177-07)			Matrix: Water	Batch: 1011233				
Calcium	6.64	0.0250	0.100	mg/L	1	11/12/10 17:10	EPA 6020	X
Iron	0.431	0.0100	0.0500					X
Magnesium	2.20	0.0100	0.0500					X
Manganese	0.0214	0.000333	0.00100					X
Potassium	1.06	0.0100	0.100					X
Sodium	5.01	0.0200	0.100					X
GS-111010-12 (A10K177-07RE1)			Matrix: Water	Batch: 1011233				
Calcium	6.37	0.0250	0.100	mg/L	1	11/12/10 17:13	EPA 6020	X
Iron	0.156	0.0100	0.0500					X
Magnesium	2.10	0.0100	0.0500					X
Manganese	0.0133	0.000333	0.00100					X
Potassium	1.01	0.0100	0.100					X
Sodium	4.86	0.0200	0.100					X

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111010-6 (A10K177-01)			Matrix: Water	Batch: 1011223				
Calcium	79.3	0.250	1.00	mg/L	10	11/12/10 14:36	EPA 6020 (Diss)	
Iron	43.5	0.100	0.500					
Magnesium	29.0	0.100	0.500					
Manganese	3.32	0.00333	0.0100					
Potassium	6.83	0.0100	0.100	"	1	11/11/10 17:19		
Sodium	18.3	0.200	1.00	"	10	11/12/10 14:36		
GS-111010-7 (A10K177-02)			Matrix: Water	Batch: 1011223				
Calcium	64.6	0.250	1.00	mg/L	10	11/12/10 14:39	EPA 6020 (Diss)	
Iron	42.0	0.100	0.500					
Magnesium	23.6	0.100	0.500					
Manganese	4.36	0.00333	0.0100					
Potassium	5.00	0.100	1.00					
Sodium	15.5	0.200	1.00					
GS-111010-8 (A10K177-03)			Matrix: Water	Batch: 1011223				
Calcium	59.0	0.250	1.00	mg/L	10	11/12/10 14:42	EPA 6020 (Diss)	
Iron	21.4	0.100	0.500					
Magnesium	34.7	0.100	0.500					
Manganese	2.00	0.00333	0.0100					
Potassium	2.97	0.100	1.00					
Sodium	56.6	0.200	1.00					
GS-111010-9 (A10K177-04)			Matrix: Water	Batch: 1011223				
Calcium	58.3	0.250	1.00	mg/L	10	11/12/10 14:45	EPA 6020 (Diss)	
Iron	21.2	0.100	0.500					
Magnesium	33.9	0.100	0.500					
Manganese	1.98	0.00333	0.0100					
Potassium	2.94	0.100	1.00					
Sodium	55.5	0.200	1.00					
GS-111010-10 (A10K177-05)			Matrix: Water	Batch: 1011223				
Calcium	58.8	0.250	1.00	mg/L	10	11/12/10 14:48	EPA 6020 (Diss)	
Iron	42.7	0.100	0.500					
Magnesium	29.2	0.100	0.500					
Manganese	3.28	0.00333	0.0100					
Potassium	3.53	0.100	1.00					
Sodium	15.6	0.200	1.00					

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting		Dilution	Date Analyzed	Method	Notes
			Limit	Units				
GS-111010-11 (A10K177-06)			Matrix: Water		Batch: 1011223			
Calcium	0.0306	0.0250	0.100	mg/L	1	11/12/10 14:51	EPA 6020 (Diss)	J
Iron	0.0162	0.0100	0.0500	"		11/11/10 17:40		J
Magnesium	ND	0.0100	0.0500			11/12/10 14:51		
Manganese	0.000467	0.000333	0.00100					J
Potassium	ND	0.0100	0.100					
Sodium	ND	0.0200	0.100					
GS-111010-12 (A10K177-07)			Matrix: Water		Batch: 1011223			
Calcium	6.55	0.0250	0.100	mg/L	1	11/11/10 17:43	EPA 6020 (Diss)	
Iron	0.132	0.0100	0.0500					
Magnesium	2.07	0.0100	0.0500					
Manganese	0.0116	0.000333	0.00100	"		11/12/10 14:54		
Potassium	1.04	0.0100	0.100	"		11/11/10 17:43		
Sodium	4.88	0.0200	0.100					

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

ANALYTICAL SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting		Units	Dilution	Date Analyzed	Method	Notes
			Limit	Matrix					
GS-111010-6 (A10K177-01)			Matrix: Water		Batch: 1011277				
Total Alkalinity	347	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	347	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-111010-7 (A10K177-02)			Matrix: Water		Batch: 1011277				
Total Alkalinity	320	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	320	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-111010-8 (A10K177-03)			Matrix: Water		Batch: 1011277				
Total Alkalinity	327	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	327	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-111010-9 (A10K177-04)			Matrix: Water		Batch: 1011277				
Total Alkalinity	318	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	318	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-111010-10 (A10K177-05)			Matrix: Water		Batch: 1011277				
Total Alkalinity	306	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	306	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-111010-11 (A10K177-06)			Matrix: Water		Batch: 1011277				
Total Alkalinity	ND	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	ND	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						
GS-111010-12 (A10K177-07)			Matrix: Water		Batch: 1011277				
Total Alkalinity	27.6	20.0	20.0		mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	27.6	20.0	20.0						
Carbonate Alkalinity	ND	20.0	20.0						
Hydroxide Alkalinity	ND	20.0	20.0						

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011225 - Method Prep: Aq						Water						
Blank (1011225-BLK1)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 01:58						
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	---	---	---	---	---	---
Nitrate-Nitrogen	ND	0.250	0.250			---	---	---	---	---	---	---
Sulfate	ND	1.00	1.00			---	---	---	---	---	---	---
LCS (1011225-BS1)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 02:19						
300.0/9056A												
Chloride	3.67	1.00	1.00	mg/L	1	4.00	---	92	90-110%	---	---	---
Nitrate-Nitrogen	0.908	0.250	0.250			1.00	---	91		---	---	---
Sulfate	4.33	1.00	1.00			4.00	---	108		---	---	---
Duplicate (1011225-DUP1)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 02:40						
QC Source Sample: Other (A10K151-01RE1)												
300.0/9056A												
Chloride	31.7	5.00	5.00	mg/L	1	---	31.6	---	---	0.5	15%	
Nitrate-Nitrogen	2.50	1.25	1.25			---	2.50	---	---	0.2	15%	
Sulfate	110	5.00	5.00			---	110	---	---	0.3	15%	
Duplicate (1011225-DUP2)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 04:02						
QC Source Sample: GS-111010-11 (A10K177-06)												
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	ND	---	---		15%	
Nitrate-Nitrogen	ND	0.250	0.250			---	ND	---	---		15%	
Sulfate	ND	1.00	1.00			---	ND	---	---		15%	
Matrix Spike (1011225-MS1)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 03:00						
QC Source Sample: Other (A10K151-01RE1)												
300.0/9056A												
Chloride	51.4	5.00	5.00	mg/L	1	20.0	31.6	99	80-120%	---	---	
Nitrate-Nitrogen	7.20	1.25	1.25			5.00	2.50	94		---	---	
Sulfate	130	5.00	5.00			20.0	110	97		---	---	
Matrix Spike (1011225-MS2)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 04:22						
QC Source Sample: GS-111010-11 (A10K177-06)												
300.0/9056A												
Chloride	4.23	1.11	1.11	mg/L	1	4.44	ND	95	80-120%	---	---	

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Anchor QEA, LLC Portland 6650 SW Redwood Lane Ste. 333 Portland, OR 97224	Project: GASCO-IDW-SEQ 2 C 2 Project Number: 000029-02.28 3A Project Manager: John Renda	Reported: 12/04/10 07:35
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QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011225 - Method Prep: Aq						Water						
Matrix Spike (1011225-MS2)						Prepared: 11/11/10 11:39 Analyzed: 11/12/10 04:22						
QC Source Sample: GS-111010-11 (A10K177-06)												
Nitrate-Nitrogen	1.04	0.278	0.278	mg/L		1.11	ND	94		---	---	
Sulfate	4.88	1.11	1.11			4.44	ND	110		---	---	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Total (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011398 - Latchat Micro Dist - aqueous						Water						
Blank (1011398-BLK1)						Prepared: 11/19/10 11:28 Analyzed: 11/19/10 15:36						
EPA 335.4												
Cyanide, Total	ND	0.00500	0.00500	mg/L	1	---	---	---	---	---	---	B-02
LCS (1011398-BS1)						Prepared: 11/19/10 11:28 Analyzed: 11/19/10 15:37						
EPA 335.4												
Cyanide, Total	0.216	0.00500	0.00500	mg/L	1	0.200	---	108	90-110%	---	---	
Duplicate (1011398-DUP1)						Prepared: 11/19/10 11:28 Analyzed: 11/19/10 15:40						
QC Source Sample: Other (A10K143-01)												
EPA 335.4												
Cyanide, Total	0.00620	0.00500	0.00500	mg/L	1	---	0.00590	---	---	5	10%	
Duplicate (1011398-DUP2)						Prepared: 11/19/10 11:28 Analyzed: 11/19/10 16:13						
QC Source Sample: Other (A10K283-02)												
EPA 335.4												
Cyanide, Total	0.160	0.00500	0.00500	mg/L	1	---	0.179	---	---	11	10%	Q-01
Matrix Spike (1011398-MS1)						Prepared: 11/19/10 11:28 Analyzed: 11/19/10 15:42						
QC Source Sample: Other (A10K143-01)												
EPA 335.4												
Cyanide, Total	0.197	0.00510	0.00510	mg/L	1	0.204	0.00590	93	90-110%	---	---	
Matrix Spike (1011398-MS2)						Prepared: 11/19/10 11:28 Analyzed: 11/19/10 16:18						
QC Source Sample: Other (A10K283-02)												
EPA 335.4												
Cyanide, Total	0.393	0.00510	0.00510	mg/L	1	0.204	0.179	105	90-110%	---	---	

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 12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011304 - Latchat Micro Dist - aqueous						Water						
Blank (1011304-BLK1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:46						
SM 4500-CN (I/E)												
Cyanide, WAD	ND	0.00500	0.0100	mg/L	1	---	---	---	---	---	---	R-08
LCS (1011304-BS2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:32						
SM 4500-CN (I/E)												
Cyanide, WAD	0.214	0.0300	0.0600	mg/L	6	0.200	---	107	90-110%	---	---	R-08
Duplicate (1011304-DUP1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:50						
QC Source Sample: Other (A10K140-01)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.0190	0.00500	0.0100	mg/L	1	---	0.0282	---	---	39	10%	Q-17, R-08
Duplicate (1011304-DUP2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:29						
QC Source Sample: Other (A10K200-05)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.0339	0.00500	0.0100	mg/L	1	---	0.0387	---	---	13	10%	Q-17, R-08
Matrix Spike (1011304-MS1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:52						
QC Source Sample: Other (A10K140-01)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.210	0.00521	0.0104	mg/L	1	0.208	0.0282	87	80-120%	---	---	R-08
Matrix Spike (1011304-MS2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:31						
QC Source Sample: Other (A10K200-05)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.227	0.00521	0.0104	mg/L	1	0.208	0.0387	90	80-120%	---	---	R-08

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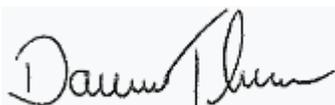
Reported:
 12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Free (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011230 - Microdiffusion						Water						
Blank (1011230-BLK1)						Prepared: 11/11/10 14:05 Analyzed: 11/11/10 18:56						
ASTM D 4282												
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	---	---	---	---	---	---	---
LCS (1011230-BS1)						Prepared: 11/11/10 14:05 Analyzed: 11/11/10 19:02						
ASTM D 4282												
Cyanide, Free	0.103	0.00200	0.00500	mg/L	1	0.100	---	103	85-115%	---	---	---
Duplicate (1011230-DUP1)						Prepared: 11/11/10 14:05 Analyzed: 11/11/10 19:03						
QC Source Sample: GS-111010-6 (A10K177-01)												
ASTM D 4282												
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	---	ND	---	---	---	20%	---
Matrix Spike (1011230-MS1)						Prepared: 11/11/10 14:05 Analyzed: 11/11/10 19:04						
QC Source Sample: GS-111010-6 (A10K177-01)												
ASTM D 4282												
Cyanide, Free	0.0651	0.00203	0.00507	mg/L	1	0.0676	ND	96	80-120%	---	---	---

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Darwin Thomas, Business Development Director

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Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
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QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011233 - EPA 3015A												
Water												
Blank (1011233-BLK1)												
						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 15:19						
EPA 6020												
Calcium	0.0336	0.0250	0.100	mg/L	1	---	---	---	---	---	---	J
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	ND	0.0100	0.100			---	---	---	---	---	---	
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
LCS (1011233-BS1)												
						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 15:22						
EPA 6020												
Calcium	5.59	0.0250	0.100	mg/L	1	5.56	---	101	80-120%	---	---	
Iron	5.58	0.0100	0.0500				---	100		---	---	
Magnesium	5.61	0.0100	0.0500				---	101		---	---	
Manganese	0.0526	0.000333	0.00100			0.0556	---	95		---	---	
Potassium	5.63	0.0100	0.100			5.56	---	101		---	---	
Sodium	5.58	0.0200	0.100				---	100		---	---	
Duplicate (1011233-DUP1)												
						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 16:12						
QC Source Sample: Other (A10K140-01)												
EPA 6020												
Calcium	73.5	0.250	1.00	mg/L	10	---	71.6	---	---	3	20%	
Iron	41.9	0.100	0.500			---	40.5	---	---	3	20%	
Magnesium	27.2	0.100	0.500			---	26.3	---	---	3	20%	
Manganese	3.11	0.00333	0.0100			---	3.01	---	---	3	20%	
Potassium	6.36	0.100	1.00			---	6.23	---	---	2	20%	
Sodium	17.8	0.200	1.00			---	17.2	---	---	3	20%	
Matrix Spike (1011233-MS1)												
						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 16:15						
QC Source Sample: Other (A10K140-01)												
EPA 6020												
Calcium	78.6	0.250	1.00	mg/L	10	5.56	71.6	126	75-125%	---	---	Q-03
Iron	46.7	0.100	0.500				40.5	112		---	---	
Magnesium	32.4	0.100	0.500				26.3	110		---	---	
Manganese	3.10	0.00333	0.0100			0.0556	3.01	154		---	---	Q-02
Potassium	12.0	0.100	1.00			5.56	6.23	103		---	---	
Sodium	23.1	0.200	1.00				17.2	105		---	---	

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 Project Number: 000029-02.28 3A
 Project Manager: John Renda

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 12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011233 - EPA 3015A						Water						
Matrix Spike (1011233-MS2)						Prepared: 11/11/10 14:46 Analyzed: 11/12/10 16:52						
QC Source Sample: GS-111010-6 (A10K177-01)												
EPA 6020												
Calcium	83.5	0.250	1.00	mg/L	10	5.56	76.5	126	75-125%	---	---	Q-03
Iron	48.4	0.100	0.500				42.4	107		---	---	
Magnesium	34.6	0.100	0.500				28.5	110		---	---	
Manganese	3.32	0.00333	0.0100			0.0556	3.24	152		---	---	Q-03
Potassium	12.5	0.100	1.00			5.56	6.69	104		---	---	
Sodium	24.0	0.200	1.00				18.2	104		---	---	
Post Spike (1011233-PS1)						Prepared: 11/12/10 16:58 Analyzed: 11/12/10 17:26						
QC Source Sample: Post Spike (A10K140-01)												
EPA 6020												
Calcium	84200			ug/L	10	23300	60000	104	75-125%		---	
Post Spike (1011233-PS2)						Prepared: 11/12/10 16:58 Analyzed: 11/12/10 17:31						
QC Source Sample: GS-111010-6 (A10K177-01)												
EPA 6020												
Calcium	84400			ug/L	10	22200	61200	104	75-125%		---	
Manganese	3470					889	2590	99	80-120%		---	
Post Spike (1011233-PS3)						Prepared: 11/15/10 21:40 Analyzed: 11/15/10 21:45						
QC Source Sample: Post Spike (A10K140-01)												
EPA 6020												
Manganese	2060			ug/L	10	1000	1350	71	80-120%		---	Q-02

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Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011223 - EPA 3015A - Dissolved						Water						
Blank (1011223-BLK1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:18						
EPA 6020 (Diss)												
Calcium	ND	0.0250	0.100	mg/L	1	---	---	---	---	---	---	
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	0.0157	0.0100	0.100			---	---	---	---	---	---	J
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
Blank (1011223-BLK2)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:21						
EPA 6020 (Diss)												
Calcium	ND	0.0250	0.100	mg/L	1	---	---	---	---	---	---	
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	0.0196	0.0100	0.100			---	---	---	---	---	---	J
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
LCS (1011223-BS1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:24						
EPA 6020 (Diss)												
Calcium	5.50	0.0250	0.100	mg/L	1	5.56	---	99	80-120%	---	---	
Iron	5.44	0.0100	0.0500			---	---	98		---	---	
Magnesium	5.63	0.0100	0.0500			---	---	101		---	---	
Manganese	0.0515	0.000333	0.00100			0.0556	---	93		---	---	
Potassium	5.70	0.0100	0.100			5.56	---	102	85-115%	---	---	
Sodium	5.61	0.0200	0.100			---	---	101	80-120%	---	---	
Duplicate (1011223-DUP1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:39						
QC Source Sample: Other (A10K043-04)												
EPA 6020 (Diss)												
Calcium	3.52	0.0250	0.100	mg/L	1	---	3.42	---	---	3	20%	
Iron	0.0382	0.0100	0.0500			---	0.0432	---	---	12	20%	J
Magnesium	3.17	0.0100	0.0500			---	3.09	---	---	3	20%	
Manganese	0.0127	0.000333	0.00100			---	0.0126	---	---	1	20%	
Potassium	0.839	0.0100	0.100			---	0.810	---	---	4	20%	
Sodium	2.73	0.0200	0.100			---	2.66	---	---	2	20%	

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QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011223 - EPA 3015A - Dissolved						Water						
Matrix Spike (1011223-MS1)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 16:42						
QC Source Sample: Other (A10K043-04)												
EPA 6020 (Diss)												
Calcium	9.05	0.0250	0.100	mg/L	1	5.56	3.42	101	75-125%	---	---	
Iron	5.51	0.0100	0.0500				0.0432	98		---	---	
Magnesium	8.75	0.0100	0.0500				3.09	102		---	---	
Manganese	0.0642	0.000333	0.00100			0.0556	0.0126	93		---	---	
Potassium	6.53	0.0100	0.100			5.56	0.810	103	70-130%	---	---	
Sodium	8.30	0.0200	0.100				2.66	101	75-125%	---	---	
Matrix Spike (1011223-MS2)						Prepared: 11/11/10 10:04 Analyzed: 11/11/10 17:46						
QC Source Sample: GS-111010-12 (A10K177-07)												
EPA 6020 (Diss)												
Iron	5.53	0.0100	0.0500	mg/L	1	5.56	0.132	97	75-125%	---	---	
Magnesium	7.80	0.0100	0.0500				2.07	103		---	---	
Manganese	0.0624	0.000333	0.00100			0.0556	0.0116	91		---	---	
Potassium	6.96	0.0100	0.100			5.56	1.04	106	70-130%	---	---	
Sodium	10.6	0.0200	0.100				4.88	102	75-125%	---	---	
Matrix Spike (1011223-MS3)						Prepared: 11/11/10 10:04 Analyzed: 11/12/10 14:57						
QC Source Sample: GS-111010-12 (A10K177-07)												
EPA 6020 (Diss)												
Calcium	12.0	0.125	0.500	mg/L	5	5.56	6.55	97	75-125%	---	---	Q-16

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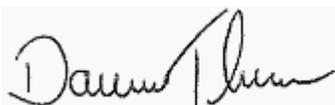
Reported:
 12/04/10 07:35

QUALITY CONTROL (QC) SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011277 - Method Prep: Aq						Water						
Blank (1011277-BLK1)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
SM 2320 B												
Total Alkalinity	ND	20.0	20.0	mg CaCO3/L	1	---	---	---	---	---	---	
Bicarbonate Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	
Carbonate Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	
Hydroxide Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	
LCS (1011277-BS1)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
SM 2320 B												
Total Alkalinity	239	20.0	20.0	mg CaCO3/L	1	236	---	101	85-115%	---	---	
Bicarbonate Alkalinity	ND	20.0	20.0			0.00100	---		0-200%	---	---	
Carbonate Alkalinity	237	20.0	20.0			236	---	101		---	---	
Hydroxide Alkalinity	ND	20.0	20.0			0.00100	---			---	---	
Duplicate (1011277-DUP1)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
QC Source Sample: GS-111010-6 (A10K177-01)												
SM 2320 B												
Total Alkalinity	354	20.0	20.0	mg CaCO3/L	1	---	347	---	---	2	20%	
Bicarbonate Alkalinity	354	20.0	20.0			---	347	---	---	2	20%	
Carbonate Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Hydroxide Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Duplicate (1011277-DUP2)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
QC Source Sample: Other (A10K200-05)												
SM 2320 B												
Total Alkalinity	304	20.0	20.0	mg CaCO3/L	1	---	312	---	---	2	20%	
Bicarbonate Alkalinity	304	20.0	20.0			---	312	---	---	2	20%	
Carbonate Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Hydroxide Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	

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Reported:
 12/04/10 07:35

SAMPLE PREPARATION INFORMATION

Anions by EPA 300.0/9056A (Ion Chromatography)

Prep: Method Prep: Ag

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011225							
A10K177-01	Water	300.0/9056A	11/10/10 07:30	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00
A10K177-02	Water	300.0/9056A	11/10/10 07:35	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00
A10K177-03	Water	300.0/9056A	11/10/10 07:45	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00
A10K177-03RE1	Water	300.0/9056A	11/10/10 07:45	11/11/10 11:39	2mL/10mL	10mL/10mL	5.00
A10K177-04	Water	300.0/9056A	11/10/10 07:50	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00
A10K177-04RE1	Water	300.0/9056A	11/10/10 07:50	11/11/10 11:39	2mL/10mL	10mL/10mL	5.00
A10K177-05	Water	300.0/9056A	11/10/10 08:10	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00
A10K177-06	Water	300.0/9056A	11/10/10 08:30	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00
A10K177-07	Water	300.0/9056A	11/10/10 09:00	11/11/10 11:39	10mL/10mL	10mL/10mL	1.00

Cyanide - Total (Aqueous)

Prep: Latchat Micro Dist - aqueous

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011398							
A10K177-01	Water	EPA 335.4	11/10/10 07:30	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00
A10K177-02	Water	EPA 335.4	11/10/10 07:35	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00
A10K177-03	Water	EPA 335.4	11/10/10 07:45	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00
A10K177-04	Water	EPA 335.4	11/10/10 07:50	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00
A10K177-05	Water	EPA 335.4	11/10/10 08:10	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00
A10K177-06	Water	EPA 335.4	11/10/10 08:30	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00
A10K177-07	Water	EPA 335.4	11/10/10 09:00	11/19/10 11:28	6mL/6mL	6mL/6mL	1.00

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Prep: Latchat Micro Dist - aqueous

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011304							
A10K177-01	Water	SM 4500-CN (I/E)	11/10/10 07:30	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K177-02	Water	SM 4500-CN (I/E)	11/10/10 07:35	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K177-03	Water	SM 4500-CN (I/E)	11/10/10 07:45	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K177-04	Water	SM 4500-CN (I/E)	11/10/10 07:50	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K177-05	Water	SM 4500-CN (I/E)	11/10/10 08:10	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K177-06	Water	SM 4500-CN (I/E)	11/10/10 08:30	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K177-07	Water	SM 4500-CN (I/E)	11/10/10 09:00	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00

Cyanide - Free (Aqueous)

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

SAMPLE PREPARATION INFORMATION

Cyanide - Free (Aqueous)

Prep: Microdiffusion

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011230							
A10K177-01	Water	ASTM D 4282	11/10/10 07:30	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00
A10K177-02	Water	ASTM D 4282	11/10/10 07:35	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00
A10K177-03	Water	ASTM D 4282	11/10/10 07:45	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00
A10K177-04	Water	ASTM D 4282	11/10/10 07:50	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00
A10K177-05	Water	ASTM D 4282	11/10/10 08:10	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00
A10K177-06	Water	ASTM D 4282	11/10/10 08:30	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00
A10K177-07	Water	ASTM D 4282	11/10/10 09:00	11/11/10 14:05	3mL/3mL	3mL/3mL	1.00

Total Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011233							
A10K177-01	Water	EPA 6020	11/10/10 07:30	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-02	Water	EPA 6020	11/10/10 07:35	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-03	Water	EPA 6020	11/10/10 07:45	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-04	Water	EPA 6020	11/10/10 07:50	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-05	Water	EPA 6020	11/10/10 08:10	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-06	Water	EPA 6020	11/10/10 08:30	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-07	Water	EPA 6020	11/10/10 09:00	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00
A10K177-07RE1	Water	EPA 6020	11/10/10 09:00	11/11/10 14:46	45mL/50mL	45mL/50mL	1.00

Dissolved Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A - Dissolved

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011223							
A10K177-01	Water	EPA 6020 (Diss)	11/10/10 07:30	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K177-02	Water	EPA 6020 (Diss)	11/10/10 07:35	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K177-03	Water	EPA 6020 (Diss)	11/10/10 07:45	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K177-04	Water	EPA 6020 (Diss)	11/10/10 07:50	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K177-05	Water	EPA 6020 (Diss)	11/10/10 08:10	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K177-06	Water	EPA 6020 (Diss)	11/10/10 08:30	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00
A10K177-07	Water	EPA 6020 (Diss)	11/10/10 09:00	11/11/10 10:04	45mL/50mL	45mL/50mL	1.00

Conventional Chemistry Parameters

Prep: Method Prep: Ag

Sample Default RL Prep

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**

Project Number: 000029-02.28 3A

Project Manager: John Renda

Reported:
 12/04/10 07:35

SAMPLE PREPARATION INFORMATION

Conventional Chemistry Parameters

Lab Number	Matrix	Method	Sampled	Prepared	Initial/Final	Initial/Final	Factor
Batch: 1011277							
A10K177-01	Water	SM 2320 B	11/10/10 07:30	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K177-02	Water	SM 2320 B	11/10/10 07:35	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K177-03	Water	SM 2320 B	11/10/10 07:45	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K177-04	Water	SM 2320 B	11/10/10 07:50	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K177-05	Water	SM 2320 B	11/10/10 08:10	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K177-06	Water	SM 2320 B	11/10/10 08:30	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K177-07	Water	SM 2320 B	11/10/10 09:00	11/14/10 11:58	50mL/50mL	50mL/50mL	NA

Lab Filtration

Prep: Lab Filtration

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011214							
A10K177-07	Water	NA	11/10/10 09:00	11/10/10 16:50	50mL/50mL		NA

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

Notes and Definitions

Qualifiers:

- B-02 Analyte detected in an associated blank at a level between one-half the MRL and the MRL. (See Notes and Conventions below.)
- J Estimated Result . Result detected below the lowest point of the calibration curve, but above the specified MDL.
- Q-01 Percent recovery and/or RPD is outside acceptance limits.
- Q-02 Spike recovery is outside of established control limits due to sample matrix interference.
- Q-03 Percent recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
- Q-16 Reanalysis of an original Batch QC sample.
- Q-17 RPD between original and duplicate sample is outside of established control limits.
- R-08 Reporting level raised due to potential high bias associated with the low end of the calibration curve.
- X See Case Narrative.

Notes and Conventions:

- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry' designation are not dry weight corrected.
- RPD Relative Percent Difference
- MDL If MDL is not listed, data has been evaluated to the Method Reporting Limit only.
- WMSC Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.
- Batch QC In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.
- Blank Policy Apex assesses blank data for potential high bias down to a level equal to 1/2 the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses.
- For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor.
- Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL.

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Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**

Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 07:35

Lab # 10K177 coc 1 of 1

CHAIN OF CUSTODY

APEX LABS

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Company: Anchor QEA		Project Mgr: John Renda		Project Name: Gasco Seq 2 C 2		Project #: 000029-02.28.3A	
Address: 6650 SW Redwood Ln # 333 Portland OR 97224		Phone: 503.670.1105		Fax: 503.670.1105		Email: J.Renda@anchorage.com	
Sampled by: Matthew Wilson		ANALYSIS REQUEST					
Site Location: OR WA		Priority Metals (13)	PCRA Metals (8)	TCRF Metals (8)	1209-COLS	1209-Z	Total Cyanide
		As, Pb, Cr, Ni, Cu, Zn, Cd, Hg, Mn, Fe, Co, Se, Ag, Ti, V, Ni, Cr	As, Pb, Cr, Ni, Cu, Zn, Cd, Hg, Mn, Fe, Co, Se, Ag, Ti, V, Ni, Cr	As, Pb, Cr, Ni, Cu, Zn, Cd, Hg, Mn, Fe, Co, Se, Ag, Ti, V, Ni, Cr			Free Cyanide
SAMPLE ID	DATE	TIME	MATRIX	# OF CONTAINERS	NWTPH-CID	NWTPH-DX	NWTPH-CX
GS-111010-6	11/04/10	0730	W	5			
GS-111010-7		0735	W	5			
GS-111010-8		0745	W	5			
GS-111010-9		0750	W	5			
GS-111010-10		0810	W	5			
GS-111010-11		0830	W	5			
GS-111010-12		0900	W	5			
LAB ID #		DATE		TIME		MATRIX	
Normal Turn Around Time (TAT) = 7-10 Business Days		24 HR		48 HR		72 HR	
TAT Requested (circle)		4 DAY		5 DAY		Other: _____	
SPECIAL INSTRUCTIONS:		Total and Dissolved metals, Dissolved metals, gel columns & Arsenic filtered in the field Cyanide → 46 hr hold time					
RELIQUISHED BY:		DATE		SIGNATURE		RECEIVED BY:	
Matthew Wilson		11/04/10		[Signature]		[Signature]	
Printed Name: Matthew Wilson		Time: 10:40		Printed Name: Matthew Wilson		Time: _____	
Company: Anchor QEA		Company: Apex		Company: _____		Company: _____	

Apex Laboratories

Darwin Thomas

Darwin Thomas, Business Development Director

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 07:35

APEX LABS COOLER RECEIPT FORM

Client: Anchor QEA Element WO#: A10K177
 Project/Project #: GASCO Seg 2 C2 / 000029-02.283A

Delivery info:

Date/Time Received: 11/10/10 @ 10:40 By: JS
 Delivered by: Apex Courier Client FedEx UPS Servoy SDS Other

Cooler Inspection Inspected by: JS @ 11:10

Chain of Custody:

Included? Yes No Signed/Dated by Client? Yes No

Signed/Dated by Apex Personnel? Yes No

Coolers: No. of Coolers: 2

	<u>Cooler #1</u>	<u>Cooler #2</u>	<u>Cooler #3</u>	<u>Cooler #4</u>
Temperature (deg. C)	<u>3.6</u>	<u>1.6</u>		
Received on Ice? (Y/N)	<u>Y</u>	<u>Y</u>		
Temp. Blanks? (Y/N)	<u>N</u>	<u>N</u>		
Ice Type: (Gel/Real/Other)	<u>real</u>	<u>real</u>		
Condition:	<u>good</u>	<u>good</u>		

Cooler out of temp? (Y/N) Possible reason why: _____

Samples Inspection: Inspected by: Jose 11/10/10 @ 12:33

All Samples Intact? Yes No Comments: _____

Bottle Labels/COCs agree? Yes No Comments: _____

Containers Appropriate for Analysis? Yes No Comments: sample 67S-111010-12 doesn't indicate aff nitric

Do VOA Vials have Visible Headspace? Yes No NA

Comments: _____

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA

Comments: _____

Additional Information:

67S-111010-12 500ml poly on FF indicated

Labeled by: JMA See Client Contact Form: Y N



Apex Labs

12232 S.W. Garden Place
Tigard, OR 97223
503-718-2323 Phone
503-718-0333 Fax

Saturday, December 4, 2010

John Renda
Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

RE: GASCO-1DW-SEQ 2 C 2 / 000029-02.28 3A

Enclosed are the results of analyses for work order A10K200, which was received by the laboratory on 11/11/2010 at 3:00:00PM.

Thank you for using Apex Labs. We appreciate your business and strive to provide the highest quality services to the environmental industry.

If you have any questions concerning this report or the services we offer, please feel free to contact me by email at: dthomas@apex-labs.com, or by phone at 503-718-2323.

Apex Laboratories



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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

ANALYTICAL REPORT FOR SAMPLES

SAMPLE INFORMATION

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
GS-111110-13	A10K200-01	Water	11/11/10 11:50	11/11/10 15:00
GS-111110-14	A10K200-02	Water	11/11/10 12:10	11/11/10 15:00
GS-111110-15	A10K200-03	Water	11/11/10 12:20	11/11/10 15:00
GS-111110-16	A10K200-04	Water	11/11/10 13:10	11/11/10 15:00
GS-111110-17	A10K200-05	Water	11/11/10 11:20	11/11/10 15:00

Apex Laboratories



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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111110-13 (A10K200-01)			Matrix: Water		Batch: 1011242			
Chloride	8.05	1.00	1.00	mg/L	1	11/12/10 08:07	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	ND	1.00	1.00					
GS-111110-14 (A10K200-02)			Matrix: Water		Batch: 1011242			
Nitrate-Nitrogen	ND	0.250	0.250	mg/L	1	11/12/10 09:08	300.0/9056A	
Sulfate	9.84	1.00	1.00					
GS-111110-14 (A10K200-02RE1)			Matrix: Water		Batch: 1011335			
Chloride	51.7	2.00	2.00	mg/L	1	11/17/10 13:07	300.0/9056A	
GS-111110-15 (A10K200-03)			Matrix: Water		Batch: 1011242			
Chloride	7.33	1.00	1.00	mg/L	1	11/12/10 09:29	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	33.2	1.00	1.00					
GS-111110-16 (A10K200-04)			Matrix: Water		Batch: 1011242			
Chloride	3.76	1.00	1.00	mg/L	1	11/12/10 09:49	300.0/9056A	
Nitrate-Nitrogen	0.715	0.250	0.250					
Sulfate	3.69	1.00	1.00					
GS-111110-17 (A10K200-05)			Matrix: Water		Batch: 1011242			
Chloride	17.0	1.00	1.00	mg/L	1	11/12/10 10:09	300.0/9056A	
Nitrate-Nitrogen	ND	0.250	0.250					
Sulfate	ND	1.00	1.00					

Apex Laboratories



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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Cyanide - Total (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111110-13 (A10K200-01)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.120	0.00250	0.00500	mg/L	1	11/17/10 15:56	EPA 335.4	
GS-111110-14 (A10K200-02)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.0839	0.00250	0.00500	mg/L	1	11/17/10 15:58	EPA 335.4	
GS-111110-15 (A10K200-03)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.0781	0.00250	0.00500	mg/L	1	11/17/10 16:05	EPA 335.4	
GS-111110-16 (A10K200-04)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.0246	0.00250	0.00500	mg/L	1	11/17/10 16:07	EPA 335.4	
GS-111110-17 (A10K200-05)			Matrix: Water		Batch: 1011322			
Cyanide, Total	0.185	0.00250	0.00500	mg/L	1	11/17/10 16:08	EPA 335.4	

Apex Laboratories



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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111110-13 (A10K200-01)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0309	0.00500	0.0100	mg/L	1	11/16/10 17:19	SM 4500-CN (I/E)	R-08
GS-111110-14 (A10K200-02)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0364	0.00500	0.0100	mg/L	1	11/16/10 17:20	SM 4500-CN (I/E)	R-08
GS-111110-15 (A10K200-03)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0388	0.00500	0.0100	mg/L	1	11/16/10 17:22	SM 4500-CN (I/E)	R-08
GS-111110-16 (A10K200-04)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0128	0.00500	0.0100	mg/L	1	11/16/10 17:23	SM 4500-CN (I/E)	R-08
GS-111110-17 (A10K200-05)			Matrix: Water		Batch: 1011304			
Cyanide, WAD	0.0387	0.00500	0.0100	mg/L	1	11/16/10 17:28	SM 4500-CN (I/E)	R-08

Apex Laboratories



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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Cyanide - Free (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111110-13 (A10K200-01)			Matrix: Water		Batch: 1011265			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/12/10 21:22	ASTM D 4282	
GS-111110-14 (A10K200-02)			Matrix: Water		Batch: 1011265			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/12/10 21:29	ASTM D 4282	
GS-111110-15 (A10K200-03)			Matrix: Water		Batch: 1011265			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/12/10 21:30	ASTM D 4282	
GS-111110-16 (A10K200-04)			Matrix: Water		Batch: 1011265			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/12/10 21:30	ASTM D 4282	
GS-111110-17 (A10K200-05)			Matrix: Water		Batch: 1011265			
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	11/12/10 21:36	ASTM D 4282	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111110-13 (A10K200-01)			Matrix: Water	Batch: 1011260				
Calcium	66.5	0.250	1.00	mg/L	10	11/15/10 19:55	EPA 6020	
Iron	40.7	0.100	0.500					
Magnesium	23.4	0.100	0.500					
Manganese	4.13	0.00333	0.0100					
Potassium	4.77	0.0100	0.100	"	1	11/15/10 21:10		
Sodium	15.5	0.200	1.00	"	10	11/15/10 19:55		
GS-111110-14 (A10K200-02)			Matrix: Water	Batch: 1011260				
Calcium	59.7	0.250	1.00	mg/L	10	11/15/10 20:10	EPA 6020	
Iron	20.9	0.100	0.500					
Magnesium	35.1	0.100	0.500					
Manganese	1.87	0.00333	0.0100					
Potassium	2.80	0.0100	0.100	"	1	11/15/10 20:31		
Sodium	48.6	0.200	1.00	"	10	11/15/10 20:10		
GS-111110-15 (A10K200-03)			Matrix: Water	Batch: 1011260				
Calcium	59.7	0.250	1.00	mg/L	10	11/15/10 20:13	EPA 6020	
Iron	42.5	0.100	0.500					
Magnesium	28.6	0.100	0.500					
Manganese	3.21	0.00333	0.0100					
Potassium	6.70	0.0100	0.100	"	1	11/15/10 20:33		
Sodium	15.3	0.200	1.00	"	10	11/15/10 20:13		
GS-111110-16 (A10K200-04)			Matrix: Water	Batch: 1011260				
Calcium	6.81	0.0250	0.100	mg/L	1	11/15/10 20:16	EPA 6020	
Iron	0.646	0.0100	0.0500					
Magnesium	2.16	0.0100	0.0500					
Manganese	0.0218	0.000333	0.00100					
Potassium	1.17	0.0100	0.100					
Sodium	4.62	0.0200	0.100					
GS-111110-17 (A10K200-05)			Matrix: Water	Batch: 1011260				
Calcium	83.3	0.250	1.00	mg/L	10	11/15/10 20:19	EPA 6020	
Iron	44.6	0.100	0.500					
Magnesium	29.5	0.100	0.500					
Manganese	3.37	0.00333	0.0100					
Potassium	3.29	0.0100	0.100	"	1	11/15/10 20:37		
Sodium	18.3	0.200	1.00	"	10	11/15/10 20:19		

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Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting		Units	Dilution	Date Analyzed	Method	Notes
			Limit	Matrix					
GS-111110-13 (A10K200-01)			Matrix: Water		Batch: 1011294				
Calcium	65.8	0.250	1.00		mg/L	10	11/17/10 13:14	EPA 6020 (Diss)	
Iron	41.2	0.100	1.00						
Magnesium	23.8	0.100	0.500						
Manganese	4.28	0.00333	0.0100						B
Potassium	4.61	0.0100	0.100		"	1	11/16/10 17:53		
Sodium	15.7	0.200	1.00		"	10	11/17/10 13:14		
GS-111110-14 (A10K200-02)			Matrix: Water		Batch: 1011294				
Calcium	56.8	0.250	1.00		mg/L	10	11/17/10 13:17	EPA 6020 (Diss)	
Iron	21.5	0.100	1.00						
Magnesium	34.6	0.100	0.500						
Manganese	1.91	0.00333	0.0100						B
Potassium	2.78	0.0100	0.100		"	1	11/16/10 17:56		
Sodium	46.2	0.200	1.00		"	10	11/17/10 13:17		
GS-111110-15 (A10K200-03)			Matrix: Water		Batch: 1011294				
Calcium	81.2	0.250	1.00		mg/L	10	11/17/10 13:20	EPA 6020 (Diss)	
Iron	44.4	0.100	1.00						
Magnesium	29.6	0.100	0.500						
Manganese	3.45	0.00333	0.0100						B
Potassium	6.47	0.0100	0.100		"	1	11/16/10 17:58		
Sodium	18.6	0.200	1.00		"	10	11/17/10 13:20		
GS-111110-16 (A10K200-04)			Matrix: Water		Batch: 1011294				
Calcium	6.69	0.0250	0.100		mg/L	1	11/16/10 18:01	EPA 6020 (Diss)	
Iron	0.218	0.0100	0.0500						
Magnesium	2.11	0.0100	0.0500						
Manganese	0.0124	0.000333	0.00100		"		11/17/10 13:08		B
Potassium	1.15	0.0100	0.100		"		11/16/10 18:01		
Sodium	4.58	0.0200	0.100						
GS-111110-17 (A10K200-05)			Matrix: Water		Batch: 1011294				
Calcium	58.0	0.250	1.00		mg/L	10	11/17/10 13:23	EPA 6020 (Diss)	
Iron	41.3	0.100	1.00						
Magnesium	28.3	0.100	0.500						
Manganese	3.21	0.00333	0.0100						B
Potassium	3.21	0.0100	0.100		"	1	11/16/10 18:04		
Sodium	15.2	0.200	1.00		"	10	11/17/10 13:23		

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

ANALYTICAL SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dilution	Date Analyzed	Method	Notes
GS-111110-13 (A10K200-01)			Matrix: Water		Batch: 1011277			
Total Alkalinity	317	20.0	20.0	mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	317	20.0	20.0					
Carbonate Alkalinity	ND	20.0	20.0					
Hydroxide Alkalinity	ND	20.0	20.0					
GS-111110-14 (A10K200-02)			Matrix: Water		Batch: 1011277			
Total Alkalinity	319	20.0	20.0	mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	319	20.0	20.0					
Carbonate Alkalinity	ND	20.0	20.0					
Hydroxide Alkalinity	ND	20.0	20.0					
GS-111110-15 (A10K200-03)			Matrix: Water		Batch: 1011277			
Total Alkalinity	352	20.0	20.0	mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	352	20.0	20.0					
Carbonate Alkalinity	ND	20.0	20.0					
Hydroxide Alkalinity	ND	20.0	20.0					
GS-111110-16 (A10K200-04)			Matrix: Water		Batch: 1011277			
Total Alkalinity	24.2	20.0	20.0	mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	24.2	20.0	20.0					
Carbonate Alkalinity	ND	20.0	20.0					
Hydroxide Alkalinity	ND	20.0	20.0					
GS-111110-17 (A10K200-05)			Matrix: Water		Batch: 1011277			
Total Alkalinity	312	20.0	20.0	mg CaCO3/L	1	11/14/10 14:00	SM 2320 B	
Bicarbonate Alkalinity	312	20.0	20.0					
Carbonate Alkalinity	ND	20.0	20.0					
Hydroxide Alkalinity	ND	20.0	20.0					

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011242 - Method Prep: Aq						Water						
Blank (1011242-BLK1)						Prepared: 11/12/10 02:49 Analyzed: 11/12/10 07:26						
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	---	---	---	---	---	---
Nitrate-Nitrogen	ND	0.250	0.250			---	---	---	---	---	---	---
Sulfate	ND	1.00	1.00			---	---	---	---	---	---	---
LCS (1011242-BS1)						Prepared: 11/12/10 02:49 Analyzed: 11/12/10 07:46						
300.0/9056A												
Chloride	3.66	1.00	1.00	mg/L	1	4.00	---	91	90-110%	---	---	---
Nitrate-Nitrogen	0.902	0.250	0.250			1.00	---	90		---	---	---
Sulfate	4.39	1.00	1.00			4.00	---	110		---	---	---
Duplicate (1011242-DUP1)						Prepared: 11/12/10 02:49 Analyzed: 11/12/10 08:27						
QC Source Sample: GS-111110-13 (A10K200-01)												
300.0/9056A												
Chloride	8.05	1.00	1.00	mg/L	1	---	8.05	---	---	0.01	15%	---
Nitrate-Nitrogen	ND	0.250	0.250			---	ND	---	---	---	---	15%
Sulfate	ND	1.00	1.00			---	ND	---	---	---	---	15%
Matrix Spike (1011242-MS1)						Prepared: 11/12/10 02:49 Analyzed: 11/12/10 08:48						
QC Source Sample: GS-111110-13 (A10K200-01)												
300.0/9056A												
Chloride	12.2	1.11	1.11	mg/L	1	4.44	8.05	94	80-120%	---	---	---
Nitrate-Nitrogen	1.03	0.278	0.278			1.11	ND	93		---	---	---
Sulfate	4.61	1.11	1.11			4.44	ND	104		---	---	---
Batch 1011335 - Method Prep: Aq						Water						
Blank (1011335-BLK1)						Prepared: 11/17/10 11:31 Analyzed: 11/17/10 12:26						
300.0/9056A												
Chloride	ND	1.00	1.00	mg/L	1	---	---	---	---	---	---	---
Nitrate-Nitrogen	ND	0.250	0.250			---	---	---	---	---	---	---
Sulfate	ND	1.00	1.00			---	---	---	---	---	---	---
LCS (1011335-BS1)						Prepared: 11/17/10 11:31 Analyzed: 11/17/10 12:47						
300.0/9056A												
Chloride	3.69	1.00	1.00	mg/L	1	4.00	---	92	90-110%	---	---	---
Nitrate-Nitrogen	0.918	0.250	0.250			1.00	---	92		---	---	---

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Anions by EPA 300.0/9056A (Ion Chromatography)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011335 - Method Prep: Aq						Water						
LCS (1011335-BS1)						Prepared: 11/17/10 11:31		Analyzed: 11/17/10 12:47				
Sulfate	4.09	1.00	1.00	mg/L		4.00	---	102		---	---	
Duplicate (1011335-DUP1)						Prepared: 11/17/10 11:31		Analyzed: 11/17/10 13:28				
QC Source Sample: GS-111110-14 (A10K200-02RE1)												
300.0/9056A												
Chloride	51.8	2.00	2.00	mg/L	1	---	51.7	---	---	0.2	15%	
Nitrate-Nitrogen	ND	0.500	0.500			---	ND	---	---		15%	
Sulfate	9.70	2.00	2.00			---	9.68	---	---	0.2	15%	
Matrix Spike (1011335-MS1)						Prepared: 11/17/10 11:31		Analyzed: 11/17/10 13:48				
QC Source Sample: GS-111110-14 (A10K200-02RE1)												
300.0/9056A												
Chloride	60.0	2.00	2.00	mg/L	1	8.00	51.7	104	80-120%	---	---	
Nitrate-Nitrogen	1.86	0.500	0.500			2.00	ND	93		---	---	
Sulfate	17.8	2.00	2.00			8.00	9.68	101		---	---	

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6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Total (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011322 - Latchat Micro Dist - aqueous						Water						
Blank (1011322-BLK2)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 15:47						
EPA 335.4												
Cyanide, Total	ND	0.00250	0.00500	mg/L	1	---	---	---	---	---	---	
LCS (1011322-BS1)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 15:29						
EPA 335.4												
Cyanide, Total	0.189	0.00250	0.00500	mg/L	1	0.200	---	95	90-110%	---	---	
Duplicate (1011322-DUP2)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 15:59						
QC Source Sample: GS-111110-14 (A10K200-02)												
EPA 335.4												
Cyanide, Total	0.0826	0.00250	0.00500	mg/L	1	---	0.0839	---	---	2	10%	
Duplicate (1011322-DUP3)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 16:16						
QC Source Sample: Other (A10K132-01)												
EPA 335.4												
Cyanide, Total	0.0450	0.00250	0.00500	mg/L	1	---	0.0456	---	---	1	10%	
Matrix Spike (1011322-MS2)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 16:01						
QC Source Sample: GS-111110-14 (A10K200-02)												
EPA 335.4												
Cyanide, Total	0.268	0.00255	0.00510	mg/L	1	0.204	0.0839	90	90-110%	---	---	
Matrix Spike (1011322-MS3)						Prepared: 11/17/10 09:30 Analyzed: 11/17/10 16:14						
QC Source Sample: Other (A10K132-01)												
EPA 335.4												
Cyanide, Total	0.179	0.00255	0.00510	mg/L	1	0.204	0.0456	66	90-110%	---	---	Q-01

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 Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011304 - Latchat Micro Dist - aqueous						Water						
Blank (1011304-BLK1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:46						
SM 4500-CN (I/E)												
Cyanide, WAD	ND	0.00500	0.0100	mg/L	1	---	---	---	---	---	---	R-08
LCS (1011304-BS2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:32						
SM 4500-CN (I/E)												
Cyanide, WAD	0.214	0.0300	0.0600	mg/L	6	0.200	---	107	90-110%	---	---	R-08
Duplicate (1011304-DUP1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:50						
QC Source Sample: Other (A10K140-01)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.0190	0.00500	0.0100	mg/L	1	---	0.0282	---	---	39	10%	Q-17, R-08
Duplicate (1011304-DUP2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:29						
QC Source Sample: GS-111110-17 (A10K200-05)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.0339	0.00500	0.0100	mg/L	1	---	0.0387	---	---	13	10%	Q-17, R-08
Matrix Spike (1011304-MS1)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 16:52						
QC Source Sample: Other (A10K140-01)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.210	0.00521	0.0104	mg/L	1	0.208	0.0282	87	80-120%	---	---	R-08
Matrix Spike (1011304-MS2)						Prepared: 11/16/10 09:27 Analyzed: 11/16/10 17:31						
QC Source Sample: GS-111110-17 (A10K200-05)												
SM 4500-CN (I/E)												
Cyanide, WAD	0.227	0.00521	0.0104	mg/L	1	0.208	0.0387	90	80-120%	---	---	R-08

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Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

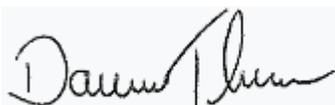
Reported:
 12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Cyanide - Free (Aqueous)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011265 - Microdiffusion						Water						
Blank (1011265-BLK1)						Prepared: 11/12/10 16:55 Analyzed: 11/12/10 21:15						
ASTM D 4282												
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	---	---	---	---	---	---	---
LCS (1011265-BS1)						Prepared: 11/12/10 16:55 Analyzed: 11/12/10 21:15						
ASTM D 4282												
Cyanide, Free	0.0843	0.00200	0.00500	mg/L	1	0.0833	---	101	85-115%	---	---	---
Duplicate (1011265-DUP1)						Prepared: 11/12/10 16:55 Analyzed: 11/12/10 21:22						
QC Source Sample: GS-111110-13 (A10K200-01)												
ASTM D 4282												
Cyanide, Free	ND	0.00200	0.00500	mg/L	1	---	ND	---	---	---	20%	---
Matrix Spike (1011265-MS1)						Prepared: 11/12/10 16:55 Analyzed: 11/12/10 21:23						
QC Source Sample: GS-111110-13 (A10K200-01)												
ASTM D 4282												
Cyanide, Free	0.0842	0.00203	0.00508	mg/L	1	0.0847	ND	99	80-120%	---	---	---

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Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011260 - EPA 3015A						Water						
Blank (1011260-BLK1)						Prepared: 11/12/10 13:32 Analyzed: 11/12/10 17:38						
EPA 6020												
Calcium	ND	0.0250	0.100	mg/L	1	---	---	---	---	---	---	
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	0.0199	0.0100	0.100			---	---	---	---	---	---	J
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
LCS (1011260-BS1)						Prepared: 11/12/10 13:32 Analyzed: 11/12/10 17:41						
EPA 6020												
Calcium	5.56	0.0250	0.100	mg/L	1	5.56	---	100	80-120%	---	---	
Iron	5.58	0.0100	0.0500			---	---	100		---	---	
Magnesium	5.58	0.0100	0.0500			---	---	100		---	---	
Manganese	0.0518	0.000333	0.00100			0.0556	---	93		---	---	
Potassium	5.64	0.0100	0.100			5.56	---	101		---	---	
Sodium	5.57	0.0200	0.100			---	---	100		---	---	
Duplicate (1011260-DUP1)						Prepared: 11/12/10 13:32 Analyzed: 11/15/10 20:25						
QC Source Sample: GS-111110-13 (A10K200-01)												
EPA 6020												
Potassium	4.71	0.0100	0.100	mg/L	1	---	4.77	---	---	1	20%	
Duplicate (1011260-DUP2)						Prepared: 11/12/10 13:32 Analyzed: 11/15/10 19:58						
QC Source Sample: GS-111110-13 (A10K200-01)												
EPA 6020												
Calcium	66.5	0.250	1.00	mg/L	10	---	66.5	---	---	0.1	20%	Q-16
Iron	39.8	0.100	0.500			---	40.7	---	---	2	20%	Q-16
Manganese	4.07	0.00333	0.0100			---	4.13	---	---	2	20%	Q-16
Sodium	15.5	0.200	1.00			---	15.5	---	---	0.1	20%	Q-16
Matrix Spike (1011260-MS1)						Prepared: 11/12/10 13:32 Analyzed: 11/15/10 20:28						
QC Source Sample: GS-111110-13 (A10K200-01)												
EPA 6020												
Potassium	10.7	0.0100	0.100	mg/L	1	5.56	4.77	107	75-125%	---	---	
Matrix Spike (1011260-MS2)						Prepared: 11/12/10 13:32 Analyzed: 11/15/10 18:53						

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Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Total Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011260 - EPA 3015A						Water						
Matrix Spike (1011260-MS2)						Prepared: 11/12/10 13:32 Analyzed: 11/15/10 18:53						
QC Source Sample: Other (A10K208-01)												
EPA 6020												
Calcium	108	11.2	45.0	mg/L	50	50.0	55.6	105	75-125%	---	---	
Iron	67.2	4.50	22.5				18.4	98		---	---	
Magnesium	51.4	4.50	22.5				ND	103		---	---	
Manganese	187	0.150	0.450			0.500	189	-370		---	---	Q-03
Potassium	56.0	4.50	45.0			50.0	ND	112		---	---	
Sodium	487	9.00	45.0				440	96		---	---	
Matrix Spike (1011260-MS4)						Prepared: 11/12/10 13:32 Analyzed: 11/15/10 20:01						
QC Source Sample: GS-111110-13 (A10K200-01)												
EPA 6020												
Calcium	74.2	0.250	1.00	mg/L	10	5.56	66.5	137	75-125%	---	---	Q-03, Q-16
Iron	46.1	0.100	0.500				40.7	97		---	---	Q-16
Manganese	4.17	0.00333	0.0100			0.0556	4.13	68		---	---	Q-03, Q-16
Sodium	21.2	0.200	1.00			5.56	15.5	103		---	---	Q-16
Post Spike (1011260-PS1)						Prepared: 11/15/10 21:48 Analyzed: 11/15/10 21:53						
QC Source Sample: GS-111110-13 (A10K200-01)												
EPA 6020												
Calcium	80600			ug/L	10	50000	29900	101	75-125%		---	
Manganese	2410					500	1860	110	80-120%		---	
Post Spike (1011260-PS2)						Prepared: 11/15/10 21:48 Analyzed: 11/15/10 22:14						
QC Source Sample: Post Spike (A10K208-01)												
EPA 6020												
Manganese	10300			ug/L	50	10000	849	95	80-120%		---	

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Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011294 - EPA 3015A - Dissolved						Water						
Blank (1011294-BLK1)						Prepared: 11/15/10 14:05 Analyzed: 11/15/10 22:20						
EPA 6020 (Diss)												
Calcium	0.0269	0.0250	0.100	mg/L	1	---	---	---	---	---	---	J
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	ND	0.000333	0.00100			---	---	---	---	---	---	
Potassium	ND	0.0100	0.100			---	---	---	---	---	---	
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
Blank (1011294-BLK2)						Prepared: 11/15/10 14:05 Analyzed: 11/15/10 22:29						
EPA 6020 (Diss)												
Calcium	0.0275	0.0250	0.100	mg/L	1	---	---	---	---	---	---	J
Iron	ND	0.0100	0.0500			---	---	---	---	---	---	
Magnesium	ND	0.0100	0.0500			---	---	---	---	---	---	
Manganese	0.0007110	0.000333	0.00100			---	---	---	---	---	---	B-02, J
Potassium	ND	0.0100	0.100			---	---	---	---	---	---	
Sodium	ND	0.0200	0.100			---	---	---	---	---	---	
LCS (1011294-BS1)						Prepared: 11/15/10 14:05 Analyzed: 11/15/10 22:32						
EPA 6020 (Diss)												
Calcium	5.79	0.0250	0.100	mg/L	1	5.56	---	104	80-120%	---	---	
Iron	5.32	0.0100	0.0500			---	---	96		---	---	
Magnesium	5.42	0.0100	0.0500			---	---	98		---	---	
Manganese	0.0521	0.000333	0.00100			0.0556	---	94		---	---	B
Potassium	5.63	0.0100	0.100			5.56	---	101	85-115%	---	---	
Sodium	5.42	0.0200	0.100			---	---	97	80-120%	---	---	
Duplicate (1011294-DUP1)						Prepared: 11/15/10 14:05 Analyzed: 11/16/10 17:19						
QC Source Sample: Other (A10K159-06)												
EPA 6020 (Diss)												
Iron	9.02	0.0100	0.0500	mg/L	1	---	9.10	---	---	0.8	20%	
Potassium	2.05	0.0100	0.100			---	2.03	---	---	1	20%	
Duplicate (1011294-DUP2)						Prepared: 11/15/10 14:05 Analyzed: 11/16/10 17:40						
QC Source Sample: Other (A10K159-06)												
EPA 6020 (Diss)												
Calcium	54.6	0.500	2.00	mg/L	20	---	57.2	---	---	5	20%	Q-16

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Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011294 - EPA 3015A - Dissolved						Water						
Duplicate (1011294-DUP2)						Prepared: 11/15/10 14:05 Analyzed: 11/16/10 17:40						
QC Source Sample: Other (A10K159-06)												
Magnesium	22.9	0.200	1.00	mg/L		---	23.6	---	---	3	20%	Q-16
Manganese	5.73	0.00666	0.0200			---	6.01	---	---	5	20%	Q-16, B
Sodium	16.6	0.400	2.00			---	17.2	---	---	3	20%	Q-16
Matrix Spike (1011294-MS1)						Prepared: 11/15/10 14:05 Analyzed: 11/16/10 17:43						
QC Source Sample: Other (A10K159-06)												
EPA 6020 (Diss)												
Calcium	61.9	0.500	2.00	mg/L	20	5.56	57.2	85	75-125%	---	---	
Iron	14.1	0.200	1.00				9.10	90		---	---	
Magnesium	29.0	0.200	1.00				23.6	97		---	---	
Manganese	5.75	0.00666	0.0200			0.0556	6.01	-464		---	---	Q-03, B
Potassium	8.09	0.200	2.00			5.56	2.03	109	70-130%	---	---	
Sodium	22.3	0.400	2.00				17.2	93	75-125%	---	---	
Matrix Spike (1011294-MS2)						Prepared: 11/15/10 14:05 Analyzed: 11/15/10 22:38						
QC Source Sample: Other (A10K210-01)												
EPA 6020 (Diss)												
Iron	5.54	0.0100	0.0500	mg/L	1	5.56	0.261	95	75-125%	---	---	
Magnesium	9.94	0.0100	0.0500				4.62	96		---	---	
Matrix Spike (1011294-MS4)						Prepared: 11/15/10 14:05 Analyzed: 11/15/10 22:48						
QC Source Sample: Other (A10K210-01)												
EPA 6020 (Diss)												
Calcium	20.0	0.250	1.00	mg/L	10	5.56	14.5	100	75-125%	---	---	Q-16
Magnesium	10.6	0.100	0.500				4.62	107		---	---	Q-16
Manganese	0.988	0.00333	0.0100			0.0556	0.953	62		---	---	B, Q-03, Q-16
Potassium	40.4	0.100	1.00			5.56	34.8	100	70-130%	---	---	
Sodium	96.8	0.200	1.00				91.6	94	75-125%	---	---	Q-16
Post Spike (1011294-PS1)						Prepared: 11/17/10 13:35 Analyzed: 11/17/10 13:44						
QC Source Sample: Post Spike (A10K159-06)												
EPA 6020 (Diss)												
Manganese	3660			ug/L	10	1000	2700	95	75-125%	---		B

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Anchor QEA, LLC Portland 6650 SW Redwood Lane Ste. 333 Portland, OR 97224	Project: GASCO-IDW-SEQ 2 C 2 Project Number: 000029-02.28 3A Project Manager: John Renda	Reported: 12/04/10 11:16
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QUALITY CONTROL (QC) SAMPLE RESULTS

Dissolved Metals by EPA 6020 (ICPMS)

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011294 - EPA 3015A - Dissolved						Water						
Post Spike (1011294-PS2)						Prepared: 11/17/10 13:35 Analyzed: 11/17/10 13:47						
QC Source Sample: Post Spike (A10K210-01)												
EPA 6020 (Diss)												
Manganese	1660			ug/L	10	909	780	97	75-125%		---	B

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
 6650 SW Redwood Lane Ste. 333
 Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
 Project Number: 000029-02.28 3A
 Project Manager: John Renda

Reported:
 12/04/10 11:16

QUALITY CONTROL (QC) SAMPLE RESULTS

Conventional Chemistry Parameters

Analyte	Result	MDL	Reporting Limit	Units	Dil.	Spike Amount	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch 1011277 - Method Prep: Aq						Water						
Blank (1011277-BLK1)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
SM 2320 B												
Total Alkalinity	ND	20.0	20.0	mg CaCO3/L	1	---	---	---	---	---	---	---
Bicarbonate Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	---
Carbonate Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	---
Hydroxide Alkalinity	ND	20.0	20.0			---	---	---	---	---	---	---
LCS (1011277-BS1)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
SM 2320 B												
Total Alkalinity	239	20.0	20.0	mg CaCO3/L	1	236	---	101	85-115%	---	---	---
Bicarbonate Alkalinity	ND	20.0	20.0			0.00100	---		0-200%	---	---	---
Carbonate Alkalinity	237	20.0	20.0			236	---	101		---	---	---
Hydroxide Alkalinity	ND	20.0	20.0			0.00100	---			---	---	---
Duplicate (1011277-DUP1)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
QC Source Sample: Other (A10K177-01)												
SM 2320 B												
Total Alkalinity	354	20.0	20.0	mg CaCO3/L	1	---	347	---	---	2	20%	
Bicarbonate Alkalinity	354	20.0	20.0			---	347	---	---	2	20%	
Carbonate Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Hydroxide Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Duplicate (1011277-DUP2)						Prepared: 11/14/10 11:58 Analyzed: 11/14/10 14:00						
QC Source Sample: GS-111110-17 (A10K200-05)												
SM 2320 B												
Total Alkalinity	304	20.0	20.0	mg CaCO3/L	1	---	312	---	---	2	20%	
Bicarbonate Alkalinity	304	20.0	20.0			---	312	---	---	2	20%	
Carbonate Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	
Hydroxide Alkalinity	ND	20.0	20.0			---	ND	---	---		20%	

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

SAMPLE PREPARATION INFORMATION

Anions by EPA 300.0/9056A (Ion Chromatography)

Prep: Method Prep: Ag

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011242							
A10K200-01	Water	300.0/9056A	11/11/10 11:50	11/12/10 02:49	10mL/10mL	10mL/10mL	1.00
A10K200-02	Water	300.0/9056A	11/11/10 12:10	11/12/10 02:49	10mL/10mL	10mL/10mL	1.00
A10K200-03	Water	300.0/9056A	11/11/10 12:20	11/12/10 02:49	10mL/10mL	10mL/10mL	1.00
A10K200-04	Water	300.0/9056A	11/11/10 13:10	11/12/10 02:49	10mL/10mL	10mL/10mL	1.00
A10K200-05	Water	300.0/9056A	11/11/10 11:20	11/12/10 02:49	10mL/10mL	10mL/10mL	1.00
Batch: 1011335							
A10K200-02RE1	Water	300.0/9056A	11/11/10 12:10	11/17/10 11:31	5mL/10mL	10mL/10mL	2.00

Cyanide - Total (Aqueous)

Prep: Latchat Micro Dist - aqueous

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011322							
A10K200-01	Water	EPA 335.4	11/11/10 11:50	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K200-02	Water	EPA 335.4	11/11/10 12:10	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K200-03	Water	EPA 335.4	11/11/10 12:20	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K200-04	Water	EPA 335.4	11/11/10 13:10	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00
A10K200-05	Water	EPA 335.4	11/11/10 11:20	11/17/10 09:30	6mL/6mL	6mL/6mL	1.00

Cyanide - Weak Acid Dissociable (WAD) (Aqueous)

Prep: Latchat Micro Dist - aqueous

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011304							
A10K200-01	Water	SM 4500-CN (I/E)	11/11/10 11:50	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K200-02	Water	SM 4500-CN (I/E)	11/11/10 12:10	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K200-03	Water	SM 4500-CN (I/E)	11/11/10 12:20	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K200-04	Water	SM 4500-CN (I/E)	11/11/10 13:10	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00
A10K200-05	Water	SM 4500-CN (I/E)	11/11/10 11:20	11/16/10 09:27	6mL/6mL	6mL/6mL	1.00

Cyanide - Free (Aqueous)

Prep: Microdiffusion

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011265							
A10K200-01	Water	ASTM D 4282	11/11/10 11:50	11/12/10 16:55	3mL/3mL	3mL/3mL	1.00
A10K200-02	Water	ASTM D 4282	11/11/10 12:10	11/12/10 16:55	3mL/3mL	3mL/3mL	1.00

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

SAMPLE PREPARATION INFORMATION

Cyanide - Free (Aqueous)

Prep: Microdiffusion

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
A10K200-03	Water	ASTM D 4282	11/11/10 12:20	11/12/10 16:55	3mL/3mL	3mL/3mL	1.00
A10K200-04	Water	ASTM D 4282	11/11/10 13:10	11/12/10 16:55	3mL/3mL	3mL/3mL	1.00
A10K200-05	Water	ASTM D 4282	11/11/10 11:20	11/12/10 16:55	3mL/3mL	3mL/3mL	1.00

Total Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011260							
A10K200-01	Water	EPA 6020	11/11/10 11:50	11/12/10 13:32	45mL/50mL	45mL/50mL	1.00
A10K200-02	Water	EPA 6020	11/11/10 12:10	11/12/10 13:32	45mL/50mL	45mL/50mL	1.00
A10K200-03	Water	EPA 6020	11/11/10 12:20	11/12/10 13:32	45mL/50mL	45mL/50mL	1.00
A10K200-04	Water	EPA 6020	11/11/10 13:10	11/12/10 13:32	45mL/50mL	45mL/50mL	1.00
A10K200-05	Water	EPA 6020	11/11/10 11:20	11/12/10 13:32	45mL/50mL	45mL/50mL	1.00

Dissolved Metals by EPA 6020 (ICPMS)

Prep: EPA 3015A - Dissolved

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011294							
A10K200-01	Water	EPA 6020 (Diss)	11/11/10 11:50	11/15/10 14:05	45mL/50mL	45mL/50mL	1.00
A10K200-02	Water	EPA 6020 (Diss)	11/11/10 12:10	11/15/10 14:05	45mL/50mL	45mL/50mL	1.00
A10K200-03	Water	EPA 6020 (Diss)	11/11/10 12:20	11/15/10 14:05	45mL/50mL	45mL/50mL	1.00
A10K200-04	Water	EPA 6020 (Diss)	11/11/10 13:10	11/15/10 14:05	45mL/50mL	45mL/50mL	1.00
A10K200-05	Water	EPA 6020 (Diss)	11/11/10 11:20	11/15/10 14:05	45mL/50mL	45mL/50mL	1.00

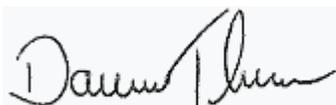
Conventional Chemistry Parameters

Prep: Method Prep: Aq

Lab Number	Matrix	Method	Sampled	Prepared	Sample Initial/Final	Default Initial/Final	RL Prep Factor
Batch: 1011277							
A10K200-01	Water	SM 2320 B	11/11/10 11:50	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K200-02	Water	SM 2320 B	11/11/10 12:10	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K200-03	Water	SM 2320 B	11/11/10 12:20	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K200-04	Water	SM 2320 B	11/11/10 13:10	11/14/10 11:58	50mL/50mL	50mL/50mL	NA
A10K200-05	Water	SM 2320 B	11/11/10 11:20	11/14/10 11:58	50mL/50mL	50mL/50mL	NA

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Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: GASCO-IDW-SEQ 2 C 2
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

Notes and Definitions

Qualifiers:

- B Analyte detected in an associated blank at a level above the MRL. (See Notes and Conventions below.)
- B-02 Analyte detected in an associated blank at a level between one-half the MRL and the MRL. (See Notes and Conventions below.)
- J Estimated Result . Result detected below the lowest point of the calibration curve, but above the specified MDL.
- Q-01 Percent recovery and/or RPD is outside acceptance limits.
- Q-03 Percent recovery and/or RPD is outside control limits due to the high concentration of analyte present in the sample.
- Q-16 Reanalysis of an original Batch QC sample.
- Q-17 RPD between original and duplicate sample is outside of established control limits.
- R-08 Reporting level raised due to potential high bias associated with the low end of the calibration curve.

Notes and Conventions:

- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis. Results listed as 'wet' or without 'dry' designation are not dry weight corrected.
- RPD Relative Percent Difference
- MDL If MDL is not listed, data has been evaluated to the Method Reporting Limit only.
- WMSC Water Miscible Solvent Correction has been applied to Results and MRLs for volatiles soil samples per EPA 8000C.
- Batch QC In cases where there is insufficient sample provided for Sample Duplicates and/or Matrix Spikes, a Lab Control Sample Duplicate (LCS Dup) is analyzed to demonstrate accuracy and precision of the extraction and analysis.
- Blank Policy Apex assesses blank data for potential high bias down to a level equal to 1/2 the method reporting limit (MRL), except for conventional chemistry and HCID analyses which are assessed only to the MRL. Sample results flagged with a B or B-02 qualifier are potentially biased high if they are less than ten times the level found in the blank for inorganic analyses or less than five times the level found in the blank for organic analyses.
- For accurate comparison of volatile results to the level found in the blank; water sample results should be divided by the dilution factor, and soil sample results should be divided by 1/50 of the sample dilution to account for the sample prep factor.
- Results qualified as reported below the MRL may include a potential high bias if associated with a B or B-02 qualified blank. B and B-02 qualifications are not applied to J qualified results reported below the MRL.

Apex Laboratories



The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Darwin Thomas, Business Development Director

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**

Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

APEX LABS
Lab # A10K200 coc Linf

CHAIN OF CUSTODY

APEX LABS

12232 S.W. Garden Place, Tigard, OR 97223 Ph: 503-718-2323 Fax: 503-718-0333

Comments: <u>Anchor QEA</u> Address: <u>6650 SW Redwood Ln #333 Portland OR 97224</u> Shipped by: <u>Matthew DeLuca</u>		Project Mgr: <u>John Renda</u> Project Name: <u>Gasco Seq 2 C 2</u> Phone: <u>5036721108</u> Fax: <u>5036721108</u> Email: <u>J.Renda@anchorqea.com</u>		Project: <u>000029-02.28 3A</u> Project Manager: <u>John Renda</u>																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
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#	SAMPLE ID	DATE	TIME	MATRIX	# OF CONTAINERS	NWTRPH-CD	NWTRPH-DS	NWTRPH-GS	BTEX	\$260 RBDN VOCs	\$260 HAP VOCs	\$260 VOA	\$270 SEM PAHs	\$102 PCBs	\$101 Chlor. Pest	\$104 HCB	\$105 PAHs	\$106 PCBs	\$107 PAHs	\$108 PCBs	\$109 PAHs	\$110 PCBs	\$111 PAHs	\$112 PCBs	\$113 PAHs	\$114 PCBs	\$115 PAHs	\$116 PCBs	\$117 PAHs	\$118 PCBs	\$119 PAHs	\$120 PCBs	\$121 PAHs	\$122 PCBs	\$123 PAHs	\$124 PCBs	\$125 PAHs	\$126 PCBs	\$127 PAHs	\$128 PCBs	\$129 PAHs	\$130 PCBs	\$131 PAHs	\$132 PCBs	\$133 PAHs	\$134 PCBs	\$135 PAHs	\$136 PCBs	\$137 PAHs	\$138 PCBs	\$139 PAHs	\$140 PCBs	\$141 PAHs	\$142 PCBs	\$143 PAHs	\$144 PCBs	\$145 PAHs	\$146 PCBs	\$147 PAHs	\$148 PCBs	\$149 PAHs	\$150 PCBs	\$151 PAHs	\$152 PCBs	\$153 PAHs	\$154 PCBs	\$155 PAHs	\$156 PCBs	\$157 PAHs	\$158 PCBs	\$159 PAHs	\$160 PCBs	\$161 PAHs	\$162 PCBs	\$163 PAHs	\$164 PCBs	\$165 PAHs	\$166 PCBs	\$167 PAHs	\$168 PCBs	\$169 PAHs	\$170 PCBs	\$171 PAHs	\$172 PCBs	\$173 PAHs	\$174 PCBs	\$175 PAHs	\$176 PCBs	\$177 PAHs	\$178 PCBs	\$179 PAHs	\$180 PCBs	\$181 PAHs	\$182 PCBs	\$183 PAHs	\$184 PCBs	\$185 PAHs	\$186 PCBs	\$187 PAHs	\$188 PCBs	\$189 PAHs	\$190 PCBs	\$191 PAHs	\$192 PCBs	\$193 PAHs	\$194 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PCBs	\$559 PAHs	\$560 PCBs	\$561 PAHs	\$562 PCBs	\$563 PAHs	\$564 PCBs	\$565 PAHs	\$566 PCBs	\$567 PAHs	\$568 PCBs	\$569 PAHs	\$570 PCBs	\$571 PAHs	\$572 PCBs	\$573 PAHs	\$574 PCBs	\$575 PAHs	\$576 PCBs	\$577 PAHs	\$578 PCBs	\$579 PAHs	\$580 PCBs	\$581 PAHs	\$582 PCBs	\$583 PAHs	\$584 PCBs	\$585 PAHs	\$586 PCBs	\$587 PAHs	\$588 PCBs	\$589 PAHs	\$590 PCBs	\$591 PAHs	\$592 PCBs	\$593 PAHs	\$594 PCBs	\$595 PAHs	\$596 PCBs	\$597 PAHs	\$598 PCBs	\$599 PAHs	\$600 PCBs	\$601 PAHs	\$602 PCBs	\$603 PAHs	\$604 PCBs	\$605 PAHs	\$606 PCBs	\$607 PAHs	\$608 PCBs	\$609 PAHs	\$610 PCBs	\$611 PAHs	\$612 PCBs	\$613 PAHs	\$614 PCBs	\$615 PAHs	\$616 PCBs	\$617 PAHs	\$618 PCBs	\$619 PAHs	\$620 PCBs	\$621 PAHs	\$622 PCBs	\$623 PAHs	\$624 PCBs	\$625 PAHs	\$626 PCBs	\$627 PAHs	\$628 PCBs	\$629 PAHs	\$630 PCBs	\$631 PAHs	\$632 PCBs	\$633 PAHs	\$634 PCBs	\$635 PAHs	\$636 PCBs	\$637 PAHs	\$638 PCBs	\$639 PAHs	\$640 PCBs	\$641 PAHs	\$642 PCBs	\$643 PAHs	\$644 PCBs	\$645 PAHs	\$646 PCBs	\$647 PAHs	\$648 PCBs	\$649 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PCBs	\$741 PAHs	\$742 PCBs	\$743 PAHs	\$744 PCBs	\$745 PAHs	\$746 PCBs	\$747 PAHs	\$748 PCBs	\$749 PAHs	\$750 PCBs	\$751 PAHs	\$752 PCBs	\$753 PAHs	\$754 PCBs	\$755 PAHs	\$756 PCBs	\$757 PAHs	\$758 PCBs	\$759 PAHs	\$760 PCBs	\$761 PAHs	\$762 PCBs	\$763 PAHs	\$764 PCBs	\$765 PAHs	\$766 PCBs	\$767 PAHs	\$768 PCBs	\$769 PAHs	\$770 PCBs	\$771 PAHs	\$772 PCBs	\$773 PAHs	\$774 PCBs	\$775 PAHs	\$776 PCBs	\$777 PAHs	\$778 PCBs	\$779 PAHs	\$780 PCBs	\$781 PAHs	\$782 PCBs	\$783 PAHs	\$784 PCBs	\$785 PAHs	\$786 PCBs	\$787 PAHs	\$788 PCBs	\$789 PAHs	\$790 PCBs	\$791 PAHs	\$792 PCBs	\$793 PAHs	\$794 PCBs	\$795 PAHs	\$796 PCBs	\$797 PAHs	\$798 PCBs	\$799 PAHs	\$800 PCBs	\$801 PAHs	\$802 PCBs	\$803 PAHs	\$804 PCBs	\$805 PAHs	\$806 PCBs	\$807 PAHs	\$808 PCBs	\$809 PAHs	\$810 PCBs	\$811 PAHs	\$812 PCBs	\$813 PAHs	\$814 PCBs	\$815 PAHs	\$816 PCBs	\$817 PAHs	\$818 PCBs	\$819 PAHs	\$820 PCBs	\$821 PAHs	\$822 PCBs	\$823 PAHs	\$824 PCBs	\$825 PAHs	\$826 PCBs	\$827 PAHs	\$828 PCBs	\$829 PAHs	\$830 PCBs	\$831 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SPECIAL INSTRUCTIONS:
 (yonda 48 hour hold time
 Total and dissolved Metals
 Dissolved metals & cations & anions filtered in field)

Normal Turn Around Time (TAT) 5.00 Business Days

TAT Requested (circle): 24 HR 48 HR 72 HR
 4 DAY 5 DAY Other: _____

SAMPLES ARE HELD FOR 30 DAYS

RELINQUISHED BY:
 Signature: Matthew DeLuca Date: 11/10
 Printed Name: Matthew DeLuca
 Signature: John Renda Date: 11/10
 Printed Name: John Renda
 Signature: Matthew DeLuca Date: 11/10
 Printed Name: Matthew DeLuca
 Company: Anchor QEA

RECEIVED BY:
 Signature: _____ Date: _____
 Printed Name: _____
 Company: _____

Apex Laboratories

Darwin Thomas

Darwin Thomas, Business Development Director

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Anchor QEA, LLC Portland
6650 SW Redwood Lane Ste. 333
Portland, OR 97224

Project: **GASCO-IDW-SEQ 2 C 2**
Project Number: 000029-02.28 3A
Project Manager: John Renda

Reported:
12/04/10 11:16

APEX LABS COOLER RECEIPT FORM

Client: Anchor QEA Element WO#: A10

Project/Project #: Gasco Seq 2 CZ / 000029-02.28 3A

Delivery info:

Date/Time Received: 11/11/10 @ 1500 By: JS

Delivered by: Apex Courier Client FedEx UPS Senvoy SDS Other

Cooler Inspection Inspected by: COB @ 1657

Chain of Custody:

Included? Yes No Signed/Dated by Client? Yes No

Signed/Dated by Apex Personnel? Yes No

Coolers: No. of Coolers: 1

	Cooler #1	Cooler #2	Cooler #3	Cooler #4
Temperature (deg. C)	<u>2.6</u>			
Received on Ice? (Y/N)	<u>(Y)</u>			
Temp. Blanks? (Y/N)				
Ice Type: (Gel/Real/Other)	<u>(Real)</u>			
Condition:	<u>good</u>			
Cooler out of temp? (Y/N)	<u>(N)</u>			
Possible reason why:				

Samples Inspection: Inspected by: COB @ 1715

All Samples Intact? Yes No Comments: _____

Bottle Labels/COCs agree? Yes No Comments: _____

Containers Appropriate for Analysis? Yes No Comments: _____

Do VOA Vials have Visible Headspace? Yes No NA

Comments: _____

Water Samples: pH Checked and Appropriate (except VOAs): Yes No NA

Comments: _____

Additional Information: _____

Labeled by: COB See Client Contact Form: Y N



APPENDIX E
DATA VALIDATION REVIEW
MEMORANDUM



DATA VALIDATION REVIEW REPORT – EPA LEVEL 2

Project: Gasco Segment 2 Capture Zone
Project Number: 000029-01
Date: December 22, 2010

This report summarizes the review of analytical results for 16 water samples collected November 8, 10, 11, 2010. The samples were collected by Anchor QEA, LLC and submitted to Apex Laboratories, LLC (Apex) in Tigard, Oregon. The samples were analyzed for the following analyses:

- Total cyanide (TCN) by United States Environmental Protection Agency (USEPA) method 335.4
- Weak acid dissociable cyanide (WADCN) by Standard Method (SM) 4500-CN I
- Free cyanide (FCN) by ASTM method D4282
- Anions by USEPA method 300.0
- Alkalinity by SM 2320B
- Total and dissolved metals by USEPA method 6020

Apex sample data group (SDG) numbers A10K140, A10K177, and A10K200 were reviewed in this report. Samples reviewed are presented in Table 1.

Table 1
Samples Reviewed

Sample ID	Well ID	Lab ID	Matrix	Analyses Requested
GS-110810-1	PW-7-93	A10K140-01	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-110810-2	PW-8-68	A10K140-02	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-110810-3	PW8-39	A10K140-03	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-110810-4	PW-9-92	A10K140-04	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-110810-5	Willamette River	A10K140-05	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111010-6	PW-7-93	A10K177-01	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111010-7	PW-8-68	A10K177-02	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111010-8	PW-8-39	A10K177-03	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111010-10	PW-9-92	A10K177-05	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111010-12	Willamette River	A10K177-07	Water	TCN, WADCN, FCN, anions, alkalinity, metals

Sample ID	Well ID	Lab ID	Matrix	Analyses Requested
GS-111110-13	PW-8-68	A10K200-01	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111110-14	PW-8-39	A10K200-02	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111110-15	PW-7-93	A10K200-03	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111110-16	Willamette River	A10K200-04	Water	TCN, WADCN, FCN, anions, alkalinity, metals
GS-111110-17	PW-9-92	A10K200-05	Water	TCN, WADCN, FCN, anions, alkalinity, metals

Data Validation and Qualifications

The following comments refer to the laboratory's performance in meeting the quality assurance/quality control (QA/QC) guidelines outlined in the analytical procedures and data quality objective sections of the Sampling and Analysis Plan (SAP) and Quality Assurance Project Plan (QAPP). Laboratory results were reviewed using *USEPA Contract Laboratory Program National Functional Guidelines for Inorganics Data Review* (USEPA 2004) and laboratory and method QC criteria as stated in USEPA (1986; SW 846, Third Edition), *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, update 1, July 1992; update IIA, August 1993; update II, September 1994; update IIB, January 1995; update III, December 1996; update IIIA, April 1998. Unless noted in this report, laboratory results for the samples listed above were within QC criteria.

Field Documentation

Field documentation was checked for completeness and accuracy. The chain-of-custody forms were signed by Apex at the time of sample receipt; the samples were received cold and in good condition.

Holding Times and Sample Preservation and Analytical Methods

Samples were appropriately preserved and analyzed within holding times with the exception of the free cyanide analyses of samples in SDG A10K140 which were analyzed between three and four hours past the 48-hour hold time. Associated sample results have been qualified "UJ" to indicate they are estimated. See Table 4 for qualified data.

Laboratory Method Blanks

Laboratory method blanks were analyzed at the required frequencies. All method blanks were free of target analytes with the following exceptions:

-
- SDG A10K140 and A10K177 Total Metals – Calcium was detected in the method blank at a level between the MDL and the MRL. Associated sample results were significantly greater than (>5x) the level detected in the method blank with one exception. This result has been qualified as a non-detect. See Table 4 for qualified data.
 - SDG A10K140 and A10K177 Dissolved Metals – Potassium was detected in both method blanks at levels between the MDL and the MRL. Associated sample results were either below detection or were significantly greater than (>5x) the higher level detected in the method blanks so no data were qualified.
 - SDG A10K200 total metals – Potassium was detected in the method blank at a level between the MDL and the MRL. Sample results were significantly greater than (>5x) the level detected in the method blank so no data were qualified.
 - SDG A10K200 Dissolved Metals – Calcium was detected in both method blanks and manganese was detected in one of the method blanks at levels between the MDL and the MRL. Associated sample results were significantly greater than (>5x) the levels detected in the blanks so no data were qualified.

Field Quality Control

Field Blanks

One field blank (GS-111010-11) was collected in association with these samples and was free of target analytes with a few exceptions. Detected results are summarized in Table 2.

Table 2

Analytes Detected in Field Blank

Analyte	Result
Cyanide	0.0082 mg/L
WAD Cyanide	0.0273 mg/L
Iron	0.0162J mg/L
Manganese	0.000467J mg/L
Calcium	0.0306J mg/L
Potassium	0.0139J mg/L
Sodium	0.0461J mg/L

Field Duplicates

One set of field duplicates were collected in association with these sample sets. Detected results are summarized in Table 3.

Table 3
Field Duplicate Results

Analyte	GS-111010-8	GS-111010-9	RPD
Alkalinity, as Calcium carbonate (CaCO ₃)	327 mg CaCO ₃ /L	318 mg CaCO ₃ /L	3%
Alkalinity, Bicarbonate	327 mg CaCO ₃ /L	318 mg CaCO ₃ /L	3%
Calcium	59D mg/L	58.3D mg/L	1%
Calcium	55.7D mg/L	56.1D mg/L	1%
Chloride (total)	54.2 mg/L	53.7 mg/L	1%
Cyanide	0.0709 mg/L	0.0659 mg/L	7%
Cyanide, Weak acid dissociable (WAD)	0.0278 mg/L	0.0334 mg/L	18%
Iron	21.4D mg/L	21.2D mg/L	1%
Iron	20.9D mg/L	20.5D mg/L	2%
Magnesium	34.7D mg/L	33.9D mg/L	2%
Magnesium	33.3D mg/L	33.2D mg/L	0%
Manganese	2D mg/L	1.98D mg/L	1%
Manganese	1.96D mg/L	1.94D mg/L	1%
Potassium	2.97D mg/L	2.94D mg/L	1%
Potassium	3.03D mg/L	3.03D mg/L	0%
Sodium	56.6D mg/L	55.5D mg/L	2%
Sodium	54.8D mg/L	54.8D mg/L	0%
Sulfate	13 mg/L	13 mg/L	0%

Concentrations at or near the reporting limit (RL) may have exaggerated relative percent difference (RPD) values. No data were qualified based on field quality control.

Surrogate Recoveries

All surrogate recoveries were within the laboratory control limits.

Laboratory Control Sample and LCS Duplicate

Laboratory control samples (LCSs) and LCS Duplicates (LCSDs) were analyzed at the required frequencies. All LCS/LCSD analyses yielded percent recoveries (%R)s and/or relative percent difference (RPD) values within laboratory control limits.

Matrix Spike and Matrix Spike Duplicate

Matrix spike (MS) and matrix spike duplicate (MSD) samples were analyzed at the required frequencies or laboratory duplicates were analyzed in place of MSDs. All %Rs and/or RPD values were within laboratory control limits with the following exceptions:

- SDG A10K140 and A10K200 Conventionals – Total cyanide recovered below control limits in one of the MS samples, however; the MS was performed on a non-project sample so no data were qualified.
- SDG A10K140 and A10K177 Total Metals – Calcium and manganese recovered above control limits in the MS, however; sample results were significantly greater than (>4x) the spike amount so no data were qualified.
- SDG A10K200 Total Metals – Manganese did not recover in one of the matrix spike samples, which was performed on a non-project sample. Calcium recovered above the control limit and manganese recovered below the control limit in the project MS. All sample concentrations were significantly greater than (>4x) the spike level so no data were qualified. Data were not qualified based on non-project MS/MSD results.
- SDG A10K200 Dissolved Metals – Manganese recovered below control limits in two of the MS samples. The MSs were performed on non-project samples and the sample concentrations were significantly greater than (>4x) the spiking levels so no data were qualified.

Laboratory Duplicates

Laboratory duplicates were analyzed at the required frequencies. RPD control limits do not apply if the sample and/or duplicate result is less than 5x the MRL. For results <5x the MRL, the difference between the sample and duplicate result must be <2x the MRL for solid matrices and <MRL for water matrices. All duplicate results were within control limits.

Sample Analysis

Two nitric acid preserved bottles were received at the laboratory for sample GS-111010-12 without any indication about which one had been field-filtered for the dissolved metals analysis. The laboratory filtered an unpreserved aliquot and analyzed that as the dissolved fraction. Both of the nitric bottles received were digested and analyzed for total metals, and the results from both tests are reported. One result reflects total metals, the other field-filtered dissolved metals. A comparison with the lab-filtered dissolved metals indicates that results reported as laboratory sample A10K177-07RE1 are probably from the field-filtered bottle and will be reported as the dissolved fraction.

Method Reporting Limits

Reporting limits were deemed acceptable as reported. All values were reported using the laboratory reporting limits. Values were reported as undiluted, or when reported as diluted, the reporting limit accurately reflects the dilution factor.

Overall Assessment

As was determined by this evaluation, the laboratory followed the specified analytical methods and all requested sample analyses were completed. Accuracy was acceptable as demonstrated by the surrogate, LCS/LCSD, and MS/MSD %R values, with the exceptions noted above. Precision was also acceptable as demonstrated by the laboratory duplicates, MS/MSD, and LCS/LCSD RPD values. Most data were deemed acceptable as reported; all other data are acceptable as qualified. Table 4 summarizes the qualifiers applied to samples reviewed in this report.

Data Qualifier Definitions

- U Indicates the compound or analyte was analyzed for but not detected at or above the specified limit.
 - J Indicates an estimated value.
 - R Indicates data is rejected and unusable
 - UJ Indicates the compound or analyte was analyzed for but not detected and the specified limit reported is estimated
 - DNR Do not report
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Table 4
Data Qualification Summary

Sample ID	Parameter	Analyte	Reported Result	Qualified Result	Reason
GS-111010-11	Total metals	Calcium	0.0478J mg/L	0.100U mg/L	Method blank contamination
GS-111010-12	Dissolved metals	Iron	0.132 mg/L	DNR	Report from field filtered sample
		Magnesium	2.07 mg/L	DNR	
		Potassium	1.04 mg/L	DNR	
		Sodium	4.88 mg/L	DNR	
		Calcium	6.55 mg/L	DNR	
		Manganese	0.0116 mg/L	DNR	
GS-111010-12 (A10K177-07RE1)	Total metals	All	All	Report as dissolved metals	Bottle not initially labeled as filtered
GS-110810-1	Conventionals	Free cyanide	0.005U mg/L	0.005UJ mg/L	Analyzed past hold time
GS-110810-2	Conventionals	Free cyanide	0.005U mg/L	0.005UJ mg/L	Analyzed past hold time
GS-110810-3	Conventionals	Free cyanide	0.005U mg/L	0.005UJ mg/L	Analyzed past hold time
GS-110810-4	Conventionals	Free cyanide	0.005U mg/L	0.005UJ mg/L	Analyzed past hold time

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