hart hickman

SMARTER ENVIRONMENTAL SOLUTIONS

Via FedEx

October 19, 2012

Toxics Cleanup Program
State of Washington - Department of Ecology
300 Desmond Drive
Lacy, WA 98503

Attention: Mr. Eugene Radcliff, L.G.

Re: Additional Remedial Action & Performance Monitoring Report
Former Clariant Corporation Facility
Kalama, WA
Facility No. 24634187
VCP Project No. SWO492
H&H Job No. CLR-045

Dear Eugene:

Per your request, Hart & Hickman, PC is submitting the enclosed Additional Remedial Action & Performance Monitoring Report hard copy and an electronic file of the report on CD-ROM in addition to the copy that you received on October 17, 2012.

Should you have any questions or need any additional information, please feel free to contact me at 704-586-0007.

Sincerely,

Hart & Hickman, PC

Steven C. Hart, L.G.
Principal

Enclosures (2): Additional Remedial Action & Performance Monitoring Report hard copy and electronic file on CD-ROM

Additional Remedial Action & Performance Monitoring Report Former Clariant Corporation Facility

Kalama, Washington
Facility No. 24634187
State of Washington Department of Ecology
VCP Project No. SWO492

H&H Job No. CLR-045
October 16, 2012

10/16/12

Steven C. Hart

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Additional Remedial Action & Performance Monitoring Report
Former Clariant Corporation Facility
Kalama, Washington
H&H Job No. CLR-045

1.0 Introduction and Background

Hart & Hickman, PC (H&H) has prepared this Additional Remedial Action and Performance Monitoring Report for remedial action (RA) activities conducted during November and December 2011 at the former Clariant Corporation (Clariant) facility located at 404 Hendrickson Drive in Kalama, Washington. A site location map is provided as Figure 1. In addition, this report includes a summary of 1-month, 3-month, and 6-month post-RA ground water performance monitoring conducted at the site since the additional RA activities.

The facility is currently owned and operated by Chemtrade Logistics, Inc. (Chemtrade). This RA report has been prepared on behalf of Clariant under Washington State Department of Ecology's (Ecology) Voluntary Cleanup Program (VCP), VCP number SWO492, facility number 24634187.

Previous RA activities were completed at the site during August and September 2010 in accordance with H&H's *Remedial Action Work Plan* (RAWP) dated August 6, 2010 (H&H 2010). The 2010 RA activities were documented in H&H's *RA Report* dated January 19, 2011 (H&H 2011a). Site background information, including a discussion of cleanup levels (CULs), points of compliance (POCs), and on-site ground water maximum contaminant levels (MCLs) are described in the RAWP and the RA report.

As described in the RAWP, the objectives of the RA activities are to:

- Remove soils impacted with cadmium and/or zinc above CULs that remained beneath and to the southeast of a truck access road in former Settling Basin #2 (FSB2) to 1) eliminate potential future human health and ecological risks associated with this soil, and 2) minimize the potential for future ground water impact from this soil; and,

- Remediate ground water such that the ground water CULs based upon protection of surface water are met at the ground water POCs adjacent to the Columbia River. As detailed in the RAWP, Ecology has approved monitoring wells AB1 and AB2 as alternative ground water POCs for the ground water remedial action. The primary goal of the RA is to remediate ground water such that zinc is at or below 74 micrograms per liter (µg/l) in POC wells AB1 and AB2. The zinc ground water remedial goal is based upon surface water protection in the Columbia River.

The RA activities conducted in August and September 2010 included excavation and off-site disposal of approximately 11,500 tons of soil from the FSB2 area, installation of 23 vertical injection wells and six horizontal injection wells, and injection of approximately 47,000 gallons of calcium polysulfide (CaSx) into the injection wells to address dissolved cadmium and/or zinc in ground water. CaSx is a lime-sulfur solution designed to be used in various treatment systems as a metal precipitating agent and has been used for in-situ treatment of ground water impacted with metals. A site map showing the vertical and horizontal injection well locations is included as Figure 2.

Based upon a review of ground water monitoring data collected after completion of the 2010 RA activities, H&H proposed additional RA activities to further remediate dissolved phase ground water impacts and to remediate leachable zinc in soil below the depths of previous soil excavations. In the July 5, 2011 *Post-Injection Monitoring Report & RAWP Addendum* (H&H 2011b), H&H proposed a plan for additional RA at the site using CaSx injection and ground water re-circulation that included plans for pilot testing of the proposed remedial activities. H&H submitted a *Pilot Test Plan* dated September 9, 2011 (H&H 2011c) to Ecology to provide additional details of the pilot testing activities. Pilot test implementation was completed at the site on September 27-28, 2012, and the pilot test activities were documented in H&H's *Pilot Test Report* dated October 28, 2011 (H&H 2011d). The CaSx injection completed during the 2010 RA and 2011 pilot testing activities were conducted under an Underground Injection Control (UIC) conditional rule authorization that was issued by Ecology for the site on August 24, 2010.

During November and December 2011, H&H completed full-scale implementation of the additional RA activities in accordance with the RAWP Addendum and a *RAWP Addendum Deviation Request* dated November 10, 2011 (H&H 2011e). The additional injection activities were performed in the (FSB2) area (north of the manufacturing plant) using injection wells IW-1 through IW-12 and HIW-1 through HIW-6, and in the southern portion of the site (to the west of the manufacturing plant) using injection wells IW-13 through IW-23 (Figure 2). The area to the west of the manufacturing plant is hereafter referred to as the manufacturing plant area (MPA).

Please note that the RAWP Addendum included installation of six new horizontal injection wells for injecting CaSx to address leachable zinc in soil below the depth of the previous soil excavation and above the typical elevation of the ground water table in a portion of the FSB2 area. However, instead of installing and utilizing horizontal wells for this purpose, soil was excavated in the FSB2 area (north of the truck access road) to a depth of approximately 15 ft bgs and CaSx solution was applied directly to the base of the excavation area.

The additional CaSx injection completed during the full-scale 2011 RA activities was conditionally rule-authorized by Ecology in an email dated November 17, 2011. The additional RA activities conducted during November and December 2011 are described in Section 2.0, and a summary of performance ground water monitoring conducted since completion of the additional RA activities is included in Section 3.0.

2.0 Additional RA Activities

Based on a review of post-2010 RA soil and ground water data, it was determined that leachable zinc in the soils located beneath the previous excavations should be addressed to prevent future dissolution of zinc from this soil during periods of high ground water elevation and also from infiltrating rainwater. Therefore, the additional RA included excavation of soil in the FSB2 area north of the truck access road to a depth of approximately 15 ft bgs and application of CaSx solution directly to the base of the excavation area to fix the zinc in these soils. The additional RA also included additional injection of CaSx using the existing injection well network to address dissolved zinc and cadmium impacts remaining in ground water. These additional RA activities are described in the following sections.

2.1 Soil Excavation CaSx Application

Soil excavation and CaSx application activities were conducted at the site between November 30 and December 6, 2011 in the area shown in Figure 3. Advanced Environmental Options, Inc. (AEO) of Spartanburg, SC was contracted by Clariant to conduct the soil excavation and CaSx application activities with H&H providing oversight. Soil excavation and CaSx application was generally completed by excavating soil from approximately 600 to 1,000 square foot (sf) areas to a depth of 15 ft bgs, applying CaSx to the bottom of area at a rate of approximately 3,000 gallons per 1,000 sf, then backfilling the area with soil from the adjacent excavation area. Note that soil excavated from the surface to 15 ft bgs in this area was clean soil used to backfill excavations completed at the site in 2003 and 2010. Excavation and CaSx application was repeated until CaSx application was completed in the approximately 7,500 sf excavation base area depicted in Figure 3. In total, approximately 23,000 gallons of CaSx solution were applied directly to the bases of the excavation areas.

CaSx solution produced by Tessenderlo Kerley was delivered to the site in tanker trucks and transferred into one of two 20,000-gallon frac tanks obtained from BakerCorp. Each tanker delivered approximately 4,400 gallons of CaSx solution that was approximately 27% by weight

calcium polysulfide and 73% by weight water. Certificates of analysis which include the quantity and elemental analysis of the CaSx delivered by each tanker during the RA activities are included in Appendix A. The CaSx was pumped from the frac tanks through hose and applied to the base of the excavation by AEO personnel standing near the edges of the excavation areas. The CaSx was distributed evenly across the base of ach excavation area and was observed to quickly infiltrate into the excavation base at the point of application. The excavator bucket was periodically used to till the bottom of the excavation area to aid in distribution of the CaSx. CaSx application volumes and flow rates were monitored using chemical-resistant in-line flow meters.

Note that the well risers of several injection wells, monitor well PZ12, and extraction well EW-1 were exposed during soil excavation activities. Prior to beginning the excavation activities, protective concrete well pads and manholes were removed from the wells and caution was used to prevent damaging the wells during the excavation. As the excavation progressed in the area of a well, 5-ft segments of 6-inch diameter PVC casing were placed around exposed well risers as needed to stabilize and protect the exposed wells. During backfilling of the excavation areas, backfill material was placed around the exposed 6-inch PVC casing used to protect the wells and hydrated bentonite was installed within the 6-inch PVC casing to approximately one foot below final grade. Note that the grout originally installed around several of the well risers did not break off of the well, and PVC casing was not needed to protect and reconstruct the well. After the excavation backfilling was completed, the well manholes were re-installed and new concrete well pads were constructed at the wellheads of each monitor well.

During the period that the excavation activities were completed, approximately 2,000 gallons of CaSx were injected into each of the previously installed horizontal injection wells HIW-1 and HIW-3 through HIW-6 to address soil located beneath and to the south of the truck access road. Note that CaSx was previously injected into these wells during the 2010 RA activities. CaSx could not be injected into HIW-2 due to apparent subsurface blockage of the well that prevented flow into the well. Horizontal injection well locations are shown in Figures 2 and 3. Photographs of the excavation and CaSx application activities are included in Appendix B.

2.2 Extraction Well Installation

As part of the additional RA activities, six ground water extraction wells (EW-2 through EW-7) were installed for use during the ground water injection activities. Extraction well installation activities were conducted at the site on December 5-7, 2011 by Cascade Drilling of Clackamas, OR with oversight by H&H. The ground water extraction wells were installed using a hollow stem auger drill rig to 35 ft below ground surface (bgs) and constructed with 25 ft of 8-inch diameter PVC well screen and 10 ft of PVC riser. Extraction well construction details are summarized along with injection well construction details in Table 1 and extraction well locations are shown in Figure 2. Extraction well boring logs and construction records are included in Appendix C.

2.3 Ground Water Injection and Re-circulation Methods

In accordance with the RAWP Addendum, the additional CaSx injection activities included extraction of ground water from the newly installed extraction wells (discussed in Section 2.2), mixing the extracted ground water with CaSx in the frac tanks, and injecting the ground water and CaSx mixture into the subsurface. Concurrent ground water extraction and injection of the mixture (hereafter referred to as re-circulation) were then conducted for approximately six hours using three injection wells and one or two extraction wells until the frac tanks were emptied. This re-circulation process was intended to enhance subsurface distribution and mixing of the CaSx within targeted areas of the aquifer. Note that re-circulation activities were conducted using extraction and injection wells located in the vicinity of each other.

In addition, the RAWP Addendum included plans for in-line filtration of the CaSx and ground water mixture prior to injection into the subsurface in order to remove insoluble zinc compounds precipitated out of solution during the above-ground CaSx and ground water mixing. During the pilot testing activities completed prior to the full-scale additional RA implementation, solids (that included zinc compounds) were effectively precipitated out of solution and removed from the re-circulated mixture using in-line filtration. Therefore, in-line filtration of the re-circulated mixture was conducted as part of the full-scale RA activities.

Equipment utilized during the injection and re-circulation included:

- Two 20,000-gallon frac tank for receipt of CaSx and for above-ground mixing of CaSx and extracted ground water;
- A bag/cartridge filter system for removal of solid compounds precipitated out of the CaSx and ground water mixture prior to injection into the subsurface;
- Multiple utility pumps for 1) boosting injection and extraction flow rates of the CaSx and ground water mixture, and 2) for circulating CaSx and ground water within the frac tank to enhance uniform mixing;
- Five gasoline-powered utility pumps for fluid transfer, mixing, and injection processes, and also to boost extraction flow rates;
- Two submersible pumps for ground water extraction;
- A generator for powering the submersible pumps;
- Hoses, piping, and fittings for fluid transport;
- An injection manifold consisting of a header and three injection lines, each with an in-line ball valve used to control the flow rate in each injection line;
- In-line totalizing flow meters for measurement of extraction and injection volumes (in gallons) and flow rates (in gallons per minute – gpm); and,
- Multiple hydrogen sulfide (HS) gas monitors used as a precautionary measure to alert personnel of the presence of HS gas at unsafe levels.

The CaSx injection and ground water re-circulation activities were conducted on December 6 through 15, 2011. In total, approximately 37,500 gallons of CaSx were utilized during the ground water injection and re-circulation activities. In general the injection activities progressed as follows:

1. Two tanker trucks each delivered approximately 4,400 gallons of CaSx solution to the site at the beginning of each day (for a total of approximately 8,800 gallons CaSx delivered per day). Each tanker transferred CaSx directly into one of the two 20,000 gallon frac tanks so that each frac tank contained approximately 4,400 gallons of CaSx.

2. Ground water was pumped from one or two extraction wells into the frac tanks until the frac tanks were nearly full. Extraction flow rates ranged from approximately 115 to 130 gpm. During the time it took to fill the frac tanks (approximately 2 hours), CaSx and ground water were continuously mixed inside of the tanks by pumping fluid out of the bottom of each tank through hoses that discharged into the top of the tanks.

3. After filling the frac tanks, the ground water and CaSx mixture in one frac tank was pumped out of the frac tank, through the filtration unit, and injected into two or three injection wells. Ground water re-circulation continued until the frac tank was empty and the process was repeated using the mixture in the other frac tank. Injection flow rates were regulated with in-line ball valves to approximately 80 to 110 gpm per well.

After beginning injection of the CaSx and ground water mixture, ground water quality parameters (including conductivity, dissolved oxygen - DO, oxidation-reduction potential - ORP, and pH) were measured in monitor wells located near the injection areas and in the extraction wells to assist in evaluating the effectiveness of the injection and re-circulation in distributing and mixing the CaSx solution throughout the targeted area of the aquifer. Based on previous injection and performance monitoring, an increase in pH and decrease in ORP are indicative of CaSx distribution. Sulfur odor and yellow, yellow-green, or green-gray coloration are also indicative of CaSx distribution. In the FSB2 area, there was evidence of CaSx distribution in extraction wells EW1 through EW3, EW5, and EW6, and in monitor wells PZ12, PZ13, and OW3. In the MPA, there was evidence of CaSx distribution in extraction well EW7 and in monitor wells PZ5 and PZ6. There was no evidence of CaSx distribution in any of the other monitoring wells prior to completion of the additional RA activities of pilot testing, and there was no evidence of CaSx distribution in PZ1, PZ3, AB1, or AB2, which are located along the western edge of the property between the injection areas and the Columbia River.

As previously mentioned, during the pilot testing activities completed prior to the full-scale additional RA implementation, solids were effectively precipitated out of solution and removed from the re-circulated mixture using in-line filtration. However, during the additional RA

activities, there was not a significant volume of sludge removed from the mixture of CaSx and ground water by the inline filtration system prior to injection.

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3.0 Performance Monitoring

Results of a ground water monitoring event conducted in September 2011were used to establish baseline conditions prior to the pilot testing and the additional RA activities. The results of the ground water monitoring event were presented in the *Pilot Test Report* (H&H 2011d). Ground water elevation data, ground water field parameters and sulfide data, and ground water sample analytical data from the monitoring event are summarized in Tables 3 through 5. Ground water elevation contour and zinc isoconcentration maps for the event are included as Figures 4A and 5A, respectively.

One-month, three-month, and six-month post-additional RA ground water monitoring events were conducted at the site on January 12, 2012, March 20-21, 2012, and June 26-27, 2012, respectively. The results of these monitoring events are discussed in the following sections.

3.1 Ground Water Elevations

A single round of water level gauging of all site monitor wells was conducted as part of each of the post-additional RA ground water monitoring events. Ground water elevation data is summarized in Table 3. Ground water elevations during the January, March, and June 2012 monitoring were approximately 1 to 2 ft, 4 to 5 ft, and 5 to 6 ft higher than the baseline (September 2011) ground water elevations, respectively. Ground water elevations during the June 2012 event were approximately 1 to 2 ft lower than the historically high levels measured at the site during June 2011. The September 2011 elevations were similar to those considered to be "normal" at the site.

Consistent with previous sampling events, the 2012 ground water elevation data indicate that shallow ground water flow at the site is influenced by the tidal elevation variations of the Columbia River. In the eastern portion of the site, there is a hydraulic gradient from east to west toward the river. In the western portion of the site, hydraulic communication between the river and shallow ground water results in a temporal mound in the ground water table near the river that creates a relatively weak hydraulic gradient from west to east in that area. The ground water

mound near the river is temporal and its presence depends upon the timing and magnitude of the tides. The converging hydraulic gradients appear to cause ground water in the central portion of the site to be temporally stagnant. Inferred ground water elevation contour maps for the January, March, and June 2012 monitoring events are included as Figures 4B through 4D, respectively.

Predicted and verified Columbia River elevation/tide data were obtained from the National Oceanic and Atmospheric Administration's (NOAA) NOS/CO-OPs Observational Data Interactive Navigation program (http://tidesandcurrents.noaa.gov/gmap3). Daily elevation data obtained from the NOAA website indicate that the elevation of the Columbia River fluctuated approximately 2 to 3 ft between low and high tides in the vicinity of the site at the time of the 2012 sampling events. Columbia River elevation data are summarized along with the site ground water elevation data in Table 3.

3.2 Ground Water Sampling Methods

The post-additional RA ground water sampling was conducted in continued accordance with the RAWP (H&H, 2010), which included collection of ground water samples from permanent monitor wells PZ1, PZ3 through PZ6, PZ12, PZ13, AB1, AB2, and OW1 through OW3. During each of the monitoring events, ground water from each of the wells was purged and sampled using standard low-flow/low-stress techniques. Ground water parameters that included temperature, pH, conductivity, DO, ORP, and turbidity were measured during the low-flow purging. A summary of the ground water field parameter data collected during each monitoring event is included in Table 4.

After ground water parameters stabilized during purging, ground water samples were collected from each monitor well into laboratory-supplied sample containers, placed into laboratory-supplied sample coolers, and covered with ice. Samples collected for dissolved cadmium and zinc were field-filtered using a 0.45-micron ground water filter prior to collection into sample containers. The samples were delivered under standard chain-of-custody protocols to Test America of Portland, OR (January and March 2012 samples) and to Test America of Nashville,

TN (June 2012 samples) for analysis of dissolved cadmium and zinc and total sulfide. Sulfide is analyzed to monitor for potential residual CaSx in the aquifer after injection.

3.3 Ground Water Analytical Results

Sulfide analytical results are summarized in Table 4 along with the ground water field parameter data. Dissolved cadmium and zinc analytical results are summarized along with historical data in Table 5. Dissolved zinc concentrations and inferred zinc isoconcentration contours for the January, March, and June 2012 sampling events are included as Figures 5B through 5D, respectively. Analytical data reports are included in Appendix D.

Baseline (September 2011) Monitoring Results

As was presented in the Pilot Test Report, results of the baseline (September 2011) ground water samples collected prior to the pilot test and additional RA activities indicated concentrations of dissolved zinc and cadmium in the MPA that were similar to pre-2010 injection levels. In the FSB2 area, concentrations of dissolved zinc increased from those detected during previous sampling events in wells located along the western portion of the site (including PZ1, OW1 through OW3, and AB2).

As summarized in greater detail in the RAWP Addendum and Pilot Test Plan, it appeared that soils located beneath the previous excavation areas contained a significant mass of leachable zinc and that this residual zinc contributed to increased concentrations of dissolved zinc detected in ground water in that area during the period of historically high ground water elevations at the site during the first half of 2011. The increased zinc concentrations in wells in the western portion of the site were likely due to the transport of ground water from the previous excavation areas toward the western portion of the site when the Columbia River elevation decreased during July through September 2011.

During the September 2011 sampling, the maximum dissolved zinc concentration detected in the FSB2 area monitor wells was 88,100 µg/l in PZ12. A dissolved zinc concentration of 14,300 µg/l was detected in the FSB2 area compliance well AB2. Zinc was not detected in PZ13

during the September 2011 monitoring event. This was the first time that dissolved zinc was not detected in well PZ13 since was installed. During the previous three sampling events conducted during December through June 2011, dissolved zinc was detected at concentrations ranging from 21,100 to 79,000 µg/l in PZ13.

The maximum dissolved zinc concentration detected in the MPA monitor wells was 4,420 µg/l in PZ3, and a dissolved zinc concentration of 1,090 µg/l was detected in the MPA area compliance well AB1. Primary dissolved cadmium impacts historically detected in the MPA have been in monitor wells PZ4 and PZ5. Dissolved cadmium was detected in both PZ4 and PZ5 during the September 2011 sampling at concentrations of 26.1 µg/l and 102 µg/l, respectively.

Sulfide concentrations were detected above laboratory reporting limits in monitor wells PZ12 and PZ13 during the September 2011 sampling.

<u>One-Month Post-Additional RA (January 2012) Monitoring Results</u>

In the FSB2 area, the January 2012 ground water sample results indicated that concentrations of dissolved zinc decreased slightly in PZ12 (from 88,100 µg/l to 83,600 µg/l) and decreased significantly in OW3 (from 41,600 µg/l to 8,100 µg/l) since the September 2011 sampling of those wells. Dissolved zinc concentrations in the other FSB2 area wells increased relative to the September 2011 results, and dissolved zinc was detected in PZ13 at a concentration of 2,140 µg/l after not being detected during September 2011. The maximum dissolved zinc concentration detected in the FSB2 area monitor wells was 83,600 µg/l in PZ12, and a dissolved zinc concentration of 19,500 µg/l was detected in the FSB2 area compliance well AB2.

In the MPA, the January 2012 ground water sample results indicated that concentrations of dissolved zinc decreased significantly in monitor wells PZ4 through PZ6 since the September 2011 sampling of those wells. The dissolved zinc concentrations detected in PZ5 (394 µg/l) and PZ6 (26.3 µg/l) were the lowest that have historically been detected in the wells. Dissolved zinc concentrations in the other MPA wells (PZ3 and AB1) were similar to the September 2011 concentrations. The maximum dissolved zinc concentration detected in the MPA area monitor wells was 4,530 µg/l in PZ3, and a dissolved zinc concentration of 923 µg/l was detected in the

MPA compliance well AB1. Dissolved cadmium was not detected in either PZ4 or PZ5 during the January 2012 sampling. This was the first time that dissolved cadmium was not detected in the wells since they were installed.

Sulfide concentrations were detected above laboratory reporting limits in monitor wells PZ12, PZ13, and OW3 during the January 2012 sampling. Dissolved zinc concentrations in PZ13 and OW3 were relatively low compared to concentrations detected in the other FSB2 area wells; however, dissolved zinc concentrations remained elevated in PZ12 despite the surplus of sulfide.

Three-Month Post-Additional RA (March 2012) Monitoring Results

In the FSB2 area, the March 2012 ground water sample results indicated that concentrations of dissolved zinc increased in several of the wells (including PZ1, PZ12, PZ13, and OW2) since the January 2012 sampling event. The maximum dissolved zinc concentration detected in the FSB2 area monitor wells was 300,000 µg/l in PZ12, and a dissolved zinc concentration of 20,000 µg/l was detected in the FSB2 area compliance well AB2.

In the MPA, the March 2012 ground water sample results indicated that concentrations of dissolved zinc increased in PZ4 and PZ6 and decreased in the area's other well since the March 2012 sampling event. The maximum dissolved zinc concentration detected in the MPA area monitor wells was 6,480 µg/l in PZ3, and a dissolved zinc concentration of 736 µg/l was detected in the MPA compliance well AB1. Dissolved cadmium was detected in both PZ4 and PZ5 during the September 2011 sampling at concentrations of 10 µg/l and 43 µg/l, respectively.

Sulfide concentrations were detected above laboratory reporting limits in monitor wells PZ6 and PZ12 during the June 2012 sampling; however, dissolved zinc concentrations remained elevated in PZ6 and PZ12 despite the surplus of sulfide.

Six-Month Post-Additional RA (June 2012) Monitoring Results

In the FSB2 area, the June 2012 ground water sample results indicated that concentrations of dissolved zinc remained elevated or increased in the majority of the wells compared to the March 2012 sampling event. In OW1, there was a notable decrease in the dissolved zinc

concentration (from 46,000 µg/l to 23,900 µg/l) as compared to the previous sampling event and there was a significant decrease in PZ13 (from 89,000 µg/l to 210 µg/l). The maximum dissolved zinc concentration detected in the FSB2 area monitor wells was 352,000 µg/l in PZ12, and a dissolved zinc concentration of 33,300 µg/l was detected in the FSB2 area compliance well AB2.

In the MPA, the June 2012 ground water sample results indicated that concentrations of dissolved zinc increased in monitor wells PZ4 and PZ6 since the March 2012 sampling event. Dissolved zinc concentrations detected in the other MPA wells were lower than those detected during the March 2012 sampling. The maximum dissolved zinc concentration detected in the MPA area monitor wells was 6,480 µg/l in PZ3, and a dissolved zinc concentration of 736 µg/l was detected in the MPA compliance well AB1. Dissolved cadmium was detected in both PZ4 and PZ5 during the September 2011 sampling at concentrations of 31.2 µg/l and 4.3 µg/l, respectively.

Sulfide concentrations were detected above laboratory reporting limits in monitor wells PZ13 and OW2 during the June 2012 sampling. The dissolved zinc concentration in PZ13 during June 2012 was significantly lower than the March 2012 detection in the well; however, dissolved zinc concentrations remained elevated in OW2 despite the presence of sulfide.

3.4 Data Evaluation

The results of the post-injection monitoring conducted since the additional RA activities indicate that reductions in dissolved zinc and cadmium concentrations in the MPA were observed in the first post-additional RA ground water sampling event conducted in January 2012. However, since that sampling event, dissolved zinc and cadmium concentrations in the MPA have returned to similar levels as were detected in the baseline (September 2011) sampling event. In the FSB2 area, dissolved zinc concentrations have generally increased since the September 2011 sampling.

H&H has reviewed data obtained from the performance monitoring wells to evaluate zinc concentration trends in relation to ground water parameter data trends (e.g., DO, ORP, pH, etc.),

and to evaluate relationships between ground water parameters. Note that ORP and pH are two of the most important factors controlling metals precipitation and speciation. Graphs depicting several combinations of zinc concentrations and/or ground water quality parameters vs. time are included in Appendix E. These graphs include zinc concentration and ORP vs. time, DO and ORP vs. time, zinc concentration and pH vs. time, and pH and ORP vs. time graphs for FSB2 area monitor wells OW1 through OW3, PZ12, PZ13, and AB2 and for MPA monitor wells PZ3 through PZ6.

ORP (or, redox potential) of ground water is a measure of electron activity and is an indicator of the relative tendency of a solution to transfer electrons. ORP affects the solubility of metals. Low ORP conditions are favorable for reduction of dissolved zinc to insoluble zinc sulfide. Prior to the first CaSx injection performed in September 2010 at the site, the average of ORP values measured in the FSB2 area performance monitor wells was approximately -16 mV. The average of ORP values measured in the FSB2 area performance monitor wells was approximately 102 mV during the most recent sampling event (June 2012). Note that CaSx has a very low ORP (less than -500 mV) in pure form and when there has been evidence of CaSx present in purge water from a well, ORP values have been very low. Prior to the first CaSx injection performed in September 2010 at the site, the average of ORP values measured in the MPA performance monitor wells was approximately 86 mV. The average of ORP values measured in the MPA performance monitor wells was approximately 82 mV during the most recent sampling event (June 2012).

As shown in the zinc concentration and ORP vs. time graphs included in Appendix E, dissolved zinc concentration and ORP trends generally indicate a correlation between increased dissolved zinc concentrations and increased ORP conditions. This is consistent with Eh-pH zinc stability diagrams which indicate that zinc solubility decreases with decreasing Eh (ORP is directly correlated to Eh depending upon the reference electrode used in the ORP measurement). Although it was expected that ORP would decrease as a result of the CaSx injection, it appears that some geochemical reaction has occurred to raise ORP.

DO is often an indicator of redox potential because oxygen is an element that commonly loses electrons to other elements. In general, there appears to be a correlation between ORP and DO trends in wells located within CaSx injection/application areas (e.g., PZ12, PZ13, and PZ4 through PZ6 to a lesser extent); however, in wells located downgradient of the CaSx injection/application areas (e.g., OW1 through OW3, and PZ1), DO concentrations have generally trended downward since CaSx injection/application while ORP levels have generally trended upward in the wells.

pH is a measure of the activity of the hydrogen ion, which is closely related to a measure of the hydrogen ion concentration in a solution. The solubility of metal species can be affected by changes in pH. For example, changes in ground water pH may cause metal ions in solution to precipitate out of solution by combining with another molecular species to form an insoluble complex, or vice versa. Note that CaSx has a very high pH (greater than 12) in pure form and when there has been evidence of CaSx present in purge water from a well, pH values have been high. A review of ground water data does not indicate a strong correlation between zinc concentrations and pH. However, note that pH levels in PZ12 (where the maximum dissolved zinc concentrations have consistently been detected) have decreased from baseline levels of approximately 5.5 to 6 to approximately 4 to 4.5 during several of the most recent sampling events. This is unexpected given the high pH of the CaSx injected into the area near PZ12.

A review of pH and ORP data indicates a strong correlation between the parameters in PZ12 and PZ13 likely as a result of the presence of CaSx in the well. Generally, there is not a strong correlation between these parameters in the other performance monitoring wells.

4.0 Conclusions and Recommendations

4.1 Conclusions

Additional RA activities were conducted at the site between November 30 and December 15, 2011. The following is a summary of those RA activities:

- Approximately 23,000 gallons of CaSx solution were applied to the base of a 15-ft deep 7,500 sf excavation area located in the FSB2 area to address residual zinc impacts in soil located beneath the depth of former excavations in the area and the shallow ground water.
- Approximately 2,000 gallons of CaSx were injected into each of the five horizontal injection wells located beneath and to the south of the truck access road to address residual zinc impacts in soil located beneath the depth of former excavations completed in these areas and the shallow ground water.
- Six ground water extraction wells were installed at the site for use in ground water extraction and re-circulation activities.
- Ground water injection and re-circulation activities were conducted to address dissolved zinc and cadmium impacts in site ground water. These activities included mixing approximately 37,500 gallons of CaSx with extracted ground water in above-ground frac tanks, injection of the mixture into site ground water, and extraction and re-circulation of ground water concurrent to the injection in order to enhance distribution of CaSx in the aquifer.

The CaSx injection and application activities were successfully implemented at the site.

Post-injection ground water performance monitoring was conducted approximately one month (in January 2012), three months (in March 2011), and six months (in June 2012) after completion of additional RA activities. Results of the ground water performance monitoring indicate that dissolved cadmium and zinc concentrations in the MPA initially decreased following completion of the additional RA activities, but increased to levels similar to pre-additional RA levels in the June 2012 samples. In the FSB2 area, dissolved zinc concentrations have generally increased.

A review of ground water quality data from the site indicates that ORP levels in performance monitoring wells have generally increased to levels that do not favor reduction of zinc and cadmium into insoluble cadmium and zinc sulfides. The ORP levels have increased above pre-remedial levels that were present at the site. This is unexpected given that the ORP of CaSx is very low. This increase may be the result of a lowered redox capacity of the aquifer (ability of a chemical system to maintain a redox potential) due to the addition of CaSx causing complex changes to the geochemistry of the aquifer.

4.2 Recommendations

H&H recommends that a geochemistry evaluation be performed to develop a conceptual model of the aquifer geochemical system. The conceptual model would be used to identify the chemical interactions between ground water and solids that comprise the aquifer and influence dissolved cadmium and/or zinc concentrations. The model may be used to simulate the effects of CaSx on the geochemical system and may help to relate increases in dissolved cadmium and/or zinc concentrations to geochemical processes. The model may also be used in the design of potential supplemental remedial measures. The geochemistry evaluation will include a detailed review of site background information, collection of ground water and soil samples for analyses necessary for the geochemical evaluation (e.g., major cations/anions, trace metals, etc), and review of the newly acquired data for development of the conceptual geochemical system model.

In addition, we recommend that ground water monitoring be continued on a quarterly basis through 2013 to continue to monitor trends in zinc and cadmium concentrations.

5.0 References

H&H, 2010. *Removal Action Work Plan,* Former Clariant Corporation Facility, Kalama, Washington. Hart & Hickman, PC. August 6, 2010.

H&H, 2011a. *Remedial Action Report,* Former Clariant Corporation Facility, Kalama, Washington. Hart & Hickman, PC. January 19, 2011.

H&H, 2011b. *Post-Injection Monitoring Report & RAWP Addendum,* Former Clariant Corporation Facility, Kalama, Washington. Hart & Hickman, PC. July 5, 2011.

H&H, 2011c. *Pilot Test Plan,* Former Clariant Corporation Facility, Kalama, Washington. Hart & Hickman, PC. September 9, 2011.

H&H, 2011d. *Pilot Test Report,* Former Clariant Corporation Facility, Kalama, Washington. Hart & Hickman, PC. October 28, 2011.

H&H, 2011e. *RAWP Addendum Deviation Request,* Clariant Corporation Facility, Kalama, Washington. Hart & Hickman, PC. November 10, 2011.

Tables

Table 1
Summary of Injection & Extraction Well Construction Details
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Installation Date	Well Diameter (inches)	Total Depth (ft bgs)	Sceen Interval (ft bgs)
Injection Wells				
IW-1	09/22/10	2	30	20-30
IW-2	09/22/10	2	30	20-30
IW-3	09/24/10	2	30	20-30
IW-4	09/24/10	2	30	20-30
IW-5	09/21/10	2	35	25-35
IW-6	09/21/10	2	35	25-35
IW-7	09/22/10	2	35	23-35
IW-8	09/22/10	2	35	25-35
IW-9	09/24/10	2	35	25-35
IW-10	09/17/10	2	35	25-35
IW-11	09/21/10	2	35	25-35
IW-12	09/21/10	2	35	25-35
IW-13	09/15/10	2	30	20-30
IW-14	09/14/10	2	30	20-30
IW-15	09/13/10	2	30	20-30
IW-16	09/13/10	2	30	20-30
IW-17	09/14/10	2	30	20-30
IW-18	09/14/10	2	30	20-30
IW-19	09/14/10	2	30	20-30
IW-20	09/13/10	2	30	20-30
IW-21	09/15/10	2	35	25-35
IW-22	09/15/10	2	30	20-30
IW-23	09/17/10	2	35	25-35
Extraction Wells				
EW-1	09/26/11	8	35	10-35
EW-2	12/05/11	8	35	10-35
EW-3	12/06/11	8	35	10-35
EW-4	12/06/11	8	35	10-35
EW-5	12/07/11	8	35	10-35
EW-6	12/07/11	8	35	10-35
EW-7	12/05/11	8	35	10-35

Note:
ft bgs = feet below ground surface

Table 2
Summary of Site Monitoring Well Construction Details
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Installation Date	Well Diameter (inches)	Total Depth (ft bgs)	Sceen Interval (ft bgs)	TOC Elevation (ft CRD)
PZ1	04/15/03	1	32	17-32	28.99
PZ2	04/15/03	1	32	17-32	30.16
PZ3	04/15/03	1	32	17-32	28.47
PZ4	04/15/03	1	32	17-32	26.78
PZ5	04/16/03	1	32	17-32	26.86
PZ6	04/16/03	1	32	17-32	27.58
PZ7	04/16/03	1	31	16-31	28.06
PZ8	04/16/03	1	31	15.5-30.5	28.17
PZ9	05/06/03	1	32	17-32	27.54
PZ10	07/26/05	0.75	32	17-32	26.94
PZ11	07/27/05	0.75	32	17-32	30.39
PZ12	07/27/05	0.75	32	17-32	30.53
PZ13	07/27/05	0.75	30	15-30	30.40
PZ14	02/06/07	0.75	32	17-32	29.09
PZ15	02/06/07	0.75	32	17-32	27.79
AB1	07/01/03	2	28	14.1-28.2	27.53
AB2	07/01/03	2	30	14.4-30.0	28.41
OW1	09/20/10	2	35	20-35	26.51
OW2	09/20/10	2	35	20-35	25.99
OW3	09/20/10	2	35	20-35	26.13

Notes:
ft bgs = feet below ground surface
ft CRD = elevation in ft relative to Columbia River Datum
TOC = Top of Casing
Survey of well elevations based on NAVD88 and adjusted to CRD by subtracting 3.8 ft
OW1 through OW3 TOC elevations have not been surveyed
Depth and screen interval of AB1 and AB2 account for 45^{o} and 35^{o} angles of installation relative to vertical, respectively.

Table 3
Summary of Ground Water Elevation Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
PZ1	02/04/10	28.99	23.65	5.34	8:29 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ1	09/01/10		26.84	2.15	09:54 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ1	11/02/10		25.50	3.49	11:19 a.m.	1:15 p.m.	4.42	8:42 a.m.	0.75
PZ1	12/20/10		22.68	6.31	11:13 a.m.	--	--	10:09 a.m.	4.25
PZ1	12/20/10		21.74	7.25	2:25 p.m.	2:27 p.m.	7.11	--	--
PZ1	03/21/11		21.64	7.35	3:52 p.m.	--	--	2:15 p.m.	4.77
PZ1	03/23/11		21.34	7.65	8:32 a.m.	7:18 a.m.	7.27	--	--
PZ1	06/21/11		18.43	10.56	3:17 p.m	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ1	06/22/11		18.49	10.50	8:20 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ1	09/23/11		26.97	2.02	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ1	09/28/11		25.31	3.68	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ1	01/12/12		24.59	4.40	8:26 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ1	03/20/12		20.72	8.27	9:30 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ1	06/26/12		19.87	9.12	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ2	02/04/10	30.16	24.74	5.42	9:05 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ2	09/01/10		28.04	2.12	9:51 a.m	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ2	12/20/10		23.86	6.30	11:28 a.m	--	--	10:09 a.m.	4.25
PZ2	12/20/10		22.80	7.36	2:34 p.m	2:27 p.m.	7.11	--	--
PZ2	03/21/11		22.86	7.30	4:06 p.m.	--	--	2:15 p.m.	4.77
PZ2	03/23/11		22.44	7.72	8:41 a.m.	7:18 a.m.	7.27	--	--
PZ2	06/21/11		19.67	10.49	3:33 p.m	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ2	06/22/11		19.72	10.44	8:06 a.m	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ2	09/23/11		28.24	1.92	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ2	09/28/11		26.52	3.64	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ2	01/12/12		25.78	4.38	8:42 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ2	03/20/12		21.92	8.24	9:28 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ2	06/26/12		21.02	9.14	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ3	02/04/10	28.47	22.99	5.48	9:19 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ3	09/01/10		26.30	2.17	09:45 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ3	11/02/10		24.55	3.92	11:59 a.m.	1:15 p.m.	4.42	8:42 a.m.	0.75
PZ3	12/20/10		22.08	6.39	11:32 a.m.	--	--	10:09 a.m.	4.25
PZ3	12/20/10		20.96	7.51	2:38 p.m.	2:27 p.m.	7.11	--	--
PZ3	03/21/11		20.98	7.49	4:34 p.m	--	--	2:15 p.m.	4.77
PZ3	03/23/11		20.70	7.77	9:07 a.m.	7:18 a.m.	7.27	--	--
PZ3	06/21/11		17.96	10.51	3:38 p.m	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ3	06/22/11		18.01	10.46	7:45 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ3	09/23/11		26.66	1.81	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ3	09/28/11		24.66	3.81	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ3	01/12/12		24.07	4.40	8:45 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02

Table 3
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Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
PZ3	03/20/12		20.23	8.24	9:24 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ3	06/26/12		19.29	9.18	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ4	02/04/10	26.78	NM	NM	NM	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ4	09/01/10		24.61	2.17	10:18 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ4	11/02/10		23.16	3.62	11:52 a.m.	13:15 p.m.	4.42	8:42 a.m.	0.75
PZ4	12/20/10		20.41	6.37	10:30 a.m	--	--	10:09 a.m.	4.25
PZ4	12/20/10		19.60	7.18	2:44 p.m.	2:27 p.m.	7.11	--	--
PZ4	03/21/11		19.17	7.61	4:11 p.m	--	--	2:15 p.m.	4.77
PZ4	03/23/11		19.14	7.64	9:12 a.m	7:18 a.m.	7.27	--	--
PZ4	06/21/11		16.07	10.71	2:55 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ4	06/22/11		16.26	10.52	7:42 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ4	09/23/11		24.60	2.18	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ4	09/28/11		23.13	3.65	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ4	01/12/12		22.39	4.39	8:48 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ4	03/20/12		18.49	8.29	9:55 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ4	06/26/12		17.69	9.09	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ5	02/04/10	26.86	21.70	5.16	9:27 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ5	09/01/10		24.73	2.13	10:22 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ5	11/02/10		23.34	3.52	11:56 a.m.	1:15 p.m.	4.42	8:42 a.m.	0.75
PZ5	12/20/10		20.41	6.45	11:36 a.m.	--	--	10:09 a.m.	4.25
PZ5	12/20/10		19.83	7.03	2:42 p.m.	2:27 p.m.	7.11	--	--
PZ5	03/21/11		19.19	7.67	4:56 p.m	--	--	2:15 p.m.	4.77
PZ5	03/23/11		19.30	7.56	9:17 a.m.	7:18 a.m.	7.27	--	--
PZ5	06/21/11		16.06	10.80	2:53 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ5	06/22/11		16.29	10.57	7:39 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ5	09/23/11		24.47	2.39	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ5	09/28/11		23.22	3.64	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ5	01/12/12		22.51	4.35	8:50 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ5	03/20/12		18.51	8.35	10:00 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ5	06/26/12		17.85	9.01	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ6	02/04/10	27.58	22.54	5.04	9:23 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ6	09/01/10		24.80	2.78	10:15 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ6	11/02/10		24.10	3.48	11:48 a.m.	1:15 p.m.	4.42	8:42 a.m.	0.75
PZ6	12/20/10		21.15	6.43	10:21 a.m.	--	--	10:09 a.m.	4.25
PZ6	12/20/10		20.65	6.93	2:52 p.m.	2:27 p.m.	7.11	--	--
PZ6	03/21/11		19.92	7.66	4:47 p.m.	--	--	2:15 p.m.	4.77
PZ6	03/23/11		20.16	7.42	8:50 a.m.	7:18 a.m.	7.27	--	--
PZ6	06/21/11		16.70	10.88	2:30 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ6	06/22/11		16.99	10.59	7:50 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ6	09/23/11		25.11	2.47	8:45 a.m.	--	--	9:06 a.m.	-0.73

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H&H Project No. CLR-045

Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
PZ6	09/28/11		23.96	3.62	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ6	01/12/12		NM	NM	NM	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ6	03/20/12		19.33	8.25	10:10 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ6	06/26/12		18.61	8.97	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ7	02/04/10	28.06	24.80	3.26	10:40 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ7	12/20/10		20.89	7.17	10:55 a.m.	--	--	10:09 a.m.	4.25
PZ7	12/20/10		20.84	7.22	3:03 p.m.	2:27 p.m.	7.11	--	--
PZ7	03/21/11		19.52	8.54	4:25 p.m.	--	--	2:15 p.m.	4.77
PZ7	03/23/11		19.17	8.89	9:00 a.m.	7:18 a.m.	7.27	--	--
PZ7	06/21/11		16.61	11.45	2:42 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ7	06/22/11		16.91	11.15	7:55 p.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ7	09/23/11		24.61	3.45	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ7	09/28/11		23.77	4.29	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ7	01/12/12		NM	NM	NM	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ7	03/20/12		19.40	8.66	9:15 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ7	06/26/12		18.20	9.86	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ8	02/04/10	28.17	21.02	7.15	9:35 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ8	09/01/10		21.54	6.63	10:10 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ8	12/20/10		20.39	7.78	11:05 a.m.	--	--	10:09 a.m.	4.25
PZ8	12/20/10		20.35	7.82	2:55 p.m.	2:27 p.m.	7.11	--	--
PZ8	03/21/11		19.35	8.82	4:15 p.m.	--	--	2:15 p.m.	4.77
PZ8	03/23/11		19.84	8.33	8:54 a.m.	7:18 a.m.	7.27	--	--
PZ8	06/21/11		16.59	11.58	2:38 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ8	06/22/11		16.89	11.28	7:58 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ8	09/23/11		21.83	6.34	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ8	09/28/11		21.68	6.49	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ8	01/12/12		21.09	7.08	9:04 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ8	03/20/12		19.31	8.86	9:10 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ8	06/26/12		17.52	10.65	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ9	02/04/10	27.54	22.04	5.50	9:42 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ9	09/01/10		25.34	2.20	9:47 a.m	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ9	12/20/10		21.06	6.48	11:40 a.m.	--	--	10:09 a.m.	4.25
PZ9	12/20/10		19.97	7.57	2:40 p.m.	2:27 p.m.	7.11	--	--
PZ9	03/21/11		19.98	7.56	4:39 p.m.	--	--	2:15 p.m.	4.77
PZ9	03/23/11		19.73	7.81	9:23 a.m.	7:18 a.m.	7.27	--	--
PZ9	06/21/11		16.98	10.56	3:40 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ9	06/22/11		17.06	10.48	7:36 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ9	09/23/11		25.67	1.87	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ9	09/28/11		23.68	3.86	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ9	01/12/12		23.07	4.47	8:53 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ9	03/20/12		19.23	8.31	9:20 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92

Table 3
Summary of Ground Water Elevation Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
PZ9	06/26/12		18.32	9.22	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ10	02/04/10	26.94	NM	NM	NM	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ10	09/01/10		24.62	2.32	10:05 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ10	12/20/10		20.26	6.68	11:51 p.m.	2:27 p.m.	7.11	10:09 a.m.	4.25
PZ10	12/20/10		19.73	7.21	3:10 p.m.	2:27 p.m.	7.11	10:09 a.m.	4.25
PZ10	03/21/11		19.02	7.92	4:57 p.m.	--	--	2:15 p.m.	4.77
PZ10	03/23/11		19.26	7.68	9:27 a.m.	7:18 a.m.	7.27	--	--
PZ10	06/21/11		15.79	11.15	3:04 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ10	06/22/11		16.06	10.88	7:33 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ10	09/23/11		24.00	2.94	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ10	09/28/11		23.08	3.86	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ10	01/12/12		22.45	4.49	8:59 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ10	03/20/12		18.26	8.68	9:05 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ10	06/26/12		17.82	9.12	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ11	02/04/10	30.39	25.26	5.13	9:10 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ11	09/01/10		28.39	2.00	10:02 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ11	12/20/10		24.11	6.28	11:26 a.m	--	--	10:09 a.m.	4.25
PZ11	12/20/10		23.50	6.89	2:31 p.m.	2:27 p.m.	7.11	--	--
PZ11	03/21/11		22.92	7.47	4:03 p.m	--	--	2:15 p.m.	4.77
PZ11	03/23/11		22.98	7.41	8:38 a.m.	7:18 a.m.	7.27	--	--
PZ11	06/21/11		19.73	10.66	3:10 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ11	06/22/11		19.92	10.47	8:08 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ11	09/23/11		28.17	2.22	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ11	09/28/11		26.86	3.53	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ11	01/12/12		26.17	4.22	8:40 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ11	03/20/12		22.14	8.25	9:50 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ11	06/26/12		21.42	8.97	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ12	02/04/10	30.53	25.42	5.11	8:34 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ12	09/01/10		NM	NM	NM	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ12	11/02/10		27.18	3.35	11:37 a.m.	1:15 p.m.	4.42	8:42 a.m.	0.75
PZ12	12/20/10		24.25	6.28	11:20 a.m.	--	--	10:09 a.m.	4.25
PZ12	12/20/10		23.50	7.03	3:12 p.m.	2:27 p.m.	7.11	--	--
PZ12	03/21/11		23.06	7.47	3:33 p.m.	--	--	2:15 p.m.	4.77
PZ12	03/23/11		23.21	7.32	8:08 a.m	7:18 a.m.	7.27	--	--
PZ12	06/21/11		19.91	10.62	3:12 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ12	06/22/11		20.11	10.42	8:11 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ12	09/23/11		28.27	2.26	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ12	09/28/11		NM	NM	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ12	01/12/12		26.32	4.21	8:38 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ12	03/20/12		22.27	8.26	9:45 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ12	06/26/12		21.60	8.93	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35

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H&H Project No. CLR-045

Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
PZ13	02/04/10	30.40	25.50	4.90	8:32 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ13	09/01/10		28.21	2.19	9:59 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ13	11/02/10		26.93	3.47	11:30 a.m.	1:15 p.m.	4.42	8:42 a.m.	0.75
PZ13	12/20/10		23.89	6.51	11:18 a.m.	--	--	10:09 a.m.	4.25
PZ13	12/20/10		23.56	6.84	2:22 p.m.	2:27 p.m.	7.11	--	--
PZ13	03/21/11		23.57	6.83	3:36 p.m.	--	--	2:15 p.m.	4.77
PZ13	03/23/11		23.11	7.29	8:05 a.m.	7:18 a.m.	7.27	--	--
PZ13	06/21/11		19.50	10.90	3:14 p.m	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ13	06/22/11		19.75	10.65	8:14 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ13	09/23/11		27.82	2.58	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ13	09/28/11		26.63	3.77	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ13	01/12/12		26.12	4.28	8:30 a.m	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ13	03/20/12		21.81	8.59	9:40 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ13	06/26/12		21.36	9.04	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ14	02/04/10	29.09	23.74	5.35	8:20 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ14	09/01/10		26.94	2.15	9:57 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ14	06/21/11		18.55	10.54	3:17 p.m	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ14	06/22/11		18.62	10.47	8:16 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ14	09/23/11		27.15	1.94	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ14	09/28/11		25.44	3.65	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ14	01/12/12		24.72	4.37	8:35 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ14	03/20/12		21.02	8.07	9:35 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ14	06/26/12		19.57	9.52	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
PZ15	02/04/10	27.79	22.22	5.57	9:45 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
PZ15	09/01/10		25.58	2.21	9:50 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
PZ15	06/21/11		NM	NM	NM	8:48 a.m.	9.36	5:06 p.m.	8.39
PZ15	06/22/11		NM	NM	NM	9:48 a.m.	9.13	6:54 a.m.	8.71
PZ15	09/23/11		26.04	1.75	8:45 a.m.	--	--	9:06 a.m.	-0.73
PZ15	09/28/11		23.91	3.88	3.25 p.m.	5:27 p.m.	4.72	--	--
PZ15	01/12/12		23.31	4.48	8:56 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
PZ15	03/20/12		19.51	8.28	9:18 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
PZ15	06/26/12		18.30	9.49	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
AB1[3]	02/04/10	27.53	30.08	6.26	9:17 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
AB1[3]	09/01/10		34.71	2.99	10:27 a.m.	9:42 p.m.	2.62	5.33 a.m.	-0.93
AB1[3]	11/02/10		32.19	4.77	12:03 p.m.	13:15 p.m.	4.42	8:42 a.m.	0.75
AB1[3]	12/20/10		29.08	6.97	11:30 a.m.	--	--	10:09 a.m.	4.25
AB1[3]	12/20/10		28.32	7.50	2:36 p.m.	2:27 p.m.	7.11	--	--
AB1[3]	03/21/11		27.65	7.98	4:32 p.m.	--	--	2:15 p.m.	4.77
AB1[3]	03/23/11		27.07	8.39	8:30 a.m.	7:18 a.m.	7.27	--	--
AB1[3]	06/21/11		23.48	10.93	3:36 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39

Table 3
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Kalama, WA
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Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
AB1[3]	06/22/11		23.49	10.92	7:46 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
AB1[3]	09/23/11		35.19	2.65	8:45 a.m.	--	--	9:06 a.m.	-0.73
AB1[3]	09/28/11		32.64	4.45	3.25 p.m.	5:27 p.m.	4.72	--	--
AB1[3]	01/12/12		31.76	5.07	8:46 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
AB1[3]	03/20/12		26.52	8.78	9:23 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
AB1[3]	06/26/12		25.13	9.76	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
AB2[3]	02/04/10	28.41	27.23	6.10	8:27 a.m.	7:39 a.m.	5.47	2.45 p.m.	1.34
AB2[3]	09/01/10		31.21	2.84	10:30 a.m	9:42 p.m.	2.62	5.33 a.m.	-0.93
AB2[3]	11/02/10		29.56	4.19	11:21 a.m.	13:15 p.m.	4.42	8:42 a.m.	0.75
AB2[3]	12/20/10		26.36	6.82	11:16 a.m.	--	--	10:09 a.m.	4.25
AB2[3]	12/20/10		24.97	7.95	2:26 p.m.	2:27 p.m.	7.11	--	--
AB2[3]	03/21/11		25.20	7.77	3:54 p.m.	--	--	2:15 p.m.	4.77
AB2[3]	03/23/11		24.63	8.23	8:30 a.m.	7:18 a.m.	7.27	--	--
AB2[3]	06/21/11		21.36	10.91	3:21 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
AB2[3]	06/22/11		21.35	10.92	8:19 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
AB2[3]	09/23/11		31.66	2.47	8:45 a.m.	--	--	9:06 a.m.	-0.73
AB2[3]	09/28/11		29.45	4.28	3.25 p.m.	5:27 p.m.	4.72	--	--
AB2[3]	01/12/12		28.60	4.98	8:25 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
AB2[3]	03/20/12		24.03	8.72	9:32 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
AB2[3]	06/26/12		22.93	9.63	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
OW1	11/02/10	26.51	23.00	3.51	11:26 a.m.	13:15 p.m.	4.42	8:42 a.m.	0.75
OW1	12/20/10		20.22	6.29	11:10 a.m.	--	--	10:09 a.m.	4.25
OW1	12/20/10		19.38	7.13	2:20 p.m.	2:27 p.m.	7.11	--	--
OW1	03/21/11		19.15	7.36	3:40 p.m.	--	--	2:15 p.m.	4.77
OW1	03/23/11		18.97	7.54	8:20 a.m.	7:18 a.m.	7.27	--	--
OW1	06/21/11		15.93	10.58	3:26 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
OW1	06/22/11		16.05	10.46	8:21 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
OW1	09/23/11		24.43	2.08	8:45 a.m.	--	--	9:06 a.m.	-0.73
OW1	09/28/11		22.79	3.72	3.25 p.m.	5:27 p.m.	4.72	--	--
OW1	01/12/12		22.16	4.35	8:26 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
OW1	03/20/12		18.25	8.26	10:20 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
OW1	06/26/12		17.41	9.10	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
OW2	11/02/10	25.99	22.45	3.54	11:24 p.m.	13:15 p.m.	4.42	8:42 a.m.	0.75
OW2	12/20/10		19.71	6.28	11:08 a.m.	--	--	10:09 a.m.	4.25
OW2	12/20/10		18.56	7.43	3:14 p.m.	2:27 p.m.	7.11	--	--
OW2	03/21/11		18.64	7.35	3:58 p.m.	--	--	2:15 p.m.	4.77
OW2	03/23/11		18.37	7.62	8:27 a.m.	7:18 a.m.	7.27	--	--
OW2	06/21/11		15.48	10.51	3:24 a.m.	8:48 a.m.	9.36	5:06 p.m.	8.39

Table 3
Summary of Ground Water Elevation Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Measured	TOC Elevation[1] (ft CRD)	Depth to Water (ft below TOC)	Water Elevation[1] (ft CRD)	Time Measured	High (CRD)[2]		Low (CRD)[2]	
						Time	Elevation (ft)	Time	Elevation (ft)
OW2	06/22/11		15.51	10.48	8:23 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
OW2	09/23/11		23.99	2.00	8:45 a.m.	--	--	9:06 a.m.	-0.73
OW2	09/28/11		22.85	3.14	3.25 p.m.	5:27 p.m.	4.72	--	--
OW2	01/12/12		21.62	4.37	8:28 a.m	5:57 a.m.	4.01	1:48 p.m.	1.02
OW2	03/20/12		17.81	8.18	10:25 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
OW2	06/26/12		16.87	9.12	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35
OW3	11/02/10	26.13	22.62	3.51	11:28 a.m.	13:15 p.m.	4.42	8:42 a.m.	0.75
OW3	12/20/10		19.83	6.30	11:13 a.m.	--	--	10:09 a.m.	4.25
OW3	12/20/10		19.98	6.15	2:28 p.m.	2:27 p.m.	7.11	--	--
OW3	03/21/11		18.76	7.37	3:42 p.m.	--	--	2:15 p.m.	4.77
OW3	03/23/11		18.60	7.53	8:14 a.m.	7:18 a.m.	7.27	--	--
OW3	06/21/11		15.55	10.58	3:30 p.m.	8:48 a.m.	9.36	5:06 p.m.	8.39
OW3	06/22/11		15.65	10.48	8:24 a.m.	9:48 a.m.	9.13	6:54 a.m.	8.71
OW3	09/23/11		24.05	2.08	8:45 a.m.	--	--	9:06 a.m.	-0.73
OW3	09/28/11		22.52	3.61	3.25 p.m.	5:27 p.m.	4.72	--	--
OW3	01/12/12		21.76	4.37	8:07 a.m.	5:57 a.m.	4.01	1:48 p.m.	1.02
OW3	03/20/12		17.90	8.23	10:30 a.m.	4:09 a.m.	7.83	11:24 a.m.	5.92
OW3	06/26/12		17.03	9.10	10:30 a.m.	10:27 p.m.	6.27	5:20 p.m.	3.35

Notes:

1) Survey based on NAVD88 and adjusted to CRD by subtracting 3.8 feet. Control point was taken from the I-5 intersection at the Todd Road overpass located at the northeast corner of the interchange.
2) Tidal data are from NOAA Co-ops web site http://co-ops.nos.noaa.gov. Verified times and high/low water level data from the Longview and St. Helens stations were used. Tides for Kalama were estimated by using the difference between the times and water level data at these two stations (assuming Kalama is located approximately at the midpoint). These elevations are based on MLLW.
3) Water elevations in the angle monitoring wells are approximated by the following calculations (where WL = depth to water):
   AB1 (27.53 - WL COS 45^{o})
   AB2 (28.41 - WL COS 35^{o})

ft TOC = feet below top of casing.
CRD = Columbia River Datum.
NM = not measured.
TOC survey data and were obtained from CDM reports or electronic files provided to H&H by Clariant.

Table 4
Summary of Ground Water Field Parameters and Sulfide Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Sampled	Time Sampled	Temp (^{o}C)	Conductivity (μs/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity* (NTU)	Sulfides (mg/L)
PZ1	04/15/03	1255	14.6	155	5.23	6.27	64	70	--
PZ1	07/18/03	1430	15.2	--	--	6.84	--	Clear	--
PZ1	08/13/03	1035	15.9	600	--	7.79	--	4.3	--
PZ1	01/28/04	1530	13.5	190	--	6.49	--	5.4	--
PZ1	04/28/04	0942	13.3	192	--	6.37	--	1.1	--
PZ1	07/29/04	1532	18.0	202	--	6.20	--	5.4	--
PZ1	10/27/04	0915	11.5	189	--	5.44	--	0.4	--
PZ1	01/27/05	1015	12.9	198	4.05	6.38	-43	0	--
PZ1	05/03/05	1532	15.6	208	--	6.02	--	0.6	--
PZ1	07/26/05	0900	15.0	167	3.38	7.25	213	1.2	--
PZ1	10/26/05	1535	13.9	142	--	5.67	--	--	--
PZ1	07/12/06	1836	14.9	159	--	5.90	--	2.8	--
PZ1	02/04/10	1415	13.2	160	2.04	5.29	24	Clear	--
PZ1	09/02/10	1400	15.8	69	8.44	5.66	-64	3.2	<0.200
PZ1	11/02/10	1650	14.8	84	7.62	6.57	-28	4.1	<0.200
PZ1	12/20/10	1634	11.2	69	6.45	6.77	43	3.2	<0.200
PZ1	03/22/11	1030	12.4	121	6.29	6.52	-59	1.3	<0.200
PZ1	06/21/11	1140	15.4	124	4.77	6.51	5.7	2.0	<0.200
PZ1	09/22/11	1125	16.8	170	8.99	5.74	261	<1.0	<0.200
PZ1	01/12/12	1010	11.0	238	--	6.13	203	0.0	<0.200
PZ1	03/21/12	1235	11.6	318	1.16	5.88	196	0.0	<0.200
PZ1	06/26/12	1255	15.6	446	0.16	6.14	186	4.2	<5.0
PZ3	04/15/03	1645	14.6	689	0.25	5.85	43	40	--
PZ3	05/06/03	1550	15.4	695	1.62	6.80	24	4	--
PZ3	05/21/03	1215	15.7	710	--	7.15	--	Clear	--
PZ3	07/18/03	1615	15.3	--	--	7.10	--	Clear	--
PZ3	08/13/03	1202	15.5	740	--	6.72	--	1.8	--
PZ3	01/28/04	1330	13.9	517	--	6.27	--	1.1	--
PZ3	04/28/04	1747	21.6	551	--	6.27	--	1.5	--
PZ3	07/29/04	1239	18.9	421	--	6.15	--	5.3	--
PZ3	10/27/04	1100	12.9	340	--	5.95	--	1.6	--
PZ3	01/27/05	1440	14.7	459	3.39	6.68	-48	0.6	--
PZ3	05/03/05	1335	16.0	436	--	6.10	--	0.7	--
PZ3	07/25/05	1256	17.7	306	2.15	6.19	80	4.0	--
PZ3	10/27/05	0915	12.8	257	--	5.64	--	--	--
PZ3	07/13/06	0718	14.2	471	--	5.84	--	2.0	--
PZ3	07/13/06	1600	14.7	198	--	6.35	--	0.3	--
PZ3	02/05/10	1120	14.0	603	1.55	6.02	23	Clear	--
PZ3	09/01/10	1436	14.0	311	3.54	6.11	67	3.4	<0.200
PZ3	11/03/10	1310	19.0	254	5.19	6.30	77	2.0	<0.200
PZ3	12/21/10	1445	12.5	200	2.79	6.69	-10	3.1	<0.200
PZ3	03/22/11	1620	12.6	342	2.64	5.96	-110	0.7	<0.200
PZ3	06/21/11	1625	18.6	341	1.16	6.20	4.4	1.1	<0.200
PZ3	09/22/11	945	17.3	404	7.46	5.86	231	<1.0	<0.200

Table 4
Summary of Ground Water Field Parameters and Sulfide Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Sampled	Time Sampled	Temp (^{o}C)	Conductivity (μs/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity* (NTU)	Sulfides (mg/L)
PZ3	01/12/12	1355	12.7	396	4.63	5.74	17	0.0	<0.200
PZ3	03/21/12	1020	11.9	607	2.66	5.70	186	0.0	<0.200
PZ3	06/27/12	835	14.6	415	0.87	6.17	149	6.2	<5.0
PZ4	04/15/03	1845	14.2	1,050	4.49	5.35	91	67	--
PZ4	05/21/03	1246	14.8	380	--	7.16	--	Clear	--
PZ4	08/13/03	1346	15.9	510	--	6.62	--	5.2	--
PZ4	01/28/04	1110	14.1	767	--	5.53	--	0.2	--
PZ4	04/28/04	2122	14.0	811	--	5.76	--	5.0	--
PZ4	07/29/04	1825	17.2	884	--	5.46	--	4.4	--
PZ4	10/27/04	1335	12.5	614	--	5.53	--	0.3	--
PZ4	01/27/05	1645	13.6	1,770	1.99	5.58	-49	0	--
PZ4	05/03/05	1152	14.6	957	--	5.58	--	0.9	--
PZ4	07/25/05	1530	15.2	454	0.86	5.82	236	2.8	--
PZ4	10/26/05	1310	13.3	692	--	5.35	--	--	--
PZ4	07/13/06	0746	14.0	465	--	5.73	--	3.1	--
PZ4	07/13/06	1640	16.5	405	--	6.18	--	8.4	--
PZ4	09/01/10	1244	13.7	636	2.91	5.50	85	3.7	<0.200
PZ4	11/03/10	1120	16.7	587	5.11	5.71	125	4.8	<0.200
PZ4	12/21/10	1515	11.8	275	2.36	6.34	-31	4.9	<0.200
PZ4	03/22/11	1445	12.7	668	5.72	5.94	-67	1.6	<0.200
PZ4	06/21/11	1515	17.0	888	6.15	5.65	36	2.3	<0.200
PZ4	09/22/11	1620	21.4	839	3.90	5.41	165	2.5	<0.200
PZ4	01/12/12	1520	11.8	220	2.18	5.77	1.0	0.0	<0.200
PZ4	03/21/12	1135	11.9	341	3.90	5.96	157	3.2	<0.200
PZ4	06/26/12	1520	14.7	400	1.23	5.93	228	5.2	<5.0
PZ5	04/16/03	1115	13.6	530	4.78	5.86	100	57	--
PZ5	05/21/03	1320	14.2	170	--	7.10	--	Clear	--
PZ5	08/13/03	1729	15.9	860	--	6.69	--	9.7	--
PZ5	01/28/04	1150	13.6	210	--	6.19	--	1.6	--
PZ5	04/28/04	1958	14.2	293	--	6.03	--	1.5	--
PZ5	07/29/04	1902	16.6	479	--	5.92	--	2.6	--
PZ5	10/27/04	1415	12.4	1,300	--	5.32	--	0.6	--
PZ5	01/27/05	1605	13.3	460	3.8	6.34	-27	7.9	--
PZ5	05/03/05	1100	14.1	281	--	5.77	--	1.1	--
PZ5	07/25/05	1737	15.8	478	3.05	5.94	199	5.2	--
PZ5	10/26/05	1150	14.0	770	--	5.45	--	--	--
PZ5	07/13/06	0800	13.9	190	--	5.00	--	4.7	--
PZ5	07/13/06	1658	12.0	186	--	5.80	--	4.5	--
PZ5	02/05/10	1455	13.6	433	1.90	5.76	22	Clear	--
PZ5	09/01/10	1521	15.8	212	4.13	5.50	87	5.4	<0.200
PZ5	11/03/10	1035	14.2	142	5.43	6.20	79	1.9	<0.200
PZ5	12/21/10	1600	10.4	142	7.21	6.22	35	2.3	<0.200
PZ5	03/22/11	1520	12.0	425	6.81	6.28	-85	1.3	<0.200
PZ5	06/21/11	1555	15.3	2,178	4.22	5.43	65	1.0	<0.200

Table 4
Summary of Ground Water Field Parameters and Sulfide Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Sampled	Time Sampled	Temp (^{o}C)	Conductivity (μs/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity* (NTU)	Sulfides (mg/L)
PZ5	09/22/11	1650	20.7	162	2.98	5.77	148	2.7	<0.200
PZ5	01/12/12	1550	11.3	234	3.22	5.60	-25	0.0	<0.200
PZ5	03/21/12	1200	10.8	322	4.88	5.78	105	27	<0.200
PZ5	06/26/12	1600	14.0	190	2.30	6.09	6	8.2	<5.0
PZ6	04/16/03	1310	13.8	345	7.07	4.74	162	17	--
PZ6	05/21/03	1415	14.4	250	--	6.85	--	Clear	--
PZ6	08/13/03	1642	16.1	880	--	6.76	--	6.9	--
PZ6	01/28/04	1020	12.1	447	--	5.96	--	0.1	--
PZ6	04/28/04	1412	19.1	293	--	5.90	--	24	--
PZ6	07/29/04	1738	18.2	725	--	5.80	--	6.3	--
PZ6	10/27/04	1500	12.2	747	--	5.63	--	0.4	--
PZ6	01/27/05	1730	13.0	991	3.72	5.59	12	3.2	--
PZ6	05/03/05	1233	14.9	1,370	--	5.28	--	0.9	--
PZ6	07/25/05	1549	16.0	1,275	4.85	4.48	290	0.9	--
PZ6	10/26/05	820	11.5	916	--	4.15	--	--	--
PZ6	07/13/06	0906	14.0	802	--	5.08	--	1.9	--
PZ6	09/01/10	1133	12.9	728	7.60	5.68	118	4.4	<0.200
PZ6	11/03/10	1155	15.4	671	6.38	5.69	133	1.5	<0.200
PZ6	12/20/10	1715	11.8	217	6.80	6.32	56	3.3	<0.200
PZ6	03/22/11	1415	11.8	357	7.19	5.76	-40	2.0	<0.200
PZ6	06/21/11	1445	16.4	420	6.93	5.94	22	4.9	<0.200
PZ6	09/22/11	1555	19.7	220	3.93	5.73	135	<1.0	<0.200
PZ6	01/12/12	1450	12.1	119	1.03	7.38	-161	0.0	<0.200
PZ6	03/21/12	1105	11.3	1140	1.73	5.6	-79	3.0	0.37
PZ6	06/27/12	805	13.1	701	0.98	5.58	28	9.4	<5.0
PZ12	07/27/05	1452	17.6	198	2.54	9.65	15	3.8	--
PZ12	10/26/05	1430	13.7	164	--	5.66	--	--	--
PZ12	07/13/06	1802	14.7	193	--	5.45	--	3.1	--
PZ12	02/04/10	1230	13.2	290	2.86	5.71	25	Clear	--
PZ12	09/02/10	1124	12.3	185	1.54	5.61	-2.2	3.5	<0.200
PZ12	11/03/10	945	11.9	269	1.93	6.70	-66	3.6	<0.200
PZ12	12/21/10	1230	12.8	372	0.61	6.54	-33	1.8	<0.200
PZ12	03/22/11	945	12.1	641	0.22	6.03	-192	1.0	<0.200
PZ12	06/21/11	1405	16.2	531	2.43	5.46	-7.1	2.6	<0.200
PZ12	09/22/11	1520	19.7	1,000	2.22	4.02	182	2.1	3.55
PZ12	01/12/12	1255	12.0	1,510	1.85	5.50	-141	525	1.01
PZ12	03/21/12	1505	11.4	2,460	1.10	4.58	-28	21	0.37
PZ12	06/27/12	1025	16.6	2,050	4.70	4.25	196	6.7	<5.0
PZ13	07/27/05	1032	15.9	168	1.52	8.61	-122	2.3	--
PZ13	09/02/10	1029	14.3	225	2.97	6.14	15	4.9	<0.200
PZ13	11/02/10	1420	16.1	1,941	0.14	9.80	-450	776	36
PZ13	12/21/10	1020	11.0	539	0.94	6.71	-101	444	<0.200
PZ13	03/22/11	900	10.5	349	4.48	6.61	-152	267	10.4
PZ13	06/21/11	1340	15.0	366	5.22	6.31	-60	22	1.22

Table 4
Summary of Ground Water Field Parameters and Sulfide Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Sampled	Time Sampled	Temp (^{o}C)	Conductivity (μs/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity* (NTU)	Sulfides (mg/L)
PZ13	09/22/11	1430	20.8	651	3.85	6.59	-233	200	2.98
PZ13	01/12/12	1325	NM	NM	NM	NM	NM	NM	61.0
PZ13	03/21/12	1555	10.2	1,190	4.69	5.75	213	82	<0.200
PZ13	06/27/12	940	13.2	368	0.12	6.20	-100	272	11.7
AB1	07/07/03	1531	17.3	397	--	6.73	--	9	--
AB1	07/18/03	1525	15.2	--	--	6.94	--	Clear	--
AB1	08/13/03	1218	15.8	720	--	6.80	--	1.1	--
AB1	01/28/04	1410	13.6	253	--	6.82	--	3.2	--
AB1	04/28/04	1843	19.0	373	--	7.04	--	25	--
AB1	07/29/04	1356	20.6	334	--	6.54	--	12	--
AB1	10/27/04	1210	14.7	195	--	6.25	--	1.0	--
AB1	01/27/05	1355	14.2	209	2.38	7.12	-58	2.6	--
AB1	05/03/05	1408	15.0	310	--	6.52	--	0.7	--
AB1	07/25/05	1425	15.4	226	3.46	6.65	189	10	--
AB1	10/27/05	1030	12.3	177	--	6.08	--	--	--
AB1	07/13/06	0730	13.7	255	--	6.08	--	0.9	--
AB1	07/13/06	1612	16.1	505	--	5.95	--	0.9	--
AB1	02/05/10	1045	12.7	391	1.65	6.29	31	Clear	--
AB1	09/01/10	1339	14.6	314	5.47	6.39	67	6.1	<0.200
AB1	11/03/10	1245	19.3	186	6.34	6.67	63	1.1	<0.200
AB1	12/21/10	1410	10.8	112	9.01	7.36	23	4.3	<0.200
AB1	03/22/11	1600	11.5	158	8.95	6.54	-50	0.5	<0.200
AB1	06/21/11	1640	16.2	212	8.63	7.17	-7.3	2.4	<0.200
AB1	09/22/11	1020	16.9	310	4.20	6.14	233	<1.0	<0.200
AB1	01/12/12	1350	11.8	271	3.02	6.22	-32	0.0	<0.200
AB1	03/21/12	1035	10.3	291	6.04	6.32	207	0.0	<0.200
AB1	06/27/12	830	13.2	294	6.71	6.63	68	2.6	<5.0
AB2	07/07/03	1247	15.8	174	--	6.29	--	2.7	--
AB2	07/18/03	1325	15.1	--	--	7.03	--	9	--
AB2	08/12/03	1700	14.7	710	--	7.11	--	5.7	--
AB2	01/28/04	1860	14.0	165	--	6.51	--	20	--
AB2	04/28/04	1030	16.6	192	--	6.67	--	219	--
AB2	07/29/04	1628	18.5	180	--	6.35	--	68	--
AB2	10/27/04	0955	12.0	162	--	5.61	--	9.1	--
AB2	01/27/05	1135	13.5	174	1.66	6.52	-68	37	--
AB2	05/03/05	1732	14.5	213	--	6.18	--	95	--
AB2	07/26/05	0811	14.5	140	1.89	7.14	190	1.2	--
AB2	01/26/05	1510	14.4	137	--	5.88	--	--	--
AB2	07/13/06	0702	14.0	190	--	5.63	--	0.3	--
AB2	07/13/06	1542	14.4	136	--	5.94	--	0.3	--
AB2	02/04/10	1330	13.1	135	6.62	5.34	28	Clear	--
AB2	09/02/10	1319	15.5	79	2.42	5.42	-15	5.4	<0.200
AB2	11/02/10	1545	16.5	111	4.18	6.99	-62	1.8	<0.200
AB2	12/20/10	1610	11.2	80	2.39	6.70	22	0.9	<0.200

Table 4
Summary of Ground Water Field Parameters and Sulfide Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Well ID	Date Sampled	Time Sampled	Temp (^{o}C)	Conductivity (µs/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mV)	Turbidity* (NTU)	Sulfides (mg/L)
AB2	03/22/11	1125	11.6	99	7.35	6.67	-66	0.5	<0.200
AB2	06/21/11	935	13.7	109	7.48	6.50	340	1.6	<0.200
AB2	09/22/11	1155	17.0	168	2.61	5.61	261	<1.0	<0.200
AB2	01/12/12	940	9.5	204	2.81	6.13	199	0.0	<0.200
AB2	03/21/12	1255	10.6	255	3.74	6.25	194	0.0	<0.200
AB2	06/26/12	1230	15.7	316	2.52	6.33	202	0.0	<5.0
OW1	09/23/10	1000	12.7	162	10.6	6.47	-51	0.2	<0.200
OW1	11/02/10	1845	14.2	104	7.28	6.63	-19	3.9	<0.200
OW1	12/20/10	1545	11.2	91	6.02	6.84	39	1.1	<0.200
OW1	03/22/11	1340	12.7	192	6.40	6.62	-59	0.5	<0.200
OW1	06/21/11	1040	15.6	227	2.84	6.39	60	3.1	<0.200
OW1	09/22/11	1305	17.0	270	4.66	5.99	229	0.3	<0.200
OW1	01/12/12	1100	10.3	347	4.41	6.19	212	0.0	<0.200
OW1	03/21/12	1420	11.1	557	0.48	6.05	28	0.0	<0.200
OW1	06/26/12	1435	15.0	776	1.22	6.11	91	11	<5.0
OW2	09/23/10	0920	13.4	123	8.87	6.34	-43	1.6	<0.200
OW2	11/02/10	1645	15.3	99	7.91	6.73	-41	4.5	<0.200
OW2	12/20/10	1355	12.2	123	6.22	5.90	89	3.2	<0.200
OW2	03/22/11	1055	11.2	172	5.70	6.60	-68	0.6	<0.200
OW2	06/21/11	1015	14.3	224	3.58	6.25	171	4.6	<0.200
OW2	09/22/11	1235	17.5	256	4.65	5.81	256	<1.0	<0.200
OW2	01/12/12	1035	11.33	298	5.10	6.10	201	0.0	<0.200
OW2	03/21/12	1320	11.25	417	1.65	5.99	173	0.0	<0.200
OW2	06/26/12	1320	14.75	628	0.05	6.08	149	5.8	5.2
OW3	09/23/10	0830	13.3	104	10.46	6.43	-50	0.2	<0.200
OW3	11/02/10	1845	13.9	104	5.85	6.46	-4.9	4.5	<0.200
OW3	12/21/10	1110	12.9	153	2.92	6.67	13.5	2.2	<0.200
OW3	03/22/11	1150	10.9	270	5.55	6.48	-74	0.6	<0.200
OW3	06/21/11	1120	15.3	186	4.41	6.45	13.4	3.3	<0.200
OW3	09/22/11	1330	17.0	355	5.60	5.82	242	0.3	<0.200
OW3	01/12/12	1140	11.7	636	1.44	5.22	-52	0.0	0.597
OW3	03/21/12	1355	14.2	1,004	1.49	5.74	-97	27	<0.200
OW3	06/26/12	1335	15.7	967	0.05	4.70	209	10	<5.0

Notes:

Only data for wells used for injection performance monitoring are shown

* turbidity values were collected prior to field filtering

^{o}C - degrees Celsius, µs/cm - microsiemens per centimeter, mg/L - milligrams per liter, mV - millivolts

ORP - oxidation reduction potential, NTU - Nephelometric turbidity units

sulfides analysis performed by laboratory using SM 4500-S-2 D

-- indicates parameter not measured/analyzed or was not available from previous report

Table 5
Summary of Ground Water Analytical Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

			Zinc		Cadmium	
			Total	Dissolved	Total	Dissolved
Sample ID	Sample Date	Sample Time	µg/L			
PZ1	04/15/03	1255	--	2,100	--	<4.4
PZ1	07/18/03	1430	--	3,500	--	--
PZ1	08/13/03	1035	7,300	--	<4.4	--
PZ1	01/28/04	1530	10,000	--	--	--
PZ1	04/29/04	1214	--	13,000	--	--
PZ1	07/29/04	1532	--	16,000	--	--
PZ1	10/27/04	0915	--	13,000	--	--
PZ1	01/27/05	1015	--	16,100	--	--
PZ1	05/03/05	1532	--	16,800	--	--
PZ1	07/26/05	0900	--	20,500	--	<2.0
PZ1	10/26/05	1535	--	12,600	--	--
PZ1	07/12/06	1836	--	11,500	--	0.7
PZ1	02/04/10	1415	--	8,440	--	0.5
PZ1	09/02/10	1400	5,630	--	<1.0	--
PZ1	11/02/10	1650	--	7,290	--	<1.0
PZ1	12/20/10	1640	--	6,720	--	<1.0
PZ1	03/22/11	1030	--	12,300	--	<10.0
PZ1	06/21/11	1140	--	14,700	--	<10.0
PZ1	09/22/11	1125	--	17,800	--	<1.0
PZ1	01/12/11	1010	--	40,000	--	<10.0
PZ1	03/21/12	1235	--	70,000	--	5.1 J
PZ1	06/26/12	1255	--	84,500	--	<100
PZ3	04/15/03	1645	--	7,200	--	<4.4
PZ3	05/06/03	1550	--	11,000	--	<4.4
PZ3	05/21/03	1215	--	12,000	--	<4.0
PZ3	07/18/03	1615	--	12,000	--	--
PZ3	08/13/03	1202	7,400	--	<4.4	--
PZ3	01/28/04	1330	8,300	--	<4.4	--
PZ3	04/28/04	1747	--	11,000	--	<4.0
PZ3	07/29/04	1239	--	6,600	--	<4.0
PZ3	10/27/04	1100	--	4,300	--	<4.0
PZ3	01/27/05	1440	--	8,920	--	<2
PZ3	05/03/05	1335	--	7,160	--	<2
PZ3	07/25/05	1256	--	6,850	--	<2.0
PZ3	10/27/05	0915	--	4,140	--	<2.0
PZ3	07/13/06	0718	--	7,510	--	1.0
PZ3	07/13/06	1600	--	850	--	0.3
PZ3	02/05/10	1170	--	3,690	--	0.5
PZ3	09/01/10	1436	2,670	--	<1.0	--
PZ3	11/03/10	1310	--	1,940	--	<1.0
PZ3	12/21/10	1445	--	2,280	--	<1.0
PZ3	03/22/11	1620	--	4,370	--	<10.0
PZ3	06/21/11	1625	--	2,930		<10.0
PZ3	09/22/11	0945	--	4,420	--	<1.0
PZ3	01/12/12	1420	--	4,530	--	<10.0

Table 5
Summary of Ground Water Analytical Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

			Zinc		Cadmium	
			Total	Dissolved	Total	Dissolved
Sample ID	Sample Date	Sample Time	µg/L			
PZ3	03/21/12	1020	--	11,000	--	1.7 J
PZ3	06/27/12	900	--	6,480	--	1.0
PZ4	04/15/03	1845	--	3,300	--	46
PZ4	05/21/03	1246	--	650	--	9.2
PZ4	08/13/03	1346	720	--	9.6	--
PZ4	01/28/04	1110	6,600	--	64	--
PZ4	04/28/04	2122	--	2,300	--	27
PZ4	07/29/04	1825	--	3,500	--	37
PZ4	10/27/04	1335	--	1,700	--	16
PZ4	01/27/05	1645	--	8,060	--	82
PZ4	05/03/05	1152	--	2,090	--	19
PZ4	07/25/05	1530	--	1,190	--	10
PZ4	10/26/05	1310	--	1,450	--	13
PZ4	07/13/06	0746 (HT)	--	620	--	7.7
PZ4	07/13/06	1640 (LT)	--	420	--	5.3
PZ4	09/01/10	1244	2,210	--	16.6	--
PZ4	11/03/10	1120	--	1,890	--	15.6
PZ4	12/21/10	1515	--	896	--	6.61
PZ4	03/22/11	1445	--	3,980	--	36.9
PZ4	06/21/11	1515	--	5,310	--	38.3
PZ4	09/22/11	1620	--	2,810	--	26.1
PZ4	01/12/12	1510	--	437	--	<10.0
PZ4	03/21/12	1135	--	1,700	--	10.0
PZ4	06/26/12	1520	--	4,880	--	31.2
PZ5	04/16/03	1115	--	3,600	--	180
PZ5	05/21/03	1320	--	3,000	--	120
PZ5	08/13/03	1729	4,300	--	160	--
PZ5	01/28/04	1150	3,700	--	110	--
PZ5	04/28/04	1958	--	6,700	--	200
PZ5	07/29/04	1902	--	8,800	--	320
PZ5	10/27/04	1415	--	34,000	--	1,100
PZ5	01/27/05	1605	--	7,930	--	326
PZ5	05/03/05	1100	--	5,850	--	244
PZ5	07/25/05	1737	--	7,550	--	302
PZ5	10/26/05	1224	--	14,100	--	628
PZ5	07/13/06	0800 (HT)	--	3,390	--	152
PZ5	07/13/06	1658 (LT)	--	3,250	--	146
PZ5	02/05/10	1450	--	3,060	--	107
PZ5	09/01/10	1521	4,350	--	118	--
PZ5	11/03/10	1035	--	2,080	--	69.7
PZ5	12/21/10	1545	--	2,880	--	91.8
PZ5	03/22/11	1520	--	2,980	--	84.7
PZ5	06/21/11	1555	--	35,800	--	1,150
PZ5	09/22/11	1650	--	2,390	--	102
PZ5	01/12/12	1550	--	394	--	<10.0

Table 5
Summary of Ground Water Analytical Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

			Zinc		Cadmium	
			Total	Dissolved	Total	Dissolved
Sample ID	Sample Date	Sample Time	µg/L			
PZ5	03/21/12	1200	--	2,100	--	43
PZ5	06/26/12	1600	--	1,680	--	4.3
PZ6	04/16/03	1310	--	1,500	--	<4.4
PZ6	05/21/03	1415	--	1,400	--	<4.0
PZ6	08/13/03	1642	2,100	--	<4.4	--
PZ6	01/28/04	1020	2,600	--	--	--
PZ6	04/28/04	1412	--	1,400	--	--
PZ6	07/29/04	1738	--	4,600	--	--
PZ6	10/27/04	1500	--	2,600	--	--
PZ6	01/27/05	1730	--	5,370	--	--
PZ6	05/03/05	1233	--	12,500	--	--
PZ6	07/25/05	1549	--	26,200	--	6
PZ6	10/27/05	0721	--	16,800	--	6
PZ6	07/13/06	0906	3,800	--	1.7	--
PZ6	09/01/10	1133	1,310	--	<1.0	--
PZ6	11/03/10	1155	--	1,190	--	<1.0
PZ6	12/20/10	1715	--	553	--	<1.0
PZ6	03/22/11	1415	--	740	--	<10.0
PZ6	06/21/11	1550	--	1,660	--	<10.0
PZ6	09/22/11	1555	--	500	--	<1.0
PZ6	01/12/12	1450	--	26.3	--	<10.0
PZ6	03/21/12	1105	--	980	--	<10.0
PZ6	06/26/12	805	--	3,570	--	<1.0
PZ12	07/27/05	1452	--	57,300	--	<2.0
PZ12	10/26/05	1430	--	44,600	--	--
PZ12	07/12/06	1802	--	37,400	--	0.4
PZ12	02/04/10	1230	--	34,200	--	0.6
PZ12	09/02/10	1124	37,800	--	<1.0	--
PZ12	11/03/10	945	--	1,940	--	<1.0
PZ12	12/21/10	1230	--	87,100	--	<1.0
PZ12	03/22/11	945	--	112,000	--	<10.0
PZ12	06/21/11	1405	--	74,100	--	<10.0
PZ12	09/22/11	1520	--	88,100	--	<1.0
PZ12	01/12/12	1255	--	83,600	--	<200
PZ12	03/21/12	1505	--	300,000	--	6.7 J
PZ12	06/27/12	1025	--	352,000	--	<100
PZ13	07/27/05	1032	--	17,300	--	<2.0
PZ13	09/02/10	1029	18,400	--	<1.0	--
PZ13	11/02/10	1420	--	151	--	<1.0
PZ13	12/21/10	1020	--	79,000	--	<1.0
PZ13	03/22/11	900	--	68,200	--	<10.0
PZ13	06/21/11	1340	--	21,100	--	<10.0
PZ13	09/22/11	1430	--	<10.0	--	<1.0
PZ13	01/12/12	1325	--	2,140	--	<10.0
PZ13	03/21/12	1555	--	89,000	--	2.4 J

Table 5
Summary of Ground Water Analytical Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

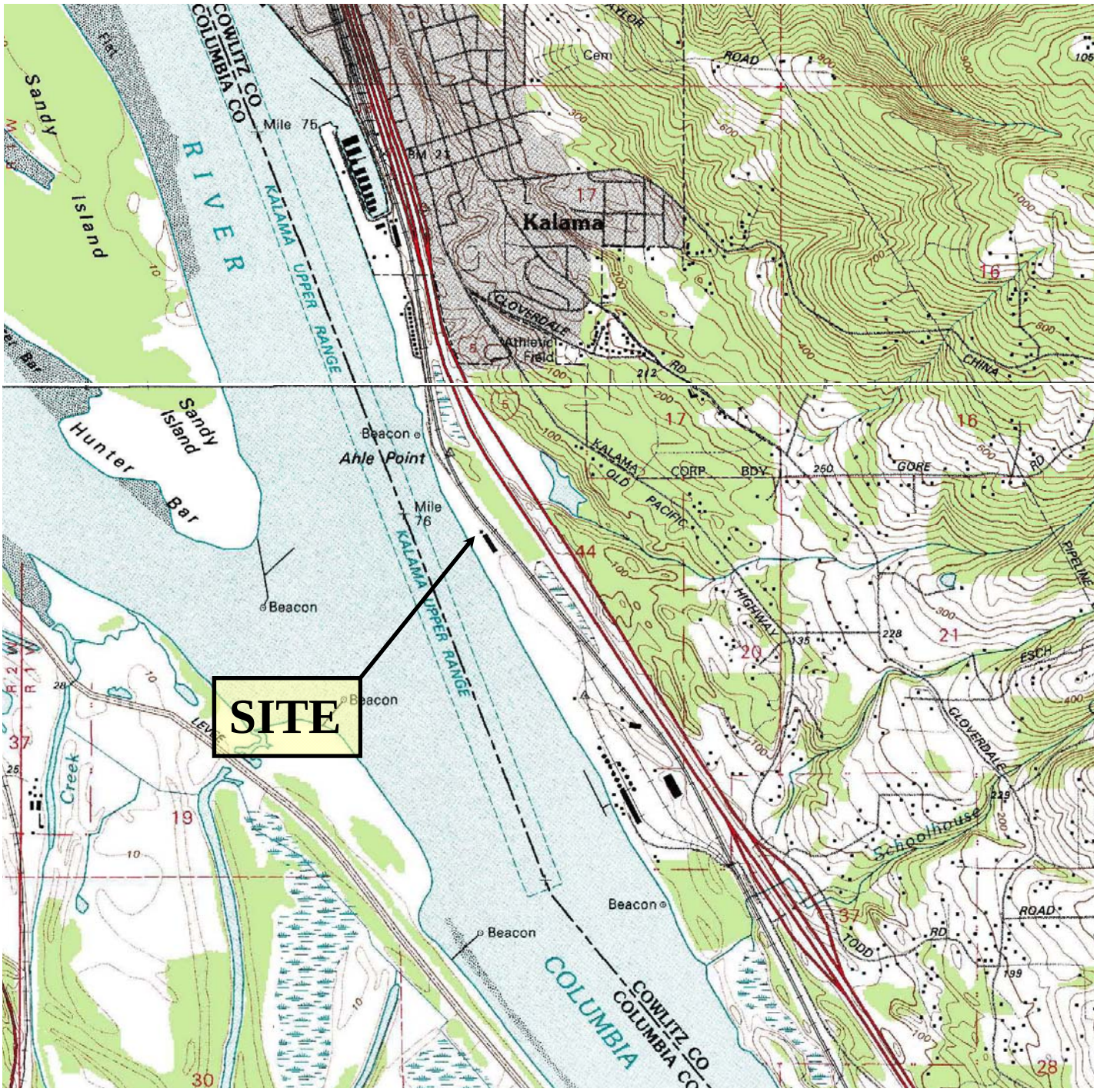
			Zinc		Cadmium	
			Total	Dissolved	Total	Dissolved
Sample ID	Sample Date	Sample Time	µg/L			
PZ13	06/27/12	940	--	210	--	<1.0
AB1	07/07/03	1531	1,200	1,100	<4.4	<4.0
AB1	07/18/03	1525	--	610	--	--
AB1	08/13/03	1218	--	810	--	<4.0
AB1	01/28/04	1410	680	--	--	--
AB1	04/28/04	1843	--	1,200	--	--
AB1	07/29/04	1356	--	1,100	--	--
AB1	10/27/04	1210	--	660	--	--
AB1	01/27/05	1355	--	1,050	--	--
AB1	05/03/05	1408	--	1,330	--	--
AB1	07/25/05	1425	--	1,280	--	<2.0
AB1	10/27/05	1030	--	697	--	--
AB1	07/13/06	0730 (HT)	--	630	--	0.3
AB1	07/13/06	1612 (LT)	--	9,000	--	1.2
AB1	02/05/10	1045	--	980	--	0.3
AB1	09/01/10	1339	996	--	<1.0	--
AB1	11/03/10	1245	--	613	--	<1.0
AB1	12/21/10	1410	--	463	--	<1.0
AB1	03/22/11	1600	--	439	--	<10.0
AB1	06/21/11	1640	--	304	--	<10.0
AB1	09/22/11	1020	--	1090	--	<1.0
AB1	01/12/12	1350	--	923	--	<10.0
AB1	03/21/12	1035	--	950	--	<10.0
AB1	06/27/12	835	--	736	--	<1.0
AB2	07/07/03	1247	3,700	3,600	<4.0	<4.0
AB2	07/18/03	1325	--	3,200	--	--
AB2	08/12/03	1700	--	2,700	--	<4.0
AB2	01/28/04	1860	3,500	--	--	--
AB2	04/28/04	1030	--	1,200	--	--
AB2	07/29/04	1628	--	6,200	--	--
AB2	10/27/04	0955	--	4,800	--	--
AB2	01/27/05	1135	--	8,490	--	--
AB2	05/03/05	1732	--	10,600	--	--
AB2	07/26/05	0811	--	7,960	--	<2.0
AB2	10/26/05	1510	--	7,540	--	--
AB2	07/13/06	0702 (HT)	--	8,010	--	0.8
AB2	07/13/06	1542 (LT)	--	4,840	--	0.5
AB2	02/04/10	1330	--	5,840	--	0.4
AB2	09/02/10	1319	9,290	--	<1.0	--
AB2	11/02/10	1545	--	7,310	--	<1.0
AB2	12/20/10	1610	--	6,310	--	<1.0
AB2	03/22/11	1125	--	5,630	--	<10.0
AB2	06/21/11	935	--	4,210	--	<10.0
AB2	09/22/11	1155	--	14,300	--	<1.0
AB2	01/12/12	940	--	19,500	--	<10.0

Table 5
Summary of Ground Water Analytical Data
Former Clariant Facility
Kalama, WA
H&H Project No. CLR-045

Sample ID	Sample Date	Sample Time	Zinc		Cadmium	
			Total	Dissolved	Total	Dissolved
			µg/L			
AB2	03/21/12	1255	--	20,000	--	1.5 J
AB2	06/26/12	1230	--	33,300	--	<1.0
OW1	09/23/10	1000	--	15,200	--	<1.0
OW1	11/02/10	1845	--	14,800	--	<1.0
OW1	12/20/10	1545	--	14,600	--	<1.0
OW1	03/22/10	1340	--	12,500	--	<10.0
OW1	06/21/11	1040	--	21,100	--	<10.0
OW1	09/22/11	1305	--	28,600	--	1.18
OW1	01/12/12	1100	--	44,500	--	<100
OW1	03/21/12	1420	--	46,000	--	2.8 J
OW1	06/26/12	1435	--	23,900	--	<100
OW2	09/23/10	0920	--	11,700	--	<1.0
OW2	11/02/10	1645	--	9,790	--	<1.0
OW2	12/20/10	1355	--	7,750	--	<1.0
OW2	03/22/11	1055	--	19,900	--	<10.0
OW2	06/21/11	1015	--	28,600	--	<10.0
OW2	09/22/11	1235	--	31,100	--	1.62
OW2	01/12/12	1035	--	52,500	--	<100
OW2	03/21/12	1320	--	91,000	--	8.4 J
OW2	06/26/12	1400	--	91,400	--	<100
OW3	09/23/10	0830	--	13,200	--	<1.0
OW3	11/02/10	1845	--	16,700	--	<1.0
OW3	12/21/10	1110	--	22,400	--	<1.0
OW3	03/22/11	1150	--	35,100	--	<10.0
OW3	06/21/11	1120	--	22,400	--	<10.0
OW3	09/22/11	1330	--	41,600	--	1.72
OW3	01/12/12	1140	--	8,100	--	<10
OW3	03/21/12	1400	--	11,000	--	<10.0
OW3	06/26/12	1335	--	47,700	--	<100

Notes:
Samples analyzed by EPA Method 6010B for total concentrations and by
EPA Method 200 or 6010B for dissolved concetrations
Only data for wells used for injection performance monitoring are shown
µg/L = micrograms per liter
-- indicates not analyzed; "J" indicates result is less than laboratory reporting limit, but greater than or equal to the minimum detection limit and the concentration is approximate.
HT - sample collected at high tide, LT - sample collected at low tide

Figures



N

APPROXIMATE

0 2,000 4,000

SCALE IN FEET

U.S.G.S. QUADRANGLE MAP

DEER ISLAND & KALAMA, WA 7.5 MIN. TOPOGRAPHIC QUADRANGLES

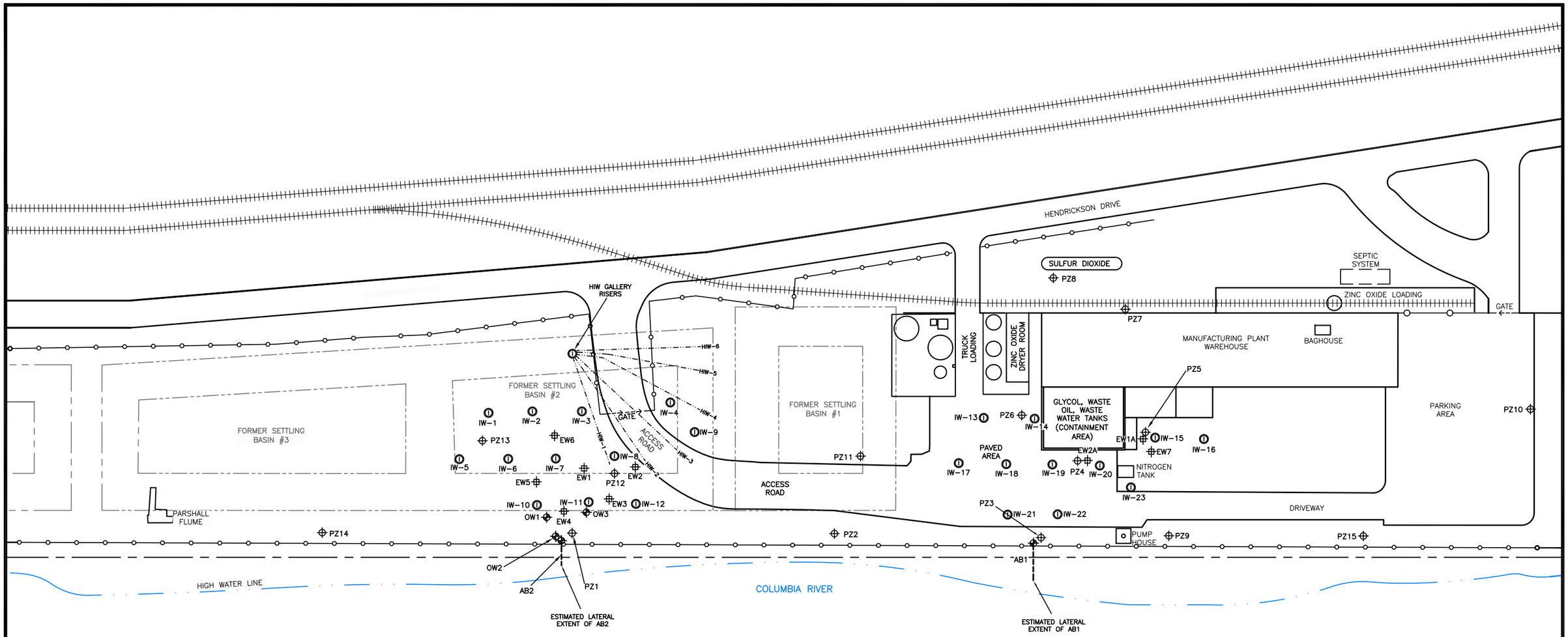
QUADRANGLE
7.5 MINUTE SERIES (TOPOGRAPHIC)

TITLE	SITE LOCATION MAP
PROJECT	CLARIANT CORPORATION KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street – Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

DATE:	09-18-12	REVISION NO:	0
JOB NO:	CLR-045	FIGURE NO:	1



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- SUBSURFACE EXTENT OF HORIZONTAL INJECTION WELL
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- INJECTION WELL
- EXTRACTION WELL

APPROXIMATE
0 80 160
SCALE IN FEET

NOTES
1. MAP BASED ON CDM SITE PLAN PROVIDED TO HART & HICKMAN BY CLARIANT CORPORATION.
2. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.
3. TEMPORARY OBSERVATION WELLS TW1 THROUGH TW3 WERE REMOVED FOLLOWING COMPLETION OF PILOT TESTING ACTIVITIES ON SEPTEMBER 29, 2011.

TITLE
SITE MAP

PROJECT
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/14/12	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 2

S:\AAA-Master Projects\Clariant - CLR\CLR-045 Kalama, WA RA\2nd Injection\Figures.dwg

HENDRICKSON DRIVE

HIW GALLERY RISERS

HIW-6

HIW-5

HIW-4

HIW-3

HIW-2

HIW-1

GATE

ACCESS ROAD

7,500 SF EXCAVATION BASE & CaSx APPLICATION AREA

11,500 SF EXCAVATION PERIMETER (TOP OF SIDEWALL WITH APPROXIMATE 1:1 SLOPE)

FORMER SETTLING BASIN #2

FORMER SETTLING BASIN #1

ACCESS ROAD

IW-1 IW-2 IW-3 IW-4 IW-5 IW-6 IW-7 IW-8 IW-9 IW-10 IW-11 IW-12

PZ11 PZ12 PZ13 PZ14 PZ1 PZ2

EW1

OW1 OW2 OW3

AB2

ESTIMATED LATERAL EXTENT OF AB2

COLUMBIA RIVER

LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- SUBSURFACE EXTENT OF EXISTING HORIZONTAL INJECTION WELL
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- INJECTION WELL
- EXTRACTION WELL
- EXTENT OF AREA EXCAVATED TO 15 FT BGS AND CaSx APPLICATION
- APPROXIMATE PERIMETER OF EXCAVATION

N

APPROXIMATE

0 30 60

SCALE IN FEET

TITLE

EXCAVATION & CaSx APPLICATION AREA

PROJECT

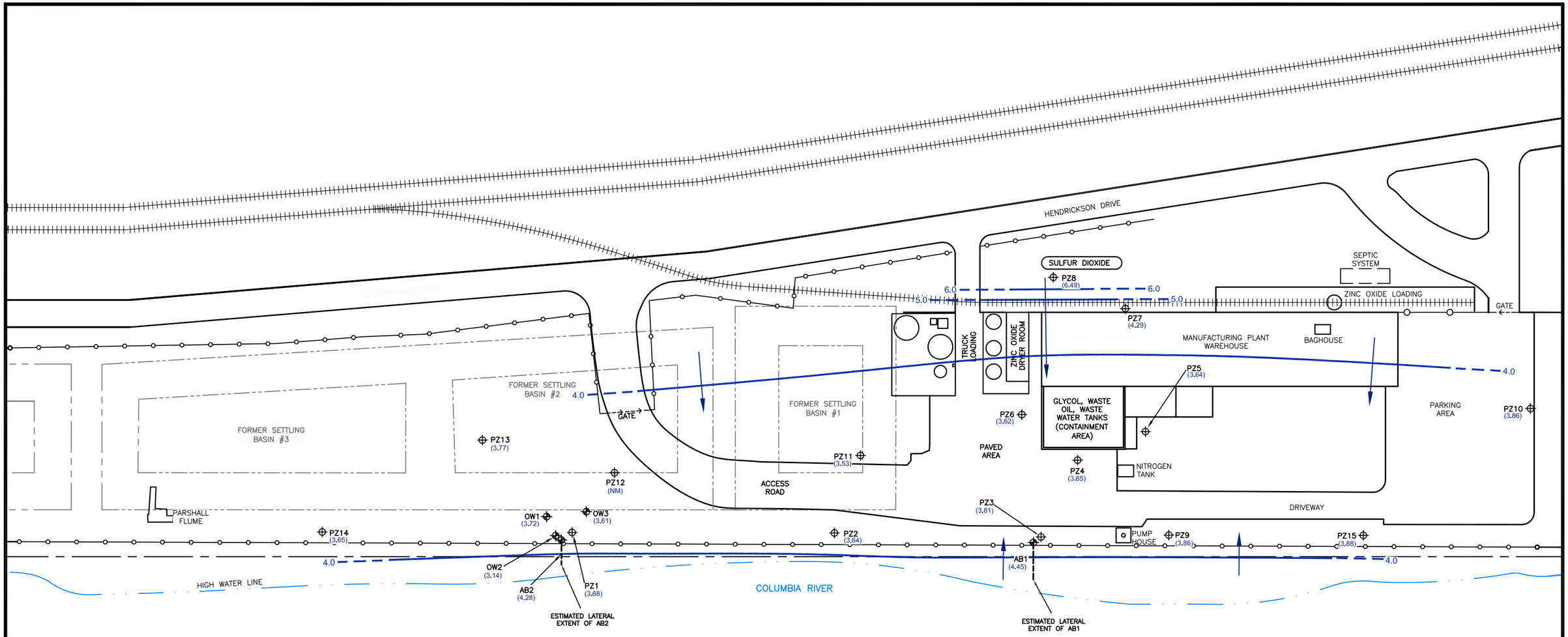
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/24/12 | REVISION NO. 0

JOB NO. CLR-045 | FIGURE NO. 3

S:\AAA-Master Projects\Clariant - CLR\CLR-045 Kalama, WA RA\2nd Injection\CaSx App Fig.dwg, FIG.1, 8/27/2012 9:30:01 AM, sdrury



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- (3.68) GROUND WATER ELEVATION (FT CRD)
- NM NOT MEASURED
- 4.0 GROUND WATER ELEVATION CONTOUR IN FT CRD (DASHING INDICATES EXTRAPOLATED CONTOUR)
- INFERRED GROUND WATER FLOW DIRECTION

NOTE
THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

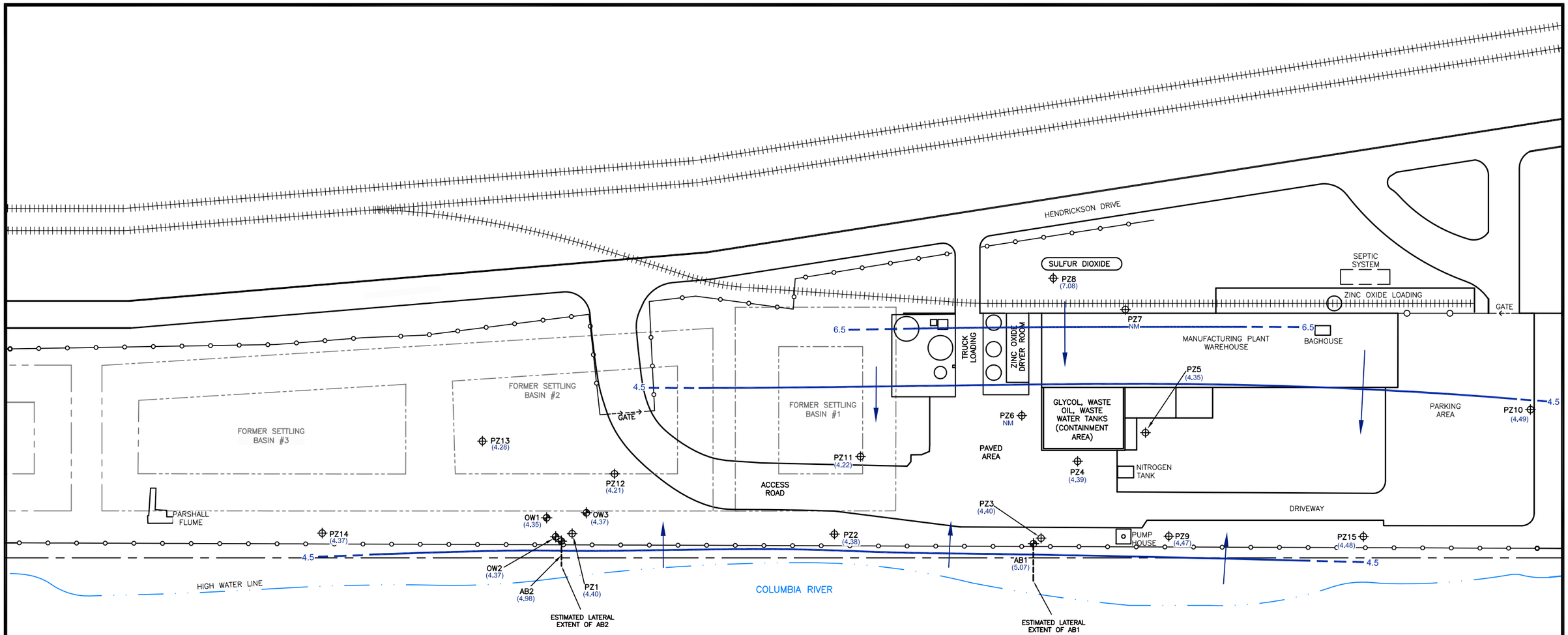
APPROXIMATE
0 80 160
SCALE IN FEET

TITLE: GROUND WATER ELEVATION CONTOUR MAP SEPTEMBER 28, 2011

PROJECT:
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR–045	FIGURE NO. 4A



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- (4.40) GROUND WATER ELEVATION (FT CRD)
- NM NOT MEASURED
- 4.5 GROUND WATER ELEVATION CONTOUR IN FT CRD (DASHING INDICATES EXTRAPOLATED CONTOUR)
- INFERRED GROUND WATER FLOW DIRECTION

APPROXIMATE
0 80 160
SCALE IN FEET

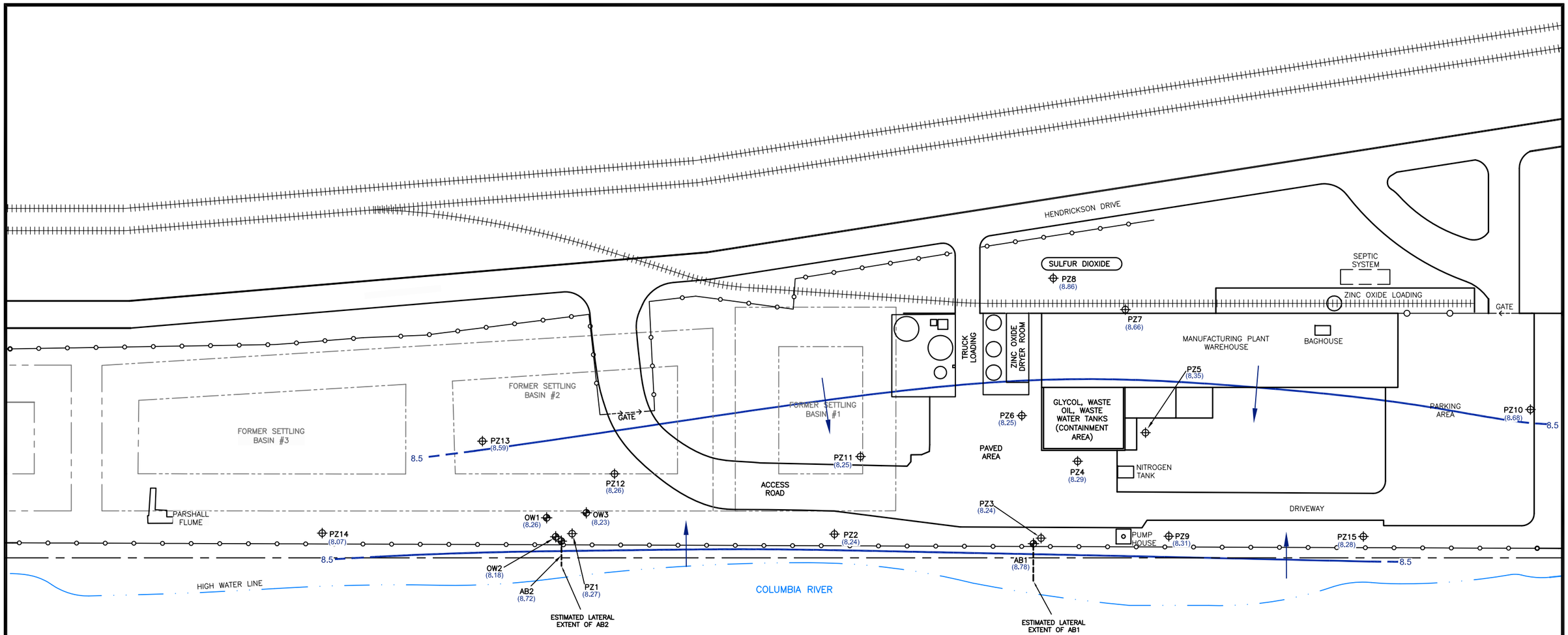
NOTES
1. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.
2. PZ6 AND PZ7 WERE OBSTRUCTED AT THE TIME THAT SITEWIDE GROUND WATER ELEVATION MEASUREMENTS WERE COLLECTED DURING THE JANUARY 12, 2012 SAMPLING EVENT.

TITLE: GROUND WATER ELEVATION CONTOUR MAP JANUARY 12, 2012

PROJECT: CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR–045	FIGURE NO. 4B



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- (8.27) GROUND WATER ELEVATION (FT CRD)
- 8.5 GROUND WATER ELEVATION CONTOUR IN FT CRD (DASHING INDICATES EXTRAPOLATED CONTOUR)
- INFERRED GROUND WATER FLOW DIRECTION

APPROXIMATE
0 80 160
SCALE IN FEET

NOTES
1. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

TITLE: GROUND WATER ELEVATION CONTOUR MAP
MARCH 20, 2012

PROJECT:
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR–045	FIGURE NO. 4C

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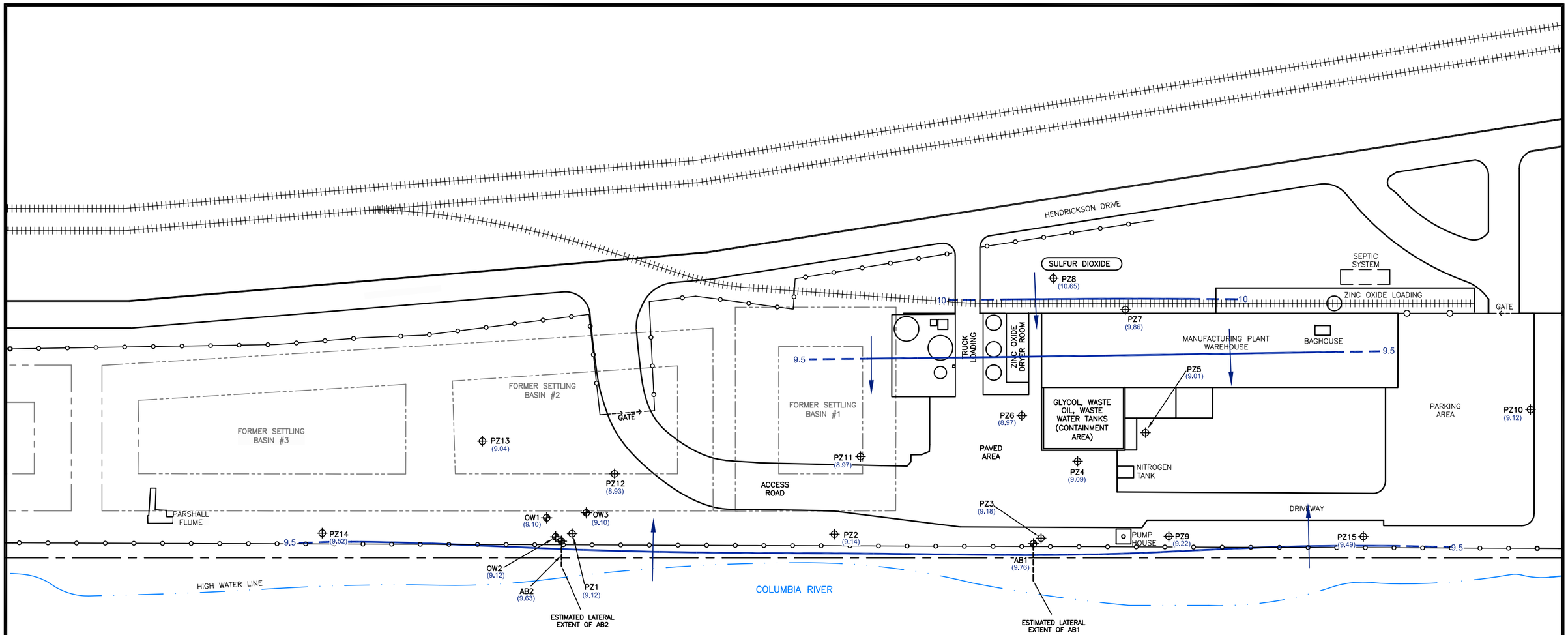


LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- (9.12) GROUND WATER ELEVATION (FT CRD)
- 9.0 GROUND WATER ELEVATION CONTOUR IN FT CRD (DASHING INDICATES EXTRAPOLATED CONTOUR)
- INFERRED GROUND WATER FLOW DIRECTION

NOTES

1. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

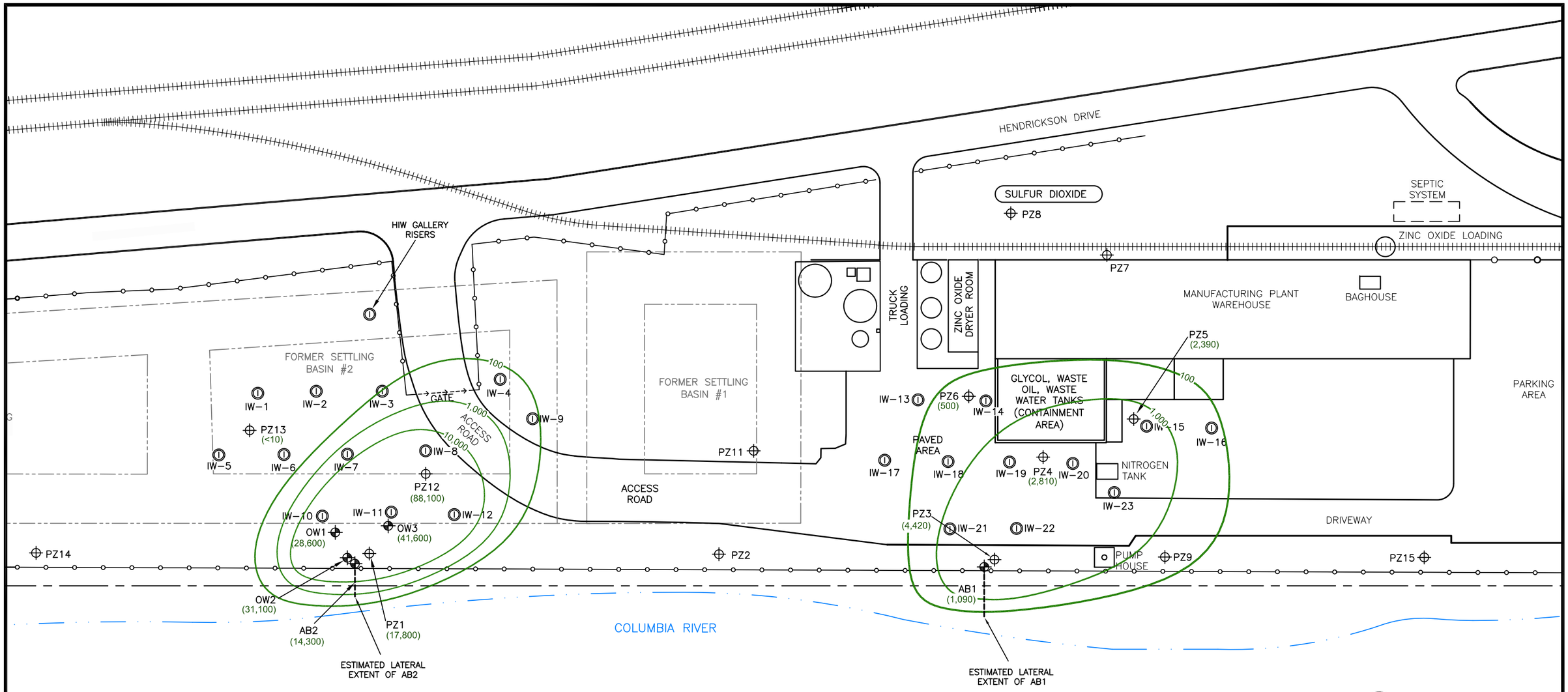
APPROXIMATE
0 80 160
SCALE IN FEET

TITLE: GROUND WATER ELEVATION CONTOUR MAP
JUNE 26, 2012

PROJECT:
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR–045	FIGURE NO. 4D



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- INJECTION WELL
- (1,090) SEPTEMBER 22, 2011 ZINC CONCENTRATION (µg/L)
- 1,000 ZINC ISOCONCENTRATION CONTOUR IN µg/L

NOTES
1. HISTORICAL GROUND WATER SAMPLE DATA USED TO AID IN CONTOURING.
2. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

APPROXIMATE
0 60 120
SCALE IN FEET

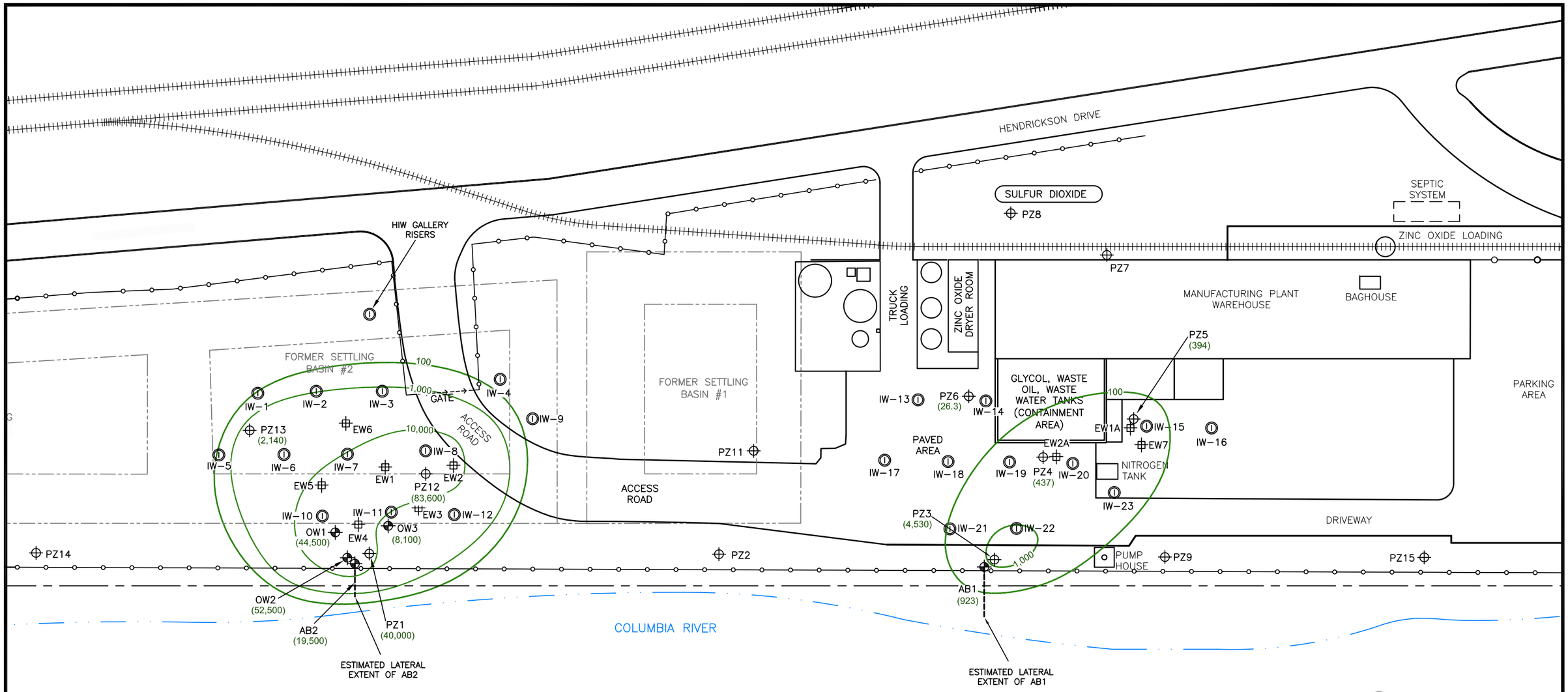
TITLE
SEPTEMBER 22, 2011
ZINC ISOCONENTRATION MAP

PROJECT
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 5A

S:\AAA-Master Projects\Clariant - CLR\CLR-045 Kalama, WA RA\2nd Injection\Figures.dwg, FIG.5A, 8/27/2012 2:10:18 PM, sdrury



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- INJECTION WELL
- EXTRACTION WELL
- (923) JANUARY 12, 2012 ZINC CONCENTRATION (µg/L)
- 1,000 ZINC ISOCONCENTRATION CONTOUR IN µg/L

NOTES
1. HISTORICAL GROUND WATER SAMPLE DATA USED TO AID IN CONTOURING.
2. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

APPROXIMATE
0 60 120
SCALE IN FEET

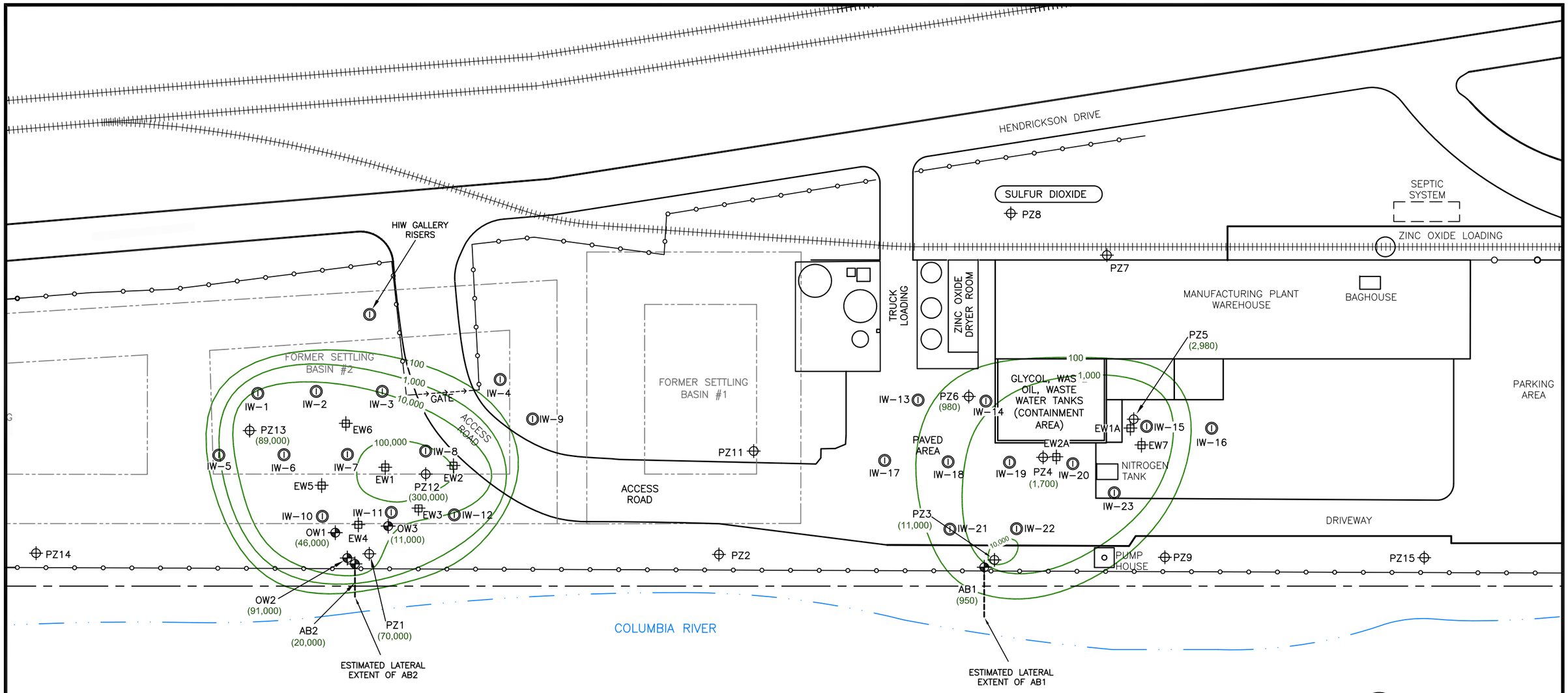
TITLE
JANUARY 12, 2012
ZINC ISOCONENTRATION MAP

PROJECT
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 5B

S:\AAA-Master Projects\Clariant - CLR\CLR-045 Kalama, WA RA\2nd Injection\Figures.dwg, FIG.5B, 8/27/2012 2:11:31 PM, sdrury



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- INJECTION WELL
- EXTRACTION WELL
- (950) MARCH 21, 2012 ZINC CONCENTRATION (µg/L)
- 1,000 ZINC ISOCONCENTRATION CONTOUR IN µg/L

NOTES
1. HISTORICAL GROUND WATER SAMPLE DATA USED TO AID IN CONTOURING.
2. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

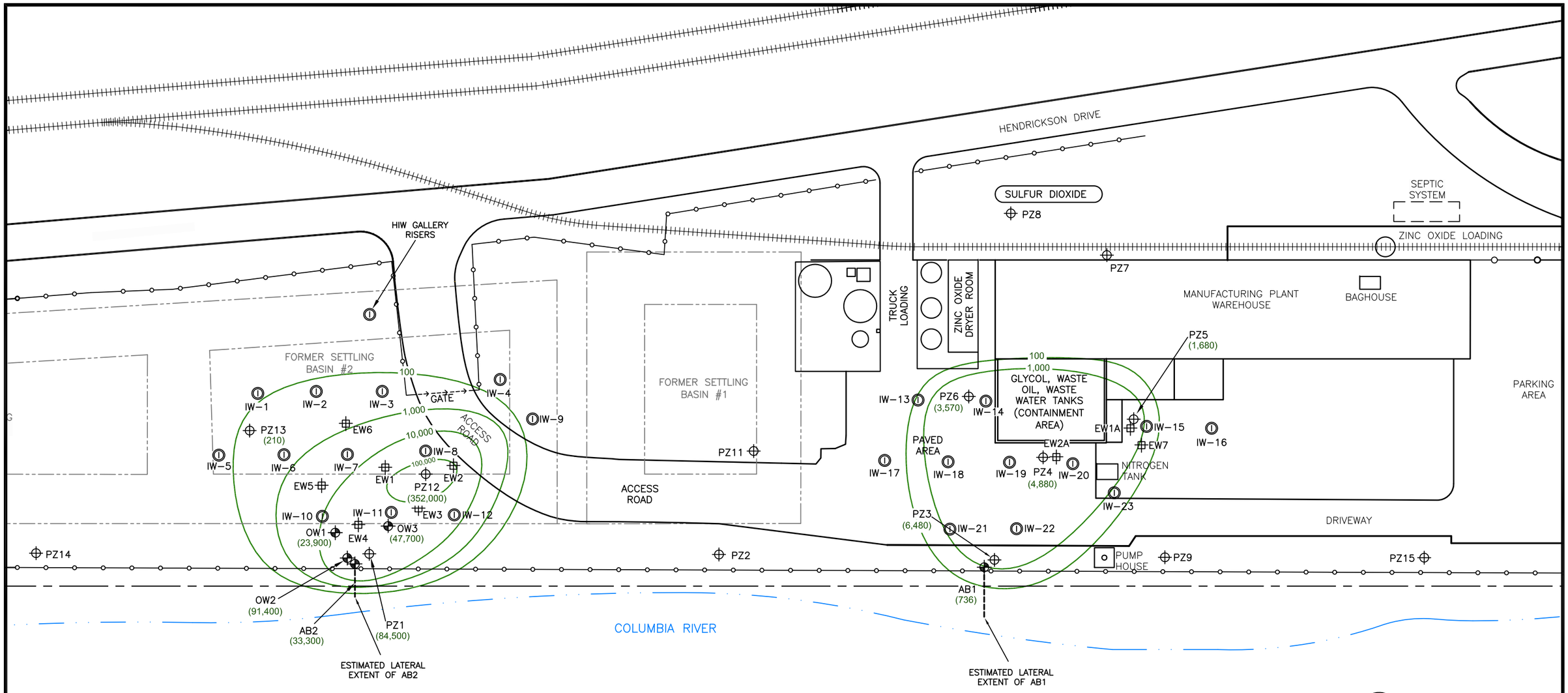
APPROXIMATE
0 60 120
SCALE IN FEET

TITLE
MARCH 21, 2012
ZINC ISOCONENTRATION MAP

PROJECT
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12	REVISION NO. 0
JOB NO. CLR-045	FIGURE NO. 5C



LEGEND:

- PROPERTY LINE
- FENCE LINE
- RAILROAD TRACK
- EAST EDGE OF COLUMBIA RIVER
- EXTENT OF FORMER SETTLING BASIN
- MONITORING/OBSERVATION WELL
- PIEZOMETER
- INJECTION WELL
- EXTRACTION WELL
- (736) JUNE 26, 2012 ZINC CONCENTRATION (µg/L)
- 1,000 ZINC ISOCONCENTRATION CONTOUR IN µg/L

NOTES
1. HISTORICAL GROUND WATER SAMPLE DATA USED TO AID IN CONTOURING.
2. THE BOTTOM OF ANGLE WELLS AB1 AND AB2 ARE LOCATED APPROXIMATELY 30 AND 20 FEET (RESPECTIVELY) SOUTHWEST OF THE WELL LOCATION DEPICTED ON THE MAP. THE DASHED LINES EXTENDING TOWARD THE COLUMBIA RIVER FROM THOSE WELLS INDICATES THE ESTIMATED LATERAL EXTENT OF EACH WELL IN THAT DIRECTION.

APPROXIMATE
0 60 120
SCALE IN FEET

TITLE
JUNE 26, 2012
ZINC ISOCONENTRATION MAP

PROJECT
CLARIANT - KALAMA SITE
404 HENDRICKSON DRIVE
KALAMA, WASHINGTON

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)
License # C-1269 / #C-245 Geology

DATE: 08/16/12 | REVISION NO. 0
JOB NO. CLR-045 | FIGURE NO. 5D

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Appendix A
CaSx Certificates of Analysis

Tessenderlo KERLEY

Customer: *CHEMTRADE LOGISTICS*

TKI LOT NUMBER :	410505	QUANTITY SHIPPED :	22.97 TONS
CUSTOMER PO # :	CLR 045	DATE SHIPPED :	11/29/11
TKI ORDER # :	410505	TRANSPORT CO. :	TKI
BILL OF LADING # :	80561180	PRODUCT GRADE :	SEE BELOW

PRODUCT : Calcium Polysulfide Solution

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS : _____

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

FORM # K-CAPSCOC-TKIGNRC-2500 Ver. 01
EFFECTIVE : 04/01/05

Tessenderlo KERLEY

Customer: *CHEMTRADE LOGISTICS*

TKI LOT NUMBER :	410505-20	QUANTITY SHIPPED :	22.88 TONS
CUSTOMER PO # :	CLR 045	DATE SHIPPED :	11/29/11
TKI ORDER # :	410505-20	TRANSPORT CO. :	TKI
BILL OF LADING # :	80561181	PRODUCT GRADE :	SEE BELOW

PRODUCT : Calcium Polysulfide Solution

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS : _____

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics

TKI LOT NUMBER	: 410505-30	QUANTITY SHIPPED	: 23.16 tons
CUSTOMER PO #	: CLR 045	DATE SHIPPED	: 11-29-11
TKI ORDER #	: 410505-30	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561211	PRODUCT GRADE	: see below

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS : _____

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics.

TKI LOT NUMBER : 410505-40.		**QUANTITY SHIPPED** :	23.03 tons.
CUSTOMER PO # : CLR 045.		**DATE SHIPPED** :	11-30-11
TKI ORDER # : 410505-40.		**TRANSPORT CO.** :	TKI
BILL OF LADING # : 805612121 2.		**PRODUCT GRADE** :	See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS :

DATE : 11-30-11 **SIGNED :** Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics

TKI LOT NUMBER	: 405616-80	QUANTITY SHIPPED	: 22.87 tons
CUSTOMER PO #	: CLR045.	DATE SHIPPED	: 12-7-11
TKI ORDER #	: 405616-80.	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561785.	PRODUCT GRADE	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1.	CALCIUM [Wt. % Ca]	6.21%
2.	SULFUR [Wt. % S]	21.20%
3.	ASSAY [Wt. % Caps]	27.41%
4.	Specific Gravity	1.248 @70°f
5.	pH	11.42

REMARKS :

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade Logistics.

TKI LOT NUMBER	: 410566-70	QUANTITY SHIPPED	: 22.93 tons.
CUSTOMER PO #	: CLR045.	DATE SHIPPED	: 12-7-11.
TKI ORDER #	: 410566-70.	TRANSPORT CO.	: TKI
BILL OF LADING #	: 805617844.	PRODUCT GRADE	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1.	CALCIUM [Wt. % Ca]	6.21%
2.	SULFUR [Wt. % S]	21.20%
3.	ASSAY [Wt. % Caps]	27.41%
4.	Specific Gravity	1.248 @70°f
5.	pH	11.42

REMARKS :

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade Logistics.

TKI LOT NUMBER	: 410566-60	QUANTITY SHIPPED	: 23.12 tons.
CUSTOMER PO #	: CLR045	DATE SHIPPED	: 12-6-11.
TKI ORDER #	: 410566-60	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561783.	PRODUCT GRADE	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1.	CALCIUM [Wt. % Ca]	6.21%
2.	SULFUR [Wt. % S]	21.20%
3.	ASSAY [Wt. % Caps]	27.41%
4.	Specific Gravity	1.248 @70°f
5.	pH	11.42

REMARKS : _____

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics.

TKI LOT NUMBER	: 410566-50	QUANTITY SHIPPED	: 22.94 tons
CUSTOMER PO #	: CLR045.	DATE SHIPPED	: 12-6-11
TKI ORDER #	: 410566-50	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561782	PRODUCT GRADE	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca]	6.21%
2. SULFUR [Wt. % S]	21.20%
3. ASSAY [Wt. % Caps]	27.41%
4. Specific Gravity	1.248 @70°f
5. pH	11.42

REMARKS : _____

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade Logistics

TKI LOT NUMBER	: 410566-30	QUANTITY SHIPPED	: 22.92 tons
CUSTOMER PO #	: CLR045	DATE SHIPPED	: 12-5-11
TKI ORDER #	: 410566-30	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561780	PRODUCT GRADE	: See Below

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca]	6.21%
2. SULFUR [Wt. % S]	21.20%
3. ASSAY [Wt. % Caps]	27.41%
4. Specific Gravity	1.248 @70°f
5. pH	11.42

REMARKS: _____

DATE: 11-30-11 SIGNED: Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics

TKI LOT NUMBER	: 405666-20	QUANTITY SHIPPED	: 22.94 tons.
CUSTOMER PO #	: CLR 045.	DATE SHIPPED	: 12-5-11.
TKI ORDER #	: 405666-20.	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561592	PRODUCT GRADE	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca]	6.21%
2. SULFUR [Wt. % S]	21.20%
3. ASSAY [Wt. % Caps]	27.41%
4. Specific Gravity	1.248 @70°f
5. pH	11.42

REMARKS : _____

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade Logistics.

TKI LOT NUMBER	: 410505-80.	**QUANTITY SHIPPED**	: 22.97 tons.
CUSTOMER PO #	: CLR045.	**DATE SHIPPED**	: 12-1-11.
TKI ORDER #	: 410505-80.	**TRANSPORT CO.**	: TKI
BILL OF LADING #	: 80561590.	**PRODUCT GRADE**	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS :

DATE : 11-30-11 **SIGNED :** Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics.

TKI LOT NUMBER	: 410505-70	QUANTITY SHIPPED	: 23.04 tons.
CUSTOMER PO #	: CLR045	DATE SHIPPED	: 12.1.11
TKI ORDER #	: 410505-70	TRANSPORT CO.	: TKi
BILL OF LADING #	: 80561589	PRODUCT GRADE	: see below

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS :

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade Logistics.

TKI LOT NUMBER	: 410505-50.	QUANTITY SHIPPED	:
CUSTOMER PO #	: CLR 045.	DATE SHIPPED	: 11-30-11.
TKI ORDER #	: 410505-50.	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561587	PRODUCT GRADE	: see below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.21%
2. SULFUR [Wt. % S] 21.20%
3. ASSAY [Wt. % Caps] 27.41%
4. Specific Gravity ..... 1.248 @70°f
5. pH 11.42

REMARKS :

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade Logistics.

TKI LOT NUMBER	: 410568-10.	QUANTITY SHIPPED	: 23.04 tons
CUSTOMER PO #	: CLR 045.	DATE SHIPPED	: 12-13-11
TKI ORDER #	: 410568-10.	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80562123	PRODUCT GRADE	: see below.

PRODUCT : CALCIUM POLYSULFIDE SOLUTION

- CERTIFICATE OF ANALYSIS -

1. CALCIUM [Wt. % Ca] 6.14%
2. SULFUR [Wt. % S] 21.18%
3. ASSAY [Wt. % Caps] 27.32%
4. Specific Gravity ..... 1.246 @70°f
5. pH 11.26

REMARKS : _____

DATE : 12-15-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

Tessenderlo KERLEY

Customer: Chemtrade logistics.

TKI LOT NUMBER	: 4105766-90	**QUANTITY SHIPPED**	: 22.82 tons.
CUSTOMER PO #	: CLR045.	**DATE SHIPPED**	: 12-12-11.
TKI ORDER #	: 4105766-90.	**TRANSPORT CO.**	: TKI
BILL OF LADING #	: 8056178	**PRODUCT GRADE**	: See below.

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1.	CALCIUM [Wt. % Ca]	6.21%
2.	SULFUR [Wt. % S]	21.20%
3.	ASSAY [Wt. % Caps]	27.41%
4.	Specific Gravity	1.248 @70°f
5.	pH	11.42

REMARKS :

DATE : 11-30-11 **SIGNED :** Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

FORM # K-CAPSCOC-TKIGNRC-2500 Ver. 01
EFFECTIVE : 04/01/05

Tessenderlo KERLEY

Customer: Chemtrade logistics

TKI LOT NUMBER	: 4105616-100	QUANTITY SHIPPED	: 22.87 tons
CUSTOMER PO #	: CLR045	DATE SHIPPED	: 12-12-11
TKI ORDER #	: 4105616700	TRANSPORT CO.	: TKI
BILL OF LADING #	: 80561787	PRODUCT GRADE	: See Below

PRODUCT : CALMET

- CERTIFICATE OF ANALYSIS -

1.	CALCIUM [Wt. % Ca]	6.21%
2.	SULFUR [Wt. % S]	21.20%
3.	ASSAY [Wt. % Caps]	27.41%
4.	Specific Gravity	1.248 @70°f
5.	pH	11.42

REMARKS :

DATE : 11-30-11 SIGNED : Marty Wagner

Marty Wagner
Laboratory Technician
TESSENDERLO KERLEY, INC.
Finley, WA.

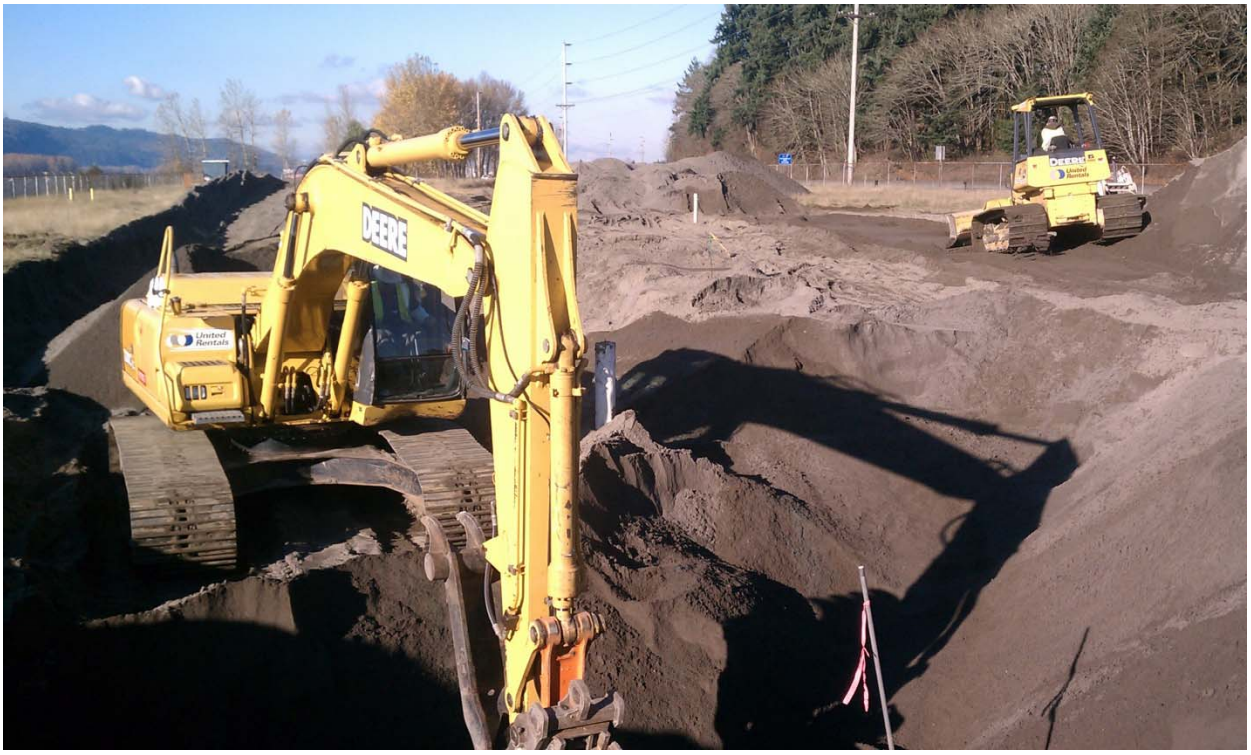
Appendix B

Photographs

Photograph 1: Excavation of soil in CaSx application area.

Photograph 2: Injection well exposed during soil excavation.

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS
2923 South Tryon Street – Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)



Photograph 3: Excavation of soil in CaSx application area.

Photograph 4: Excavation of soil in CaSx application area.

Photograph 5: CaSx delivery and transfer into frac tank.

Photograph 6: Excavation and preparation for application of CaSx.

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2923 South Tryon Street – Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

Photograph 7: Application of CaSx to base of excavation.

Photograph 8: Application of CaSx to base of excavation.

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Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

Photograph 9: Application of CaSx to base of excavation.

Photograph 10: Backfilling after application of CaSx to base of excavation.

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2923 South Tryon Street – Suite 100
Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

Photograph 11: Extraction well installation.

Photograph 12: Extraction well installation.

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Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

Photograph 13: Extraction well pumping.

Photograph 14: Injection & re-circulation.

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Charlotte, North Carolina 28203
704-586-0007 (p) 704-586-0373 (f)

Photograph 15: Injection & re-circulation equipment.

Photograph 16: Injection & re-circulation.

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Photograph 17: Totalizing flow meters and flow control valves in two legs off injection manifold.

Photograph 18: Totalizing flow meter.

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704-586-0007 (p) 704-586-0373 (f)

Photograph 19: Injection manifold.

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Appendix C

Extraction Well Boring Logs & Construction Records

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

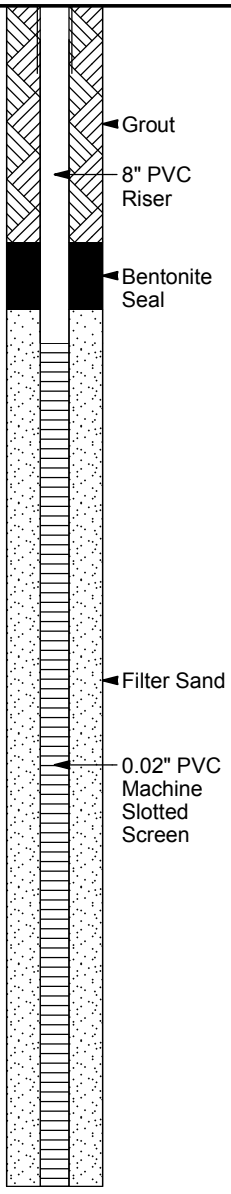
3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER EW-2

PROJECT: Clariant - Kalama RA
JOB NUMBER: CLR-045
LOCATION: Kalama, Washington

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Gray/brown, loose, slightly moist, fine to medium SAND (2010 excavation backfill material)
15						Gray/black/brown, slightly moist, fine to coarse SAND
20						Gray/black/brown, very moist to wet, fine to coarse SAND
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DEPTH (ft): 0, 5, 10, 15, 20, 25, 30, 35

DRILLING CONTRACTOR: Cascade Drilling
DRILL RIG/ METHOD: CME-75 / Hollow Stem Auger
SAMPLING METHOD: Drill Cuttings
LOGGED BY: BSD
DRAWN BY:

BORING STARTED: 12/5/11
BORING COMPLETED: 12/5/11
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

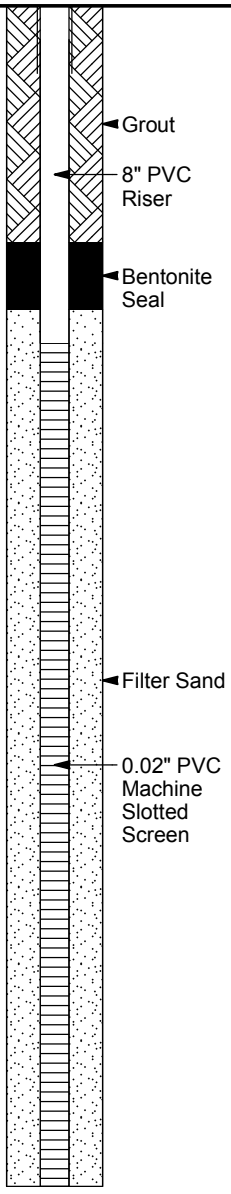
3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER EW-3

PROJECT: Clariant - Kalama RA
JOB NUMBER: CLR-045
LOCATION: Kalama, Washington

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Gray/brown, loose, slightly moist, fine to medium SAND (2010 excavation backfill material)
15						Gray/black/brown, slightly moist, fine to coarse SAND
20						Gray/black/brown, very moist to wet, fine to coarse SAND
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DEPTH (ft): 0, 5, 10, 15, 20, 25, 30, 35

DRILLING CONTRACTOR: Cascade Drilling
DRILL RIG/ METHOD: CME-75 / Hollow Stem Auger
SAMPLING METHOD: Drill Cuttings
LOGGED BY: BSD
DRAWN BY:

BORING STARTED: 12/6/11
BORING COMPLETED: 12/6/11
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

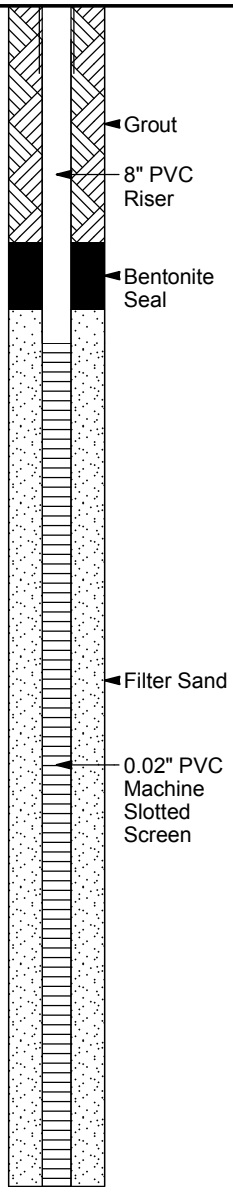
3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER EW-4

PROJECT: Clariant - Kalama RA
JOB NUMBER: CLR-045
LOCATION: Kalama, Washington

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Gray/brown, loose, slightly moist, fine to medium SAND (2010 excavation backfill material)
15						Gray/black/brown, slightly moist, fine to coarse SAND
20						Gray/black/brown, very moist to wet, fine to coarse SAND
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DEPTH (ft): 0, 5, 10, 15, 20, 25, 30, 35

DRILLING CONTRACTOR: Cascade Drilling
DRILL RIG/ METHOD: CME-75 / Hollow Stem Auger
SAMPLING METHOD: Drill Cuttings
LOGGED BY: BSD
DRAWN BY:

BORING STARTED: 12/6/11
BORING COMPLETED: 12/6/11
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

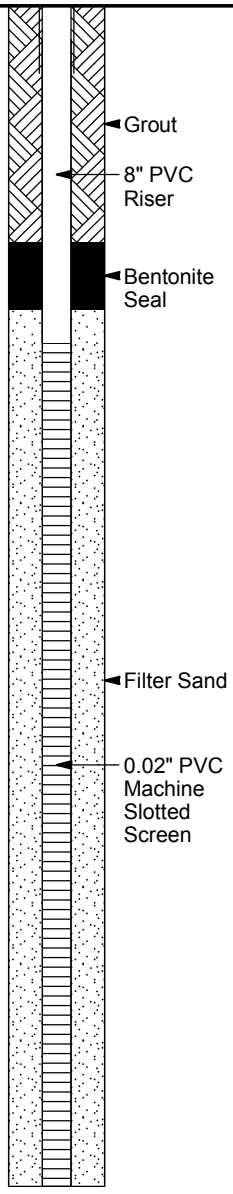
3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER EW-5

PROJECT: Clariant - Kalama RA
JOB NUMBER: CLR-045
LOCATION: Kalama, Washington

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Gray/brown, loose, slightly moist, fine to medium SAND (2010 excavation backfill material)
15						Gray/black/brown, slightly moist, fine to coarse SAND
20						Gray/black/brown, very moist to wet, fine to coarse SAND
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DEPTH (ft): 0, 5, 10, 15, 20, 25, 30, 35

DRILLING CONTRACTOR: Cascade Drilling
DRILL RIG/ METHOD: CME-75 / Hollow Stem Auger
SAMPLING METHOD: Drill Cuttings
LOGGED BY: BSD
DRAWN BY:

BORING STARTED: 12/7/11
BORING COMPLETED: 12/7/11
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

BORING LOG - HART HICKMAN.GDT - 9/25/12 16:11 - S:\AAA-MASTER GINT PROJECTS\CLR-045.GPJ

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

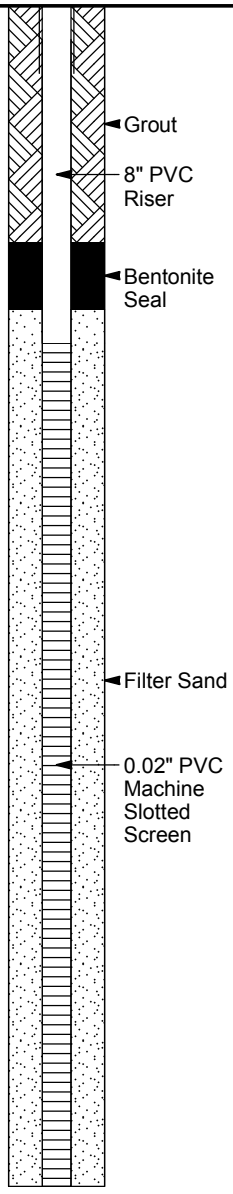
3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER EW-6

PROJECT: Clariant - Kalama RA
JOB NUMBER: CLR-045
LOCATION: Kalama, Washington

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Gray/brown, loose, slightly moist, fine to medium SAND (2010 excavation backfill material)
15						Gray/black/brown, slightly moist, fine to coarse SAND
20						Gray/black/brown, very moist to wet, fine to coarse SAND
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DEPTH (ft): 0, 5, 10, 15, 20, 25, 30, 35

DRILLING CONTRACTOR: Cascade Drilling
DRILL RIG/ METHOD: CME-75 / Hollow Stem Auger
SAMPLING METHOD: Drill Cuttings
LOGGED BY: BSD
DRAWN BY:

BORING STARTED: 12/7/11
BORING COMPLETED: 12/7/11
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

hart hickman
SMARTER ENVIRONMENTAL SOLUTIONS

2923 South Tryon Street-Suite 100
Charlotte, North Carolina 28203
704-586-0007(p) 704-586-0373(f)

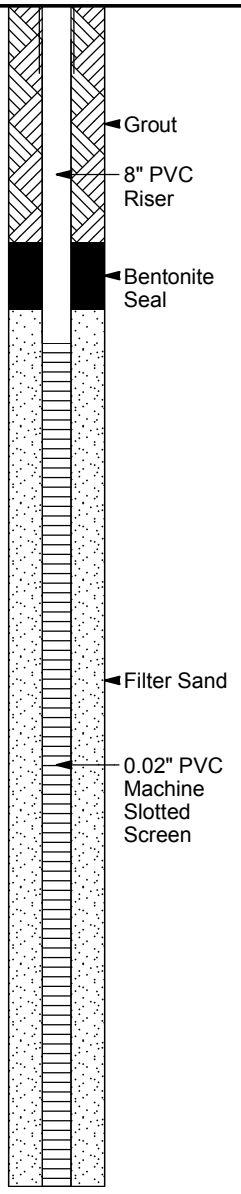
3334 Hillsborough Street
Raleigh, North Carolina 27607
919-847-4241(p) 919-847-4261(f)

BORING NUMBER EW-7

PROJECT: Clariant - Kalama RA
JOB NUMBER: CLR-045
LOCATION: Kalama, Washington

DEPTH (ft)	RECOVERY (%)	SAMPLE TYPE NUMBER	OVA (ppm) BKG.	OVA (ppm) SAMP.	LITHOLOGY	MATERIAL DESCRIPTION
0						Gravel
						Gray/brown, moist, fine to coarse SAND
20						Gray/brown, moist to wet, fine to coarse SAND
25						Gray/black/brown, wet, medium to coarse SAND, with some fine to medium gravel
35						Bottom of borehole at 35.0 feet.

BORING DIAGRAM



DEPTH (ft)

DRILLING CONTRACTOR: Cascade Drilling
DRILL RIG/ METHOD: CME-75 / Hollow Stem Auger
SAMPLING METHOD: Drill Cuttings
LOGGED BY: BSD
DRAWN BY:

BORING STARTED: 12/5/11
BORING COMPLETED: 12/5/11
TOTAL DEPTH: 35 ft.
TOP OF CASING ELEV:
DEPTH TO WATER:

Remarks:

BORING LOG - HART HICKMAN.GDT - 9/25/12 16:11 - S:\AAA-MASTER GINT PROJECTS\CLR-045.GPJ

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE06593

Construction/Decommission

P11350-5692

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Chemtrade Performance Chemicals**

Site Address: **404 Hendrickson Drive**

Consulting Firm: **Hart & Hickman**

City: **Kalama** County: **Cowlitz**

Unique Ecology Well ID Tag No. **BHH- 259**

Location: 1/4 **NW** 1/4 **NW** Sec **20** Twn **6N** R **1W** EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

[x] Driller [ ] Trainee Name (Print) **Darryl Metzger**

Driller/Trainee Signature _____

Tax Parcel No. **6-005401**

Driller/Trainee License No. **2587**

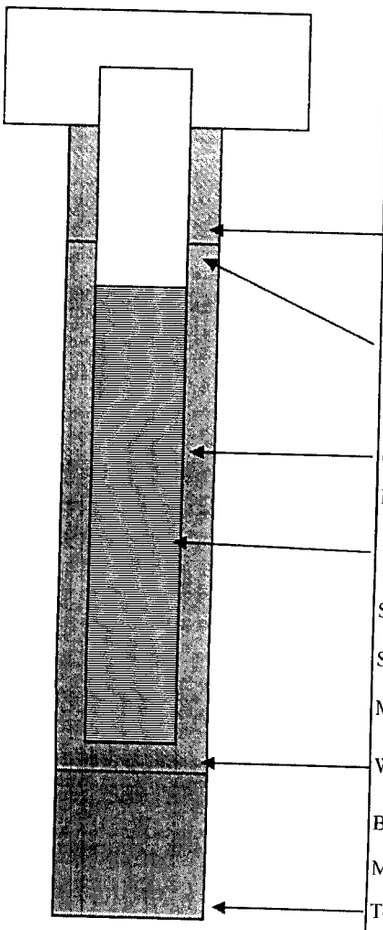
Cased Diameter 8" Static Level 27'

If trainee, licensed driller's Signature and License No. _____

Work/Decommission Start Date 12/6/11

Work/Decommission End Date 12/6/11

Construction/Design



Well Name:

Concrete Surface Seal Depth	1	FT
Blank Casing (dia x dep)	8" x 10'	
Material	PVC sch 40	
Backfill	1' - 8'	FT
Type	bent chips	
Seal	7'	
Material	bent chips	
Gravel Pack	27	FT
Material	Silica Sand 8/12	
Screen (dia x dep)	8" x 25'	
Slot Size	020	
Material	PVC sch 40 ~~Silica Sand~~	
Well Depth	35	FT
Backfill		
Material		
Total Hole Depth	35	FT

Formation Description

0 - 35'	FT	Coarse, med, fine sand
0 -	FT	
0 -	FT	

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE06593

Construction/Decommission

P11350-5692

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Chemtrade Performance Chemicals**

Site Address: **404 Hendrickson Drive**

Consulting Firm: **Hart & Hickman**

City: **Kalama** County: **Cowlitz**

Unique Ecology Well ID Tag No. **BHH- 260**

Location 1/4 **NW** 1/4 **NW** Sec **20** Twn **6N** R **1W** EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

[x] Driller [ ] Trainee Name (Print) **Darryl Metzger**

Driller/Trainee Signature _____

Driller/Trainee License No. **2587**

Tax Parcel No. **6-005401**

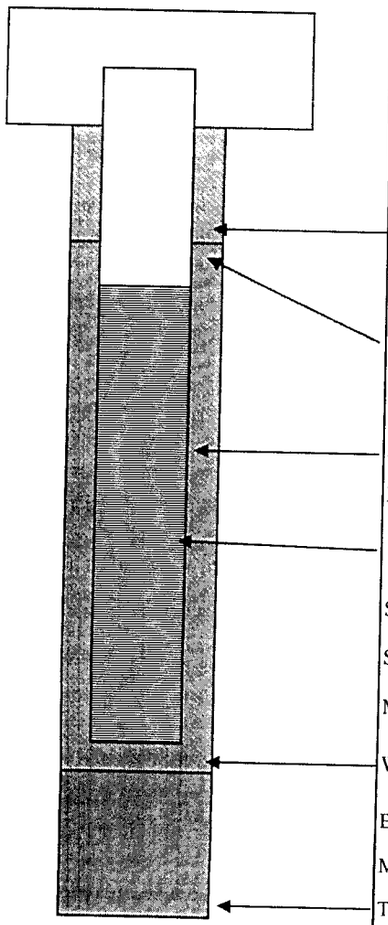
Cased Diameter 8" Static Level 27'

If trainee, licensed driller's Signature and License No. _____

Work/Decommission Start Date 12/5/11

Work/Decommission End Date 12/5/11

Construction/Design



Well Name:

Concrete Surface Seal Depth	1 FT
Blank Casing (dia x dep)	8" x 9'
Material	PVC Sch 40
Backfill	1' - 7' FT
Type	Bent chips
Seal	6"
Material	Bent
Gravel Pack	27 FT
Material	Silica 8/12
Screen (dia x dep)	8" x 25
Slot Size	.020
Material	PVC Sch 40
Well Depth	34' FT
Backfill	34' - 35
Material	Silica
Total Hole Depth	35 FT

Formation Description

0 - 35' FT

Course, med, fine Sand

0 - FT

0 - FT

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rec=v 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. RE06593

Construction/Decommission

P11350-5692

[X] Construction
[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well
[X] Resource Protection
[ ] Geotechnical Soil Boring

Property Owner: **Chemtrade Performance Chemicals**
Site Address: **404 Hendrickson Drive**
Consulting Firm: **Hart & Hickman**
City: **Kalama** County: **Cowlitz**

Unique Ecology Well ID
Tag No. **BHH-** 261

Location 1/4 **NW** 1/4 **NW** Sec **20** Twn **6N** R **1W** EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

[x] Driller [ ] Trainee Name (Print) **Darryl Metzger**
Driller/Trainee Signature _____
Driller/Trainee License No. **2587**

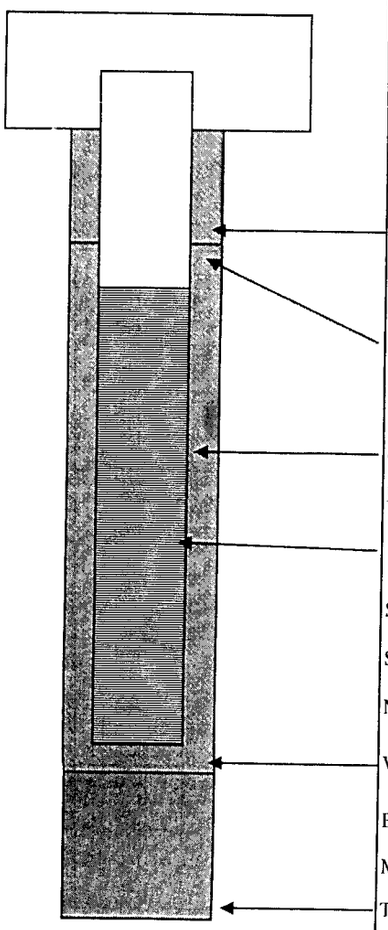
Tax Parcel No. **6-005401**

Cased Diameter 8" Static Level 25

If trainee, licensed driller's Signature and License No. _____

Work/Decommission Start Date 12/5/11
Work/Decommission End Date 12/5/11

Construction/Design



Well Name:

Concrete Surface Seal Depth	1	FT
Blank Casing (dia x dep)	8" x 8'	
Material		
Backfill	1' – 6'	FT
Type	bent chips	
Seal		
Material		
Gravel Pack	27	FT
Material	Silica 8/12	
Screen (dia x dep)	8" x 25'	
Slot Size	.020	
Material	PVC sch 40	
Well Depth	33'	FT
Backfill	33' – 35'	
Material	Silica 8/12	
Total Hole Depth	35	FT

Formation Description

0 - 35'	FT	Coarse-med-Fine Sand
0 -	FT	
0 -	FT	

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE06593

Construction/Decommission

P11350-5692

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Chemtrade Performance Chemicals**

Site Address: **404 Hendrickson Drive**

Consulting Firm: **Hart & Hickman**

City: **Kalama** County: **Cowlitz**

Unique Ecology Well ID Tag No. **BHH- 267**

Location 1/4 **NW** 1/4 **NW** Sec **20** Twn **6N** R **1W** EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

[x] Driller [ ] Trainee Name (Print) **Darryl Metzger**

Driller/Trainee Signature _____

Driller/Trainee License No. **2587**

Tax Parcel No. **6-005401**

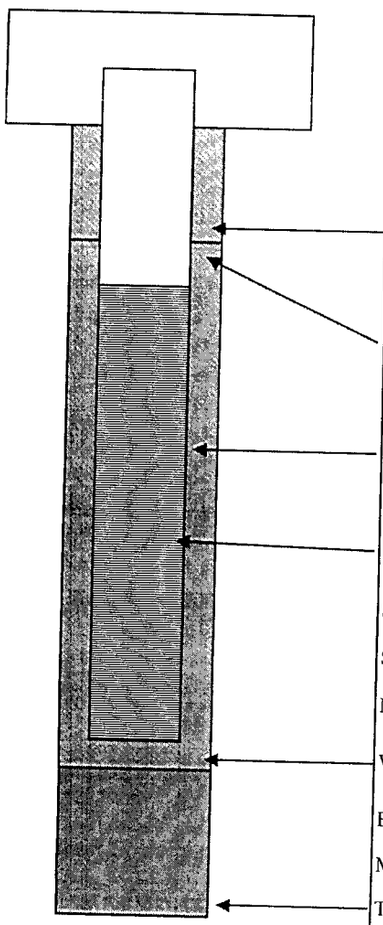
Cased Diameter 8" Static Level 27'

Work/Decommission Start Date 12/6/11

Work/Decommission End Date 12/6/11

If trainee, licensed driller's Signature and License No. _____

Construction/Design



Well Name:

Concrete Surface Seal Depth	1	FT
Blank Casing (dia x dep)	8" x 10'	
Material	PVC sch 40	
Backfill	1' - 8'	FT
Type	bent chips	
Seal	8	
Material	bent chips	
Gravel Pack	27	FT
Material	Silica 8/12	
Screen (dia x dep)	6" x 25'	
Slot Size	020	
Material	Silica 8/12	
Well Depth	35'	FT
Backfill		
Material		
Total Hole Depth	35'	FT

Formation Description

0 - 35' FT — Coarse, med, fine Sand

0 - _____ FT

0 - _____ FT

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rec=v 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT

Notice of Intent No. RE06593

P11350-5692

Construction/Decommission

[X] Construction

[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well

[X] Resource Protection

[ ] Geotechnical Soil Boring

Property Owner: **Chemtrade Performance Chemicals**

Site Address: **404 Hendrickson Drive**

Consulting Firm: **Hart & Hickman**

City: **Kalama** County: **Cowlitz**

Unique Ecology Well ID Tag No. **BHH- 263**

Location 1/4 **NW** 1/4 **NW** Sec **20** Twn **6N** R **1W** EWM or WWM

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards. Materials used and the information reported above are true to my best knowledge and belief.

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

[x] Driller [ ] Trainee Name (Print) **Darryl Metzger**

Driller/Trainee Signature _____

Tax Parcel No. **6-005401**

Driller/Trainee License No. **2587**

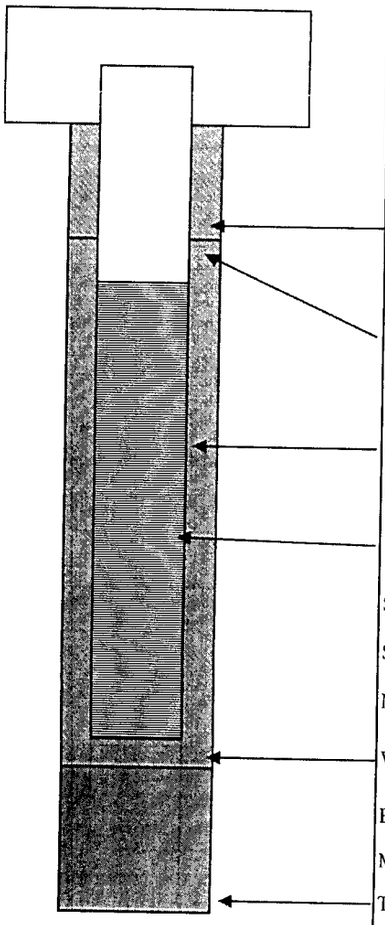
Cased Diameter 8" Static Level 27"

If trainee, licensed driller's Signature and License No. _____

Work/Decommission Start Date 12-7-2011

Work/Decommission End Date 12-7-2011

Construction/Design



Well Name:

Concrete Surface Seal Depth	1 FT
Blank Casing (dia x dep)	8" x 10'
Material	PVC Sch 40
Backfill	1-8' FT
Type	bent chips
Seal	7'
Material	bent chips
Gravel Pack	27 FT
Material	Silica Sand 8/12
Screen (dia x dep)	8' x 25'
Slot Size	020
Material	PVC sch 40
Well Depth	35 FT
Backfill	
Material	
Total Hole Depth	35 FT

Formation Description

0 - 35 FT: Coarse, med. fine sand

0 - _____ FT

0 - _____ FT

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rec=v 2/01)

RESOURCE PROTECTION WELL REPORT

(SUBMIT ONE WELL REPORT PER WELL INSTALLED)

CURRENT
Notice of Intent No. RE06593

Construction/Decommission

P11350-5692

[X] Construction
[ ] Decommission *ORIGINAL INSTALLATION Notice of Intent Number* _____

Type of Well
[X] Resource Protection
[ ] Geotechnical Soil Boring

Property Owner: **Chemtrade Performance Chemicals**
Site Address: **404 Hendrickson Drive**
City: **Kalama** County: **Cowlitz**

Consulting Firm: **Hart & Hickman**

Unique Ecology Well ID
Tag No. **BHH- 264**

Location 1/4 **NW** 1/4 **NW** Sec **20** Twn **6N** R **1W** EWM or WWM

Lat/Long (s,t,r still Required) Lat Deg _____ Lat Min/Sec _____ Long Deg _____ Long Min/Sec _____

WELL CONSTRUCTION CERTIFICATION: I constructed and/or accept responsibility for construction of this well, and its compliance with all Washington well construction standards Materials used and the information reported above are true to my best knowledge and belief

[x] Driller [ ] Trainee Name (Print) **Darryl Metzger**

Driller/Trainee Signature _____

Driller/Trainee License No. **2587**

If trainee, licensed driller's Signature and License No. _____

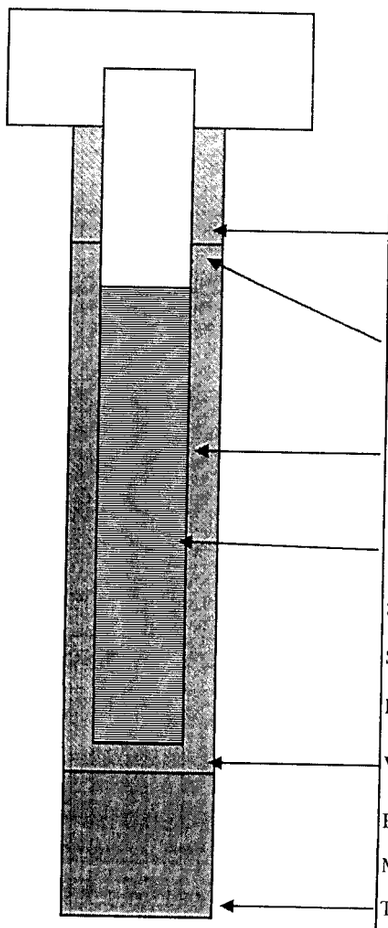
Tax Parcel No. **6-005401**

Cased Diameter 8" Static Level 27'

Work/Decommission Start Date 12-7-11

Work/Decommission End Date 12-7-11

Construction/Design



Well Name:

Concrete Surface Seal Depth	1	FT
Blank Casing (dia x dep)	8" x 10'	
Material	PVC sch 40	
Backfill	1' - 8'	FT
Type	bent chips	
Seal	7'	
Material	bent chips	
Gravel Pack	27	FT
Material	Silica Sand 8/12	
Screen (dia x dep)	8" x 25'	
Slot Size	.020	
Material	PVC Sch 40	
Well Depth	35	FT
Backfill		
Material		
Total Hole Depth	35	FT

Formation Description

0 - 35	FT	Coarse, med. fine sand
0 -	FT	
0 -	FT	

Scale 1" = _____

Page _____ of _____

ECY 050-12 (Rev 2/01)

Appendix D
Laboratory Analytical Data Reports

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Tel: (503) 906-9200

TestAmerica Job ID: PVA0403
Client Project/Site: CLR-045
Client Project Description: Clariant - Kalama

For:
Hart & Hickman
2923 S. Tryon St, Ste. 100
Charlotte, NC 28203

Attn: Scott Drury

Authorized for release by:
1/27/2012 5:03:32 PM

Darrell Auvil
Project Manager
darrell.auvil@testamericainc.com

Table of Contents

Sample Summary

Client: Hart & Hickman
Project/Site: CLR-045

TestAmerica Job ID: PVA0403

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
PVA0403-01	AB1	Water	01/12/12 13:50	01/13/12 17:30
PVA0403-02	AB2	Water	01/12/12 09:40	01/13/12 17:30
PVA0403-03	PZ1	Water	01/12/12 10:10	01/13/12 17:30
PVA0403-04	PZ3	Water	01/12/12 14:20	01/13/12 17:30
PVA0403-05	PZ4	Water	01/12/12 15:20	01/13/12 17:30
PVA0403-06	PZ5	Water	01/12/12 15:50	01/13/12 17:30
PVA0403-07	PZ6	Water	01/12/12 14:50	01/13/12 17:30
PVA0403-08	PZ12	Water	01/12/12 12:55	01/13/12 17:30
PVA0403-09	PZ13	Water	01/12/12 13:25	01/13/12 17:30
PVA0403-10	OW1	Water	01/12/12 11:00	01/13/12 17:30
PVA0403-11	OW2	Water	01/12/12 10:35	01/13/12 17:30
PVA0403-12	OW3	Water	01/12/12 11:40	01/13/12 17:30

Client: Hart & Hickman
Project/Site: CLR-045

TestAmerica Job ID: PVA0403

Qualifiers

Metals

Qualifier	Qualifier Description
MHA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
RL1	Reporting limit raised due to sample matrix effects.

Wet Chem

Qualifier	Qualifier Description
M8	The MS and/or MSD were below the acceptance limits. See Blank Spike (LCS).

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DL, RA, RE, IN	Indicates a Dilution, Reanalysis, Re-extraction, or additional Initial metals/anion analysis of the sample
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: AB1

Lab Sample ID: PVA0403-01

Date Collected: 01/12/12 13:50

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 00:15	1.00
Zinc	**0.923**		0.0200		mg/l		01/18/12 12:25	01/19/12 00:15	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: AB2

Lab Sample ID: PVA0403-02

Date Collected: 01/12/12 09:40

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 00:27	1.00
Zinc	**19.5**		0.100		mg/l		01/18/12 12:25	01/19/12 19:13	5.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ1

Lab Sample ID: PVA0403-03

Date Collected: 01/12/12 10:10

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 00:39	1.00
Zinc	**40.0**		0.200		mg/l		01/18/12 12:25	01/19/12 19:25	10.0

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ3

Lab Sample ID: PVA0403-04

Date Collected: 01/12/12 14:20

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 00:45	1.00
Zinc	**4.53**		0.0200		mg/l		01/18/12 12:25	01/19/12 00:45	1.00

Method: NCA SOP - Lab Filtration

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lab Filtration	ND		1.00		N/A		01/17/12 10:19	01/17/12 10:31	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ4

Lab Sample ID: PVA0403-05

Date Collected: 01/12/12 15:20

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 00:51	1.00
Zinc	**0.437**		0.0200		mg/l		01/18/12 12:25	01/19/12 00:51	1.00

Method: NCA SOP - Lab Filtration

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lab Filtration	ND		1.00		N/A		01/17/12 10:19	01/17/12 10:31	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ5

Lab Sample ID: PVA0403-06

Date Collected: 01/12/12 15:50

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 00:57	1.00
Zinc	**0.394**		0.0200		mg/l		01/18/12 12:25	01/19/12 00:57	1.00

Method: NCA SOP - Lab Filtration

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lab Filtration	ND		1.00		N/A		01/17/12 10:19	01/17/12 10:31	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ6

Lab Sample ID: PVA0403-07

Date Collected: 01/12/12 14:50

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 19:32	1.00
Zinc	**0.0263**		0.0200		mg/l		01/18/12 12:25	01/19/12 01:16	1.00

Method: NCA SOP - Lab Filtration

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lab Filtration	ND		1.00		N/A		01/17/12 10:19	01/17/12 10:31	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ12

Lab Sample ID: PVA0403-08

Date Collected: 01/12/12 12:55

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND	RL1	0.200		mg/l		01/18/12 12:25	01/19/12 19:38	20.0
Zinc	**83.6**		0.400		mg/l		01/18/12 12:25	01/19/12 19:38	20.0

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**1.01**		0.400		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: PZ13

Lab Sample ID: PVA0403-09

Date Collected: 01/12/12 13:25

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 19:44	1.00
Zinc	**2.14**		0.0200		mg/l		01/18/12 12:25	01/19/12 01:28	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**61.0**		20.0		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: OW1

Lab Sample ID: PVA0403-10

Date Collected: 01/12/12 11:00

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND	RL1	0.100		mg/l		01/18/12 12:25	01/19/12 19:50	10.0
Zinc	**44.5**		0.200		mg/l		01/18/12 12:25	01/19/12 19:50	10.0

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample ID: OW2

Lab Sample ID: PVA0403-11

Date Collected: 01/12/12 10:35

Matrix: Water

Date Received: 01/13/12 17:30

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND	RL1	0.100		mg/l		01/18/12 12:25	01/19/12 19:56	10.0
Zinc	**52.5**		0.200		mg/l		01/18/12 12:25	01/19/12 19:56	10.0

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Client Sample Results

Client: Hart & Hickman
Project/Site: CLR-045

TestAmerica Job ID: PVA0403

Client Sample ID: OW3
Date Collected: 01/12/12 11:40
Date Received: 01/13/12 17:30

Lab Sample ID: PVA0403-12
Matrix: Water

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/19/12 20:08	1.00
Zinc	**8.10**		0.0200		mg/l		01/18/12 12:25	01/19/12 01:52	1.00

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**0.597**		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Method: EPA 200.7 - Dissolved Metals per EPA 200 Series Methods

Lab Sample ID: 12A0454-BLK1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12A0454 — **Prep Batch: 12A0454_P**

Analyte	Blank Result	Blank Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.0100		mg/l		01/18/12 12:25	01/18/12 23:59	1.00
Zinc	ND		0.0200		mg/l		01/18/12 12:25	01/18/12 23:59	1.00

Lab Sample ID: 12A0454-BS1 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12A0454 — **Prep Batch: 12A0454_P**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.500	0.508		mg/l		102	85 - 115
Zinc	1.00	0.996		mg/l		99.6	85 - 115

Lab Sample ID: 12A0454-MS1 — **Client Sample ID: AB2**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12A0454 — **Prep Batch: 12A0454_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	Matrix Spike Result	Matrix Spike Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND		0.500	0.509		mg/l		102	75 - 125

Lab Sample ID: 12A0454-MS1 — **Client Sample ID: AB2**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12A0454 — **Prep Batch: 12A0454_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	Matrix Spike Result	Matrix Spike Qualifier	Unit	D	%Rec	%Rec. Limits
Zinc	19.5		1.00	19.8	MHA	mg/l		29.2	75 - 125

Lab Sample ID: 12A0454-MS2 — **Client Sample ID: OW2**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12A0454 — **Prep Batch: 12A0454_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	Matrix Spike Result	Matrix Spike Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	ND	RL1	0.500	0.552		mg/l		110	75 - 125
Zinc	52.5		1.00	53.5		mg/l		99.0	75 - 125

Lab Sample ID: 12A0454-DUP1 — **Client Sample ID: AB1**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12A0454 — **Prep Batch: 12A0454_P**

Analyte	Sample Result	Sample Qualifier	Duplicate Result	Duplicate Qualifier	Unit	D	RPD	RPD Limit
Cadmium	ND		ND		mg/l			20
Zinc	0.923		0.990		mg/l		6.97	20

Method: NCA SOP - Lab Filtration

Lab Sample ID: 12A0407-BLK1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12A0407 — **Prep Batch: 12A0407_P**

Analyte	Blank Result	Blank Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Lab Filtration	ND		1.00		N/A		01/17/12 10:19	01/17/12 10:31	1.00

Client: Hart & Hickman
Project/Site: CLR-045

TestAmerica Job ID: PVA0403

Method: SM 4500-S-2 D - Conventional Chemistry Parameters per Standard Methods

Lab Sample ID: 12A0349-BLK1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12A0349 — **Prep Batch: 12A0349_P**

Analyte	Blank Result	Blank Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.200		mg/l		01/16/12 07:27	01/16/12 14:48	1.00

Lab Sample ID: 12A0349-BS1 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12A0349 — **Prep Batch: 12A0349_P**

Analyte			Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits		
Sulfide			1.00	0.952		mg/l		95.2	75 - 125		

Lab Sample ID: 12A0349-MS1 — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12A0349 — **Prep Batch: 12A0349_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	Matrix Spike Result	Matrix Spike Qualifier	Unit	D	%Rec	%Rec. Limits		
Sulfide	ND		1.00	0.348	M8	mg/l		34.8	75 - 125		

Lab Sample ID: 12A0349-DUP1 — **Client Sample ID: Duplicate**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12A0349 — **Prep Batch: 12A0349_P**

Analyte	Sample Result	Sample Qualifier		Duplicate Result	Duplicate Qualifier	Unit	D			RPD	RPD Limit
Sulfide	ND			ND		mg/l					20

Certification Summary

Client: Hart & Hickman
Project/Site: CLR-045

TestAmerica Job ID: PVA0403

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Portland	Alaska	Alaska UST	10	UST-012
TestAmerica Portland	Alaska	State Program	10	OR00040
TestAmerica Portland	California	State Program	9	2597
TestAmerica Portland	Oregon	NELAC	10	OR100021
TestAmerica Portland	USDA	USDA		P330-11-00092
TestAmerica Portland	Washington	State Program	10	C586

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave,Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210 X
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #: PVA0403

CLIENT: H+H

INVOICE TO: Cynthia Wells ← ~~Same~~ SAME

REPORT TO: Scott Drumm
ADDRESS: 2923 S. Tryon St. ~~SE~~ 100, Charlotte, NC 28203

PHONE: 7045860027 FAX:

P.O. NUMBER: CLA.045

PROJECT NAME: CLARIANT - BALEMAN

PROJECT NUMBER: CLA.045

SAMPLED BY: BSD

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1

OTHER Specify: STD

* Turnaround Requests less than standard may incur Rush Charges.

PRESERVATIVE: HNO3, None

REQUESTED ANALYSES: Dissolved Zn + Cd; Total Sulfides

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Dissolved Zn + Cd	Total Sulfides	MATRIX (W, S, O)	# OF CONT.	LOCATION/ COMMENTS	TA WO ID
1	AB1	1/12/12 1350	X	X	W	2	Field Filtered	
2	AB2	1/12/12 0940	X	X	W	2	Field Filtered	
3	PZ1	1/12/12 1010	X	X	W	2	Field Filtered	
4	PZ3	1/12/12 1420	X	X	W	2	Not Field Filtered	
5	PZ4	1/12/12 1520	X	X	W	2	Not Field Filtered	
6	PZ5	1/12/12 1550	X	X	W	2	Not FF	
7	PZ6	1/12/12 1450	X	X	W	2	Not FF	
8	PZ12	1/12/12 1255	X	X	W	2	Field Filtered	
9	PZ13	1/12/12 1325	X	X	W	2	Field Filtered	
10	OW1	1/12/12 1100	X	X	W	2	Field Filtered	

RELEASED BY: Scott Drumm — DATE: 1/13/12 — TIME: 1000
PRINT NAME: Scott Drumm — FIRM: H+H

RECEIVED BY: Paul Surbeck-Serey — DATE: 1/13/12 — TIME: 1730
PRINT NAME: Paul Surbeck-Serey — FIRM: TAP

RELEASED BY: — DATE: — TIME:
PRINT NAME: — FIRM:

RECEIVED BY: — DATE: — TIME:
PRINT NAME: — FIRM:

ADDITIONAL REMARKS: All Samples for Dissolved Zinc + Cadmium by 6010

*PZ3, PZ4, PZ6, PZ5 Samples were collected into unpreserved bottles + NOT Field Filtered

TEMP: 3.1

PAGE 1 OF 2

TAL-1000(0408)

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave,Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210 ☒
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #: PVA0403

CLIENT: H+H

INVOICE TO: ATTN Cynthia Wells ← SAME

REPORT TO: Scott Denny
ADDRESS: 2923 S. Tryon St Ste 100 Charlotte, NC 28203
PHONE: 704 586 0007 FAX:

P.O. NUMBER:

PROJECT NAME: Clariant Kalama
PROJECT NUMBER: CLA.005
SAMPLED BY: BSD

TURNAROUND REQUEST
in Business Days *

Organic & Inorganic Analyses: 10 STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1

OTHER Specify: STD

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	PRESERVATIVE: HNO3	PRESERVATIVE: La Acetate	REQUESTED ANALYSES: Dissolved Zn + Cl	REQUESTED ANALYSES: Total Sulfide	MATRIX (W, S, O)	# OF CONT.	LOCATION/ COMMENTS	TA WO ID
1	OW2	1/12/12 / 1035	X	X			W	2	Field Filtered	
2	OW3	1/12/12 / 1140	X	X			W	2	Field Filtered	
3										
4										
5										
6										
7										
8										
9										
10										

RELEASED BY: Scott Denny DATE: TIME:
PRINT NAME: Scott Denny FIRM: H+H

RECEIVED BY: PHIL SUARK DATE: 1/13/12
PRINT NAME: PHIL SUARK FIRM: TAP TIME: 1730

RELEASED BY: DATE: TIME:
PRINT NAME: FIRM:

RECEIVED BY: DATE: TIME:
PRINT NAME: FIRM:

ADDITIONAL REMARKS:

TEMP: 3.1

PAGE 2 OF 2

TAL-1000(0408)

Seway

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Portland Sample Control Checklist

Work Order #: PVA0403 **Date/Time Received:** 1/13/12 @ 1730

Client Name: Hart & Hickman

Project Name: Clariant - Kalama

Time Zone:
☐EDT/EST ☐CDT/CST ☐MDT/MST ☑PDT/PST ☐AK ☐HI ☐OTHER

Unpacking Checks:

Cooler (s): 1

Temperature (s): 3.1

Digi #1 ☐ **Digi #2** ☐ **IR Gun** ☑ (☑Plastic ☐Glass)

IR Gun- Degree ☐ (☑Plastic)

Ice used: (circle one) GEL LOOSE BLUE NONE OTHER: _____ **Initials:** PSJ

Temperature out of Range:
__Not enough or No Ice
__Ice Melted
__W/in 4 Hrs of collection
__Ice Not Needed
__ Other:_____

N/A	Yes	No	
☑	☐	☐	1. If ESI client, were temp blanks received? If no, document on NOD.
☑	☐	☐	2. Custody seals intact? If ESI client and no is checked, document on NOD.
	☑	☐	3. Chain of Custody present? If no, document on NOD. Along with "received by" & "relinquished by" signatures with date & time?
	☑	☐	4. Bottles received intact? If no, document on NOD.
	☑	☐	5. Sample is not multiphasic? If no, document on NOD.
	☑	☐	6. Sampler name/signature documented on COC?
	☑	☐	7. Proper container and preservatives used? If no, document on NOD.
☑	☐	☐	8. pH for ESI samples checked and meets requirements? If no, document on NOD.
☑	☐	☐	9. Cyanide samples checked for sulfides and meets requirements? If no, notify PM.
☑	☐	☐	10. HF Dilution required?
	☑	☐	11. Sufficient volume provided for all analysis and requested MS/MSD? If no, document on NOD and consult PM before proceeding.
	☑	☐	12. Did Chain of Custody agree with samples received? If no, document on NOD.
☑	☐	☐	13. Were VOA vial samples received without headspace?
☑	☐	☐	14. Did samples require preservation with sodium thiosulfate?
☑	☐	☐	15. If yes to #14, was the residual chlorine test negative? If no, document on NOD.
☐	☑	☐	16. Are dissolved/field filtered metals bottles sediment-free? If no, document on NOD.
☑	☐	☐	17. Are analyses with short holding times received in hold?
☑	☐	☐	18. Were special log- in instructions read and followed?
☐	☑	☐	19. Were lab sample labels verified against the client sample labels?

Sample cont. do not read FF, only the COC reads FF.

Checklist Reviewed: **Log-in initials:** _____ **Labeler initials:** _____

9405 SW Nimbus Ave, Beaverton OR 97008 **tel** 503.906.9200 **fax** 503.906.9210 **www.testamericainc.com**

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Portland
9405 SW Nimbus Ave.
Beaverton, OR 97008
Tel: (503)906-9200

TestAmerica Job ID: 250-1102-1
Client Project/Site: Groundwater

For:
Hart & Hickman, PC
3334 Hillsborough Street
Raleigh, North Carolina 27607

Attn: Mr. Scott Drury

Authorized for release by:
4/5/2012 11:47:04 AM

Peggy Siegfried
Project Manager I
peggy.siegfried@testamericainc.com

Table of Contents

Sample Summary

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
250-1102-1	PZ1	Water	03/21/12 12:35	03/22/12 17:45
250-1102-2	PZ3	Water	03/21/12 10:20	03/22/12 17:45
250-1102-3	PZ4	Water	03/21/12 11:35	03/22/12 17:45
250-1102-4	PZ5	Water	03/21/12 12:00	03/22/12 17:45
250-1102-5	PZ6	Water	03/21/12 11:05	03/22/12 17:45
250-1102-6	PZ12	Water	03/21/12 15:05	03/22/12 17:45
250-1102-7	PZ13	Water	03/21/12 15:55	03/22/12 17:45
250-1102-8	OW1	Water	03/21/12 14:20	03/22/12 17:45
250-1102-9	OW2	Water	03/21/12 13:20	03/22/12 17:45
250-1102-10	OW3	Water	03/21/12 14:00	03/22/12 17:45
250-1102-11	AB1	Water	03/21/12 10:35	03/22/12 17:45
250-1102-12	AB2	Water	03/21/12 12:55	03/22/12 17:45
250-1102-13	OW3-U	Water	03/21/12 14:00	03/22/12 17:45
250-1102-14	PZ12-U	Water	03/21/12 15:05	03/22/12 17:45
250-1102-15	PZ13-U	Water	03/21/12 15:55	03/22/12 17:45
250-1102-16	PZ13-S	Water	03/21/12 15:55	03/22/12 17:45

Definitions/Glossary

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Qualifiers

Metals

Qualifier	Qualifier Description
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.
4	MS, MSD: The analyte present in the original sample is 4 times greater than the matrix spike concentration; therefore, control limits are not applicable.

General Chemistry

Qualifier	Qualifier Description
F	MS or MSD exceeds the control limits

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DL, RA, RE, IN	Indicates a Dilution, Reanalysis, Re-extraction, or additional Initial metals/anion analysis of the sample
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Detection Summary

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Client Sample ID: PZ1 — Lab Sample ID: 250-1102-1

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0051	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	70		0.40	0.062	mg/L	20		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ3 — Lab Sample ID: 250-1102-2

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0017	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	11		0.10	0.016	mg/L	5		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ4 — Lab Sample ID: 250-1102-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.010		0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	1.7		0.020	0.0031	mg/L	1		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ5 — Lab Sample ID: 250-1102-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.043		0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	2.1		0.020	0.0031	mg/L	1		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ6 — Lab Sample ID: 250-1102-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	0.98		0.020	0.0031	mg/L	1		200.7 Rev 4.4	Dissolved
Sulfide	0.37		0.20	0.031	mg/L	1		376.2	Total/NA

Client Sample ID: PZ12 — Lab Sample ID: 250-1102-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0067	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	300		2.0	0.31	mg/L	100		200.7 Rev 4.4	Dissolved
Sulfide	0.37		0.20	0.031	mg/L	1		376.2	Total/NA

Client Sample ID: PZ13 — Lab Sample ID: 250-1102-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0024	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	89		0.40	0.062	mg/L	20		200.7 Rev 4.4	Dissolved

Client Sample ID: OW1 — Lab Sample ID: 250-1102-8

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0028	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	46		0.40	0.062	mg/L	20		200.7 Rev 4.4	Dissolved

Client Sample ID: OW2 — Lab Sample ID: 250-1102-9

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0084	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	91		0.40	0.062	mg/L	20		200.7 Rev 4.4	Dissolved

Client Sample ID: OW3 — Lab Sample ID: 250-1102-10

Detection Summary

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Client Sample ID: OW3 (Continued) — Lab Sample ID: 250-1102-10

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	11		0.10	0.016	mg/L	5		200.7 Rev 4.4	Dissolved

Client Sample ID: AB1 — Lab Sample ID: 250-1102-11

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	0.95		0.020	0.0031	mg/L	1		200.7 Rev 4.4	Dissolved

Client Sample ID: AB2 — Lab Sample ID: 250-1102-12

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Cadmium	0.0015	J	0.010	0.00030	mg/L	1		200.7 Rev 4.4	Dissolved
Zinc	20		0.10	0.016	mg/L	5		200.7 Rev 4.4	Dissolved

Client Sample ID: OW3-U — Lab Sample ID: 250-1102-13

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	9.9		0.020	0.0031	mg/L	1		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ12-U — Lab Sample ID: 250-1102-14

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	300		2.0	0.31	mg/L	100		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ13-U — Lab Sample ID: 250-1102-15

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	91		0.40	0.062	mg/L	20		200.7 Rev 4.4	Dissolved

Client Sample ID: PZ13-S — Lab Sample ID: 250-1102-16

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Zinc	80		0.40	0.062	mg/L	20		200.7 Rev 4.4	Dissolved

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Method: 200.7 Rev 4.4 - Metals (ICP) - Dissolved

Client Sample ID: PZ1 — **Lab Sample ID: 250-1102-1**
Date Collected: 03/21/12 12:35 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0051	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 19:39	1
Zinc	70		0.40	0.062	mg/L		03/28/12 15:01	03/29/12 22:43	20

Client Sample ID: PZ3 — **Lab Sample ID: 250-1102-2**
Date Collected: 03/21/12 10:20 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0017	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 19:45	1
Zinc	11		0.10	0.016	mg/L		03/28/12 15:01	03/29/12 22:49	5

Client Sample ID: PZ4 — **Lab Sample ID: 250-1102-3**
Date Collected: 03/21/12 11:35 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.010		0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 19:51	1
Zinc	1.7		0.020	0.0031	mg/L		03/28/12 15:01	03/29/12 19:51	1

Client Sample ID: PZ5 — **Lab Sample ID: 250-1102-4**
Date Collected: 03/21/12 12:00 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.043		0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:10	1
Zinc	2.1		0.020	0.0031	mg/L		03/28/12 15:01	03/29/12 20:10	1

Client Sample ID: PZ6 — **Lab Sample ID: 250-1102-5**
Date Collected: 03/21/12 11:05 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:16	1
Zinc	0.98		0.020	0.0031	mg/L		03/28/12 15:01	03/29/12 20:16	1

Client Sample ID: PZ12 — **Lab Sample ID: 250-1102-6**
Date Collected: 03/21/12 15:05 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0067	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:22	1
Zinc	300		2.0	0.31	mg/L		03/28/12 15:01	03/29/12 22:55	100

Client Sample ID: PZ13 — **Lab Sample ID: 250-1102-7**
Date Collected: 03/21/12 15:55 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0024	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:29	1
Zinc	89		0.40	0.062	mg/L		03/28/12 15:01	03/29/12 23:01	20

Client Sample ID: OW1 — **Lab Sample ID: 250-1102-8**
Date Collected: 03/21/12 14:20 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0028	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:35	1
Zinc	46		0.40	0.062	mg/L		03/28/12 15:01	03/29/12 23:07	20

Method: 200.7 Rev 4.4 - Metals (ICP) - Dissolved

Client Sample ID: OW2 — **Lab Sample ID: 250-1102-9**
Date Collected: 03/21/12 13:20 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0084	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:41	1
Zinc	91		0.40	0.062	mg/L		03/28/12 15:01	03/29/12 23:13	20

Client Sample ID: OW3 — **Lab Sample ID: 250-1102-10**
Date Collected: 03/21/12 14:00 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:53	1
Zinc	11		0.10	0.016	mg/L		03/28/12 15:01	03/29/12 23:38	5

Client Sample ID: AB1 — **Lab Sample ID: 250-1102-11**
Date Collected: 03/21/12 10:35 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 20:59	1
Zinc	0.95		0.020	0.0031	mg/L		03/28/12 15:01	03/29/12 20:59	1

Client Sample ID: AB2 — **Lab Sample ID: 250-1102-12**
Date Collected: 03/21/12 12:55 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	0.0015	J	0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 21:05	1
Zinc	20		0.10	0.016	mg/L		03/28/12 15:01	03/29/12 23:44	5

Client Sample ID: OW3-U — **Lab Sample ID: 250-1102-13**
Date Collected: 03/21/12 14:00 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Zinc	9.9		0.020	0.0031	mg/L		03/28/12 15:01	03/29/12 21:32	1

Client Sample ID: PZ12-U — **Lab Sample ID: 250-1102-14**
Date Collected: 03/21/12 15:05 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Zinc	300		2.0	0.31	mg/L		03/28/12 15:01	03/29/12 23:56	100

Client Sample ID: PZ13-U — **Lab Sample ID: 250-1102-15**
Date Collected: 03/21/12 15:55 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Zinc	91		0.40	0.062	mg/L		03/28/12 15:01	03/30/12 00:02	20

Client Sample ID: PZ13-S — **Lab Sample ID: 250-1102-16**
Date Collected: 03/21/12 15:55 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Zinc	80		0.40	0.062	mg/L		03/28/12 15:01	03/30/12 00:08	20

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

General Chemistry

Client Sample ID: PZ1 — **Lab Sample ID: 250-1102-1**
Date Collected: 03/21/12 12:35 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: PZ3 — **Lab Sample ID: 250-1102-2**
Date Collected: 03/21/12 10:20 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: PZ4 — **Lab Sample ID: 250-1102-3**
Date Collected: 03/21/12 11:35 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: PZ5 — **Lab Sample ID: 250-1102-4**
Date Collected: 03/21/12 12:00 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: PZ6 — **Lab Sample ID: 250-1102-5**
Date Collected: 03/21/12 11:05 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**0.37**		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: PZ12 — **Lab Sample ID: 250-1102-6**
Date Collected: 03/21/12 15:05 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**0.37**		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: PZ13 — **Lab Sample ID: 250-1102-7**
Date Collected: 03/21/12 15:55 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: OW1 — **Lab Sample ID: 250-1102-8**
Date Collected: 03/21/12 14:20 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: OW2 — **Lab Sample ID: 250-1102-9**
Date Collected: 03/21/12 13:20 — **Matrix: Water**
Date Received: 03/22/12 17:45

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

General Chemistry

Client Sample ID: OW3
Date Collected: 03/21/12 14:00
Date Received: 03/22/12 17:45

Lab Sample ID: 250-1102-10
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: AB1
Date Collected: 03/21/12 10:35
Date Received: 03/22/12 17:45

Lab Sample ID: 250-1102-11
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Client Sample ID: AB2
Date Collected: 03/21/12 12:55
Date Received: 03/22/12 17:45

Lab Sample ID: 250-1102-12
Matrix: Water

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Method: 200.7 Rev 4.4 - Metals (ICP)

Lab Sample ID: LCS 250-2873/2-A
Matrix: Water
Analysis Batch: 2965

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 2873

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.500	0.490		mg/L		98	85 - 115
Zinc	1.00	0.993		mg/L		99	85 - 115

Lab Sample ID: MB 250-2801/1-B
Matrix: Water
Analysis Batch: 2965

Client Sample ID: Method Blank
Prep Type: Dissolved
Prep Batch: 2873

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.010	0.00030	mg/L		03/28/12 15:01	03/29/12 19:02	1
Zinc	ND		0.020	0.0031	mg/L		03/28/12 15:01	03/29/12 19:02	1

Lab Sample ID: 250-1102-9 MS
Matrix: Water
Analysis Batch: 2965

Client Sample ID: OW2
Prep Type: Dissolved
Prep Batch: 2873

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.0084	J	0.500	0.510		mg/L		100	75 - 125

Lab Sample ID: 250-1102-9 MS
Matrix: Water
Analysis Batch: 2965

Client Sample ID: OW2
Prep Type: Dissolved
Prep Batch: 2873

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Zinc	91		1.00	90.1	4	mg/L		-121	75 - 125

Method: 376.2 - Sulfide

Lab Sample ID: MB 250-2815/4
Matrix: Water
Analysis Batch: 2815

Client Sample ID: Method Blank
Prep Type: Total/NA

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		0.20	0.031	mg/L			03/27/12 14:25	1

Lab Sample ID: LCS 250-2815/5
Matrix: Water
Analysis Batch: 2815

Client Sample ID: Lab Control Sample
Prep Type: Total/NA

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfide	1.00	0.753		mg/L		75	75 - 125

Lab Sample ID: 250-1102-1 MS
Matrix: Water
Analysis Batch: 2815

Client Sample ID: PZ1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	Spike Added	MS Result	MS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfide	ND		1.00	0.730	F	mg/L		73	75 - 125

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Method: 376.2 - Sulfide (Continued)

Lab Sample ID: 250-1102-1 DU
Matrix: Water
Analysis Batch: 2815

Client Sample ID: PZ1
Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier		DU Result	DU Qualifier	Unit	D			RPD	RPD Limit
Sulfide	ND			ND		mg/L				NC	20

Certification Summary

Client: Hart & Hickman, PC
Project/Site: Groundwater

TestAmerica Job ID: 250-1102-1

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Portland	Alaska	State Program	10	OR00040
TestAmerica Portland	Alaska (UST)	State Program	10	UST-012
TestAmerica Portland	California	State Program	9	2597
TestAmerica Portland	Oregon	NELAC	10	OR100021
TestAmerica Portland	USDA	Federal		P330-11-00092
TestAmerica Portland	Washington	State Program	10	C586

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

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11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave,Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #: 250-1102

CLIENT: Hart + Hickman

REPORT TO: Scott Drury sdrury@harthickman.com
ADDRESS: 2923 S. Tryon St. Ste 100
Charlotte, NC 28203

PHONE: 7049586007 FAX:

INVOICE TO: Same address
H+H
Attn: Cynthia Wells cwells@harthickman.com

P.O. NUMBER:

PROJECT NAME: Clariant - Kalama

PROJECT NUMBER: CLR.045

SAMPLED BY: Scott Drury

TURNAROUND REQUEST
in Business Days *

Organic & Inorganic Analyses: 10 STD. | 7 | 5 | 4 | 3 | 2 | 1 | <1

Petroleum Hydrocarbon Analyses: 5 STD. | 4 | 3 | 2 | 1 | <1

OTHER Specify: STD PER CONTRACT w/H+H

* Turnaround Requests less than standard may incur Rush Charges.

PRESERVATIVE: Nitric (HNO3/HCl) | NaOH

REQUESTED ANALYSES: 6010 Dissolved Zn + Ca | Total Sulfides

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	6010 Dissolved Zn + Ca	Total Sulfides	MATRIX (W, S, O)	# OF CONT.	LOCATION/ COMMENTS	TA WO ID
1	PZ1	032112 / ~~1235~~ 1330	X	X	W	2	Field filtered metals bottle	
2	PZ3	032112 / 1020	X	X	W	2	Field filtered metals bottle	
3	PZ4	032112 / 1135	X	X	W	2	Field filtered metals bottle only	
4	PZ5	032112 / 1200	X	X	W	2	Field filtered metals bottle only	
5	PZ6	032112 / 1105	X	X	W	2	Field filtered metals bottle	
6	PZ12	032112 / 1505	X	X	W	2	Field filtered metals bottle	
7	PZ13	032112 / 1555	X	X	W	2	Field filtered metals bottle	
8	OW1	032112 / 1420	X	X	W	2	Field filtered metals bottle	
9	OW2	032112 / 1320	X	X	W	2	Field filtered metals bottle	
10	OW3	032112 / 1400	X	X	W	2	Field filtered metals bottle	

RELEASED BY: Scott Drury DATE: 3/22/12
PRINT NAME: Scott Drury FIRM: H+H TIME:

RECEIVED BY: Phil Svabik-Sror DATE: 3/22/12
PRINT NAME: PHIL SVABIK-SROR FIRM: TAP TIME: 1745

RELEASED BY: DATE:
PRINT NAME: FIRM: TIME:

RECEIVED BY: DATE:
PRINT NAME: FIRM: TIME:

ADDITIONAL REMARKS:

TEMP: 1.0 PAGE OF

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11720 North Creek Pkwy N Suite 400, Bothell, WA 98011-8244 425-420-9200 FAX 420-9210
11922 E. First Ave, Spokane, WA 99206-5302 509-924-9200 FAX 924-9290
9405 SW Nimbus Ave, Beaverton, OR 97008-7145 503-906-9200 FAX 906-9210
2000 W International Airport Rd Ste A10, Anchorage, AK 99502-1119 907-563-9200 FAX 563-9210

CHAIN OF CUSTODY REPORT

Work Order #: 250-1102

CLIENT: H+H

INVOICE TO: H+H ATTN: CYNTHIA WELLS

REPORT TO: Scott Denny sdenny@harthickman.com
ADDRESS: 2923 S. Tryon St. Ste 100
Charlotte, NC 28203

PHONE: 704 586 0007 FAX:

P.O. NUMBER:

PROJECT NAME: Clariant - Kalama

PROJECT NUMBER: CLR.045

SAMPLED BY: Scott Denny

TURNAROUND REQUEST in Business Days *

Organic & Inorganic Analyses: 10 (STD.) 7 5 4 3 2 1 <1

Petroleum Hydrocarbon Analyses: 5 (STD.) 4 3 2 1 <1

OTHER Specify: STD PER CONTRACT w/ H+H

* Turnaround Requests less than standard may incur Rush Charges.

	CLIENT SAMPLE IDENTIFICATION	SAMPLING DATE/TIME	Dissolved Zn/Cd (Preservative: Nitric)	Total Sulfides (Preservative: NaOH)		Dissolved Zn only (Preservative: None)	Dissolved Zn (no acid) (Preservative: None)	Preserved								MATRIX (W, S, O)	# OF CONT.	LOCATION/ COMMENTS	TA WO ID
1	AB1	032112 / 1035	X	X												W	2	Field filtered metals bottle	
2	AB2	032112 / 1255	X	X												W	2	Field filtered metals bottle	
3																~~DISSD~~ (BSD)		(BSD)	
4	OW3-U	032112 / 1400				X	X									W	1	~~Run STD Dissolved Zn, Rest~~	
5	PZ12-U	032112 / 1505				X	X									W	1		
6	PZ13-U	032112 / 1555				X	X									W	1		
7																			
8	PZ13-S	032112 / 1555				X	X									W	1		
9																			
10																			

RELEASED BY: Scott D
PRINT NAME: Scott Denny FIRM: H+H DATE: 3/22/12 TIME:

RECEIVED BY: Phil M. [signature]
PRINT NAME: PHIL SVABIK-SEROR FIRM: TAP DATE: 3/22/12 TIME: 1745

RELEASED BY:
PRINT NAME: FIRM: DATE: TIME:

RECEIVED BY:
PRINT NAME: FIRM: DATE: TIME:

ADDITIONAL REMARKS: Run OW3-U, PZ12-U, PZ13-U, + PZ13-S for dissolved Zn. These are not field filtered samples. In addition, run each of these samples without intro of acid; (separately & from standard dissolved analysis) L-by ~~standard metals~~

TEMP: 1.0

PAGE OF

IR/9-LOOSE

TAL-1000(0408)

Login Sample Receipt Checklist

Client: Hart & Hickman, PC

Job Number: 250-1102-1

Login Number: 1102

List Source: TestAmerica Portland

List Number: 1

Creator: Morgan, Jessica

Question	Answer	Comment
Radioactivity either was not measured or, if measured, is at or below background	N/A	
The cooler's custody seal, if present, is intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the sample IDs on the containers and the COC.	True	
Samples are received within Holding Time.	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.	N/A	
Multiphasic samples are not present.	N/A	
Samples do not require splitting or compositing.	N/A	
Residual Chlorine Checked.	N/A	

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ANALYTICAL REPORT

TestAmerica Laboratories, Inc.
TestAmerica Nashville
2960 Foster Creighton Road
Nashville, TN 37204
Tel: 800-765-0980

TestAmerica Job ID: NWF2625
Client Project/Site: CLR.045
Client Project Description: Clariant - Kalama

For:
Hart & Hickman (2162)
2923 South Tryon Street, Suite 100
Charlotte, NC 28203-5449

Attn: Scott Drury

Authorized for release by:
7/6/2012 3:51:48 PM

Ken A. Hayes
Senior Project Manager
ken.hayes@testamericainc.com

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.

Table of Contents

Sample Summary

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Lab Sample ID	Client Sample ID	Matrix	Collected	Received
NWF2625-01	PZ1	Water	06/26/12 12:55	06/28/12 07:50
NWF2625-02	PZ3	Water	06/27/12 09:00	06/28/12 07:50
NWF2625-03	PZ4	Water	06/26/12 15:20	06/28/12 07:50
NWF2625-04	PZ5	Water	06/26/12 16:00	06/28/12 07:50
NWF2625-05	PZ6	Water	06/27/12 08:05	06/28/12 07:50
NWF2625-06	PZ12	Water	06/27/12 10:25	06/28/12 07:50
NWF2625-07	PZ13	Water	06/27/12 09:40	06/28/12 07:50
NWF2625-08	AB1	Water	06/27/12 08:30	06/28/12 07:50
NWF2625-09	AB2	Water	06/26/12 12:30	06/28/12 07:50
NWF2625-10	OW1	Water	06/26/12 14:35	06/28/12 07:50
NWF2625-11	OW2	Water	06/26/12 14:00	06/28/12 07:50
NWF2625-12	OW3	Water	06/26/12 13:35	06/28/12 07:50
NWF2625-13	OW3-U	Water	06/26/12 13:35	06/28/12 07:50
NWF2625-14	PZ12-U	Water	06/27/12 10:25	06/28/12 07:50
NWF2625-15	PZ13-U	Water	06/27/12 09:40	06/28/12 07:50

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Qualifiers

Metals

Qualifier	Qualifier Description
P7	Sample filtered in lab.

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
☼	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CNF	Contains no Free Liquid
DL, RA, RE, IN	Indicates a Dilution, Reanalysis, Re-extraction, or additional Initial metals/anion analysis of the sample
EDL	Estimated Detection Limit
EPA	United States Environmental Protection Agency
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
ND	Not detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RL	Reporting Limit
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Client Sample ID: PZ1
Lab Sample ID: NWF2625-01
Date Collected: 06/26/12 12:55
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.100		mg/L		07/01/12 11:05	07/04/12 13:33	100
Zinc	**84.5**		5.00		mg/L		07/01/12 11:05	07/04/12 13:33	100

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: PZ3
Lab Sample ID: NWF2625-02
Date Collected: 06/27/12 09:00
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	**0.00100**		0.00100		mg/L		07/01/12 11:05	07/04/12 01:38	1.00
Zinc	**6.48**		0.500		mg/L		07/01/12 11:05	07/04/12 13:36	10.0

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: PZ4
Lab Sample ID: NWF2625-03
Date Collected: 06/26/12 15:20
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	**0.0312**		0.00100		mg/L		07/01/12 11:05	07/04/12 01:41	1.00
Zinc	**4.88**		0.500		mg/L		07/01/12 11:05	07/04/12 13:39	10.0

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: PZ5
Lab Sample ID: NWF2625-04
Date Collected: 06/26/12 16:00
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	**0.00430**		0.00100		mg/L		07/01/12 11:05	07/04/12 01:45	1.00
Zinc	**1.68**		0.0500		mg/L		07/01/12 11:05	07/04/12 01:45	1.00

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: PZ6
Lab Sample ID: NWF2625-05
Date Collected: 06/27/12 08:05
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		07/01/12 11:05	07/04/12 01:48	1.00

Client Sample ID: PZ6 — Lab Sample ID: NWF2625-05

Date Collected: 06/27/12 08:05 Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Zinc	**3.57**		0.500		mg/L		07/01/12 11:05	07/04/12 13:43	10.0

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: PZ12 — Lab Sample ID: NWF2625-06

Date Collected: 06/27/12 10:25 Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.100		mg/L		07/01/12 11:05	07/04/12 13:46	100
Zinc	**352**		50.0		mg/L		07/01/12 11:05	07/05/12 01:59	1000

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: PZ13 — Lab Sample ID: NWF2625-07

Date Collected: 06/27/12 09:40 Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		07/01/12 11:05	07/04/12 01:54	1.00
Zinc	**0.210**		0.0500		mg/L		07/01/12 11:05	07/04/12 01:54	1.00

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**11.7**		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: AB1 — Lab Sample ID: NWF2625-08

Date Collected: 06/27/12 08:30 Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		07/01/12 11:05	07/04/12 01:57	1.00
Zinc	**0.736**		0.0500		mg/L		07/01/12 11:05	07/04/12 01:57	1.00

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: AB2 — Lab Sample ID: NWF2625-09

Date Collected: 06/26/12 12:30 Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.100		mg/L		07/01/12 11:05	07/04/12 13:49	100
Zinc	**33.3**		5.00		mg/L		07/01/12 11:05	07/04/12 13:49	100

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Client Sample ID: AB2

Lab Sample ID: NWF2625-09

Date Collected: 06/26/12 12:30
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: OW1

Lab Sample ID: NWF2625-10

Date Collected: 06/26/12 14:35
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.100		mg/L		07/01/12 11:05	07/04/12 13:52	100
Zinc	**23.9**		5.00		mg/L		07/01/12 11:05	07/04/12 13:52	100

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: OW2

Lab Sample ID: NWF2625-11

Date Collected: 06/26/12 14:00
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.100		mg/L		07/01/12 11:05	07/04/12 13:56	100
Zinc	**91.4**		5.00		mg/L		07/01/12 11:05	07/04/12 13:56	100

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	**5.20**		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: OW3

Lab Sample ID: NWF2625-12

Date Collected: 06/26/12 13:35
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.100		mg/L		07/01/12 11:05	07/05/12 02:02	100
Zinc	**47.7**		5.00		mg/L		07/01/12 11:05	07/05/12 02:02	100

Method: SW846 9030B/9034 - General Chemistry Parameters

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Client Sample ID: OW3-U

Lab Sample ID: NWF2625-13

Date Collected: 06/26/12 13:35
Matrix: Water
Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND	P7	0.100		mg/L		07/01/12 11:05	07/04/12 14:10	100
Zinc	**52.8**	**P7**	5.00		mg/L		07/01/12 11:05	07/04/12 14:10	100

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Client Sample ID: PZ12-U

Lab Sample ID: NWF2625-14

Date Collected: 06/27/12 10:25

Matrix: Water

Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND	P7	0.100		mg/L		07/01/12 11:05	07/04/12 14:14	100
Zinc	**380**	**P7**	5.00		mg/L		07/01/12 11:05	07/04/12 14:14	100

Client Sample ID: PZ13-U

Lab Sample ID: NWF2625-15

Date Collected: 06/27/12 09:40

Matrix: Water

Date Received: 06/28/12 07:50

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B - Dissolved

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND	P7	0.00100		mg/L		07/01/12 11:05	07/04/12 03:06	1.00
Zinc	**0.625**	**P7**	0.0500		mg/L		07/01/12 11:05	07/04/12 03:06	1.00

Method: SW846 6010B - Dissolved Metals by EPA Method 6010B

Lab Sample ID: 12F5721-BLK1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12F5721 — **Prep Batch: 12F5721_P**

Analyte	Blank Result	Blank Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Cadmium	ND		0.00100		mg/L		06/29/12 10:05	07/04/12 00:55	1.00
Zinc	ND		0.0500		mg/L		06/29/12 10:05	07/04/12 00:55	1.00

Lab Sample ID: 12F5721-BS1 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12F5721 — **Prep Batch: 12F5721_P**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.0500	0.0521		mg/L		104	80 - 120
Zinc	0.500	0.493		mg/L		99	80 - 120

Lab Sample ID: 12F5721-MS1 — **Client Sample ID: Matrix Spike**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12F5721 — **Prep Batch: 12F5721_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	Matrix Spike Result	Matrix Spike Qualifier	Unit	D	%Rec	%Rec. Limits
Cadmium	0.000400		0.0500	0.0497		mg/L		99	75 - 125
Zinc	ND		0.500	0.486		mg/L		97	75 - 125

Lab Sample ID: 12F5721-MSD1 — **Client Sample ID: Matrix Spike Duplicate**
Matrix: Water — **Prep Type: Dissolved**
Analysis Batch: 12F5721 — **Prep Batch: 12F5721_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	ıtrix Spike Dup Result	Matrix Spike Dup Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Cadmium	0.000400		0.0500	0.0483		mg/L		96	75 - 125	3	20
Zinc	ND		0.500	0.488		mg/L		98	75 - 125	0.4	20

Method: SW846 9030B/9034 - General Chemistry Parameters

Lab Sample ID: 12F5759-BLK1 — **Client Sample ID: Method Blank**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12F5759 — **Prep Batch: 12F5759_P**

Analyte	Blank Result	Blank Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Sulfide	ND		5.00		mg/L		06/29/12 12:14	07/03/12 17:20	1.00

Lab Sample ID: 12F5759-BS1 — **Client Sample ID: Lab Control Sample**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12F5759 — **Prep Batch: 12F5759_P**

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfide	20.0	19.6		mg/L		98	80 - 120

Lab Sample ID: 12F5759-MS1 — **Client Sample ID: PZ1**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12F5759 — **Prep Batch: 12F5759_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	Matrix Spike Result	Matrix Spike Qualifier	Unit	D	%Rec	%Rec. Limits
Sulfide	ND		20.0	19.4		mg/L		97	70 - 130

Method: SW846 9030B/9034 - General Chemistry Parameters (Continued)

Lab Sample ID: 12F5759-MSD1 — **Client Sample ID: PZ1**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12F5759 — **Prep Batch: 12F5759_P**

Analyte	Sample Result	Sample Qualifier	Spike Added	ıtrix Spike Dup Result	Matrix Spike Duı Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Sulfide	ND		20.0	19.4		mg/L		97	70 - 130	0	10

Lab Sample ID: 12F5759-DUP1 — **Client Sample ID: PZ3**
Matrix: Water — **Prep Type: Total**
Analysis Batch: 12F5759 — **Prep Batch: 12F5759_P**

Analyte	Sample Result	Sample Qualifier		Duplicate Result	Duplicate Qualifier	Unit	D			RPD	RPD Limit
Sulfide	ND			ND		mg/L					10

QC Association Summary

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Metals

Analysis Batch: 12F5721

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
12F5721-BLK1	Method Blank	Dissolved	Water	SW846 6010B	12F5721_P
12F5721-BS1	Lab Control Sample	Dissolved	Water	SW846 6010B	12F5721_P
12F5721-MS1	Matrix Spike	Dissolved	Water	SW846 6010B	12F5721_P
12F5721-MSD1	Matrix Spike Duplicate	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-01	PZ1	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-02	PZ3	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-03	PZ4	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-04	PZ5	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-05	PZ6	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-06	PZ12	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-07	PZ13	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-08	AB1	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-09	AB2	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-10	OW1	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-11	OW2	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-12	OW3	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-13	OW3-U	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-14	PZ12-U	Dissolved	Water	SW846 6010B	12F5721_P
NWF2625-15	PZ13-U	Dissolved	Water	SW846 6010B	12F5721_P

Prep Batch: 12F5721_P

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
12F5721-BLK1	Method Blank	Dissolved	Water	EPA 3010A / 6010 Dissolved	
12F5721-BS1	Lab Control Sample	Dissolved	Water	EPA 3010A / 6010 Dissolved	
12F5721-MS1	Matrix Spike	Dissolved	Water	EPA 3010A / 6010 Dissolved	
12F5721-MSD1	Matrix Spike Duplicate	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-01	PZ1	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-02	PZ3	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-03	PZ4	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-04	PZ5	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-05	PZ6	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-06	PZ12	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-07	PZ13	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-08	AB1	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-09	AB2	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-10	OW1	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-11	OW2	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-12	OW3	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-13	OW3-U	Dissolved	Water	EPA 3010A / 6010 Dissolved	

Metals (Continued)

Prep Batch: 12F5721_P (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
NWF2625-14	PZ12-U	Dissolved	Water	EPA 3010A / 6010 Dissolved	
NWF2625-15	PZ13-U	Dissolved	Water	EPA 3010A / 6010 Dissolved	

WetChem

Analysis Batch: 12F5759

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
12F5759-BLK1	Method Blank	Total	Water	SW846 9030B/9034	12F5759_P
12F5759-BS1	Lab Control Sample	Total	Water	SW846 9030B/9034	12F5759_P
12F5759-DUP1	PZ3	Total	Water	SW846 9030B/9034	12F5759_P
12F5759-MS1	PZ1	Total	Water	SW846 9030B/9034	12F5759_P
12F5759-MSD1	PZ1	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-01	PZ1	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-02	PZ3	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-03	PZ4	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-04	PZ5	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-05	PZ6	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-06	PZ12	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-07	PZ13	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-08	AB1	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-09	AB2	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-10	OW1	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-11	OW2	Total	Water	SW846 9030B/9034	12F5759_P
NWF2625-12	OW3	Total	Water	SW846 9030B/9034	12F5759_P

Prep Batch: 12F5759_P

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
12F5759-BLK1	Method Blank	Total	Water	NO PREP	
12F5759-BS1	Lab Control Sample	Total	Water	NO PREP	
12F5759-DUP1	PZ3	Total	Water	NO PREP	
12F5759-MS1	PZ1	Total	Water	NO PREP	
12F5759-MSD1	PZ1	Total	Water	NO PREP	
NWF2625-01	PZ1	Total	Water	NO PREP	
NWF2625-02	PZ3	Total	Water	NO PREP	
NWF2625-03	PZ4	Total	Water	NO PREP	
NWF2625-04	PZ5	Total	Water	NO PREP	
NWF2625-05	PZ6	Total	Water	NO PREP	
NWF2625-06	PZ12	Total	Water	NO PREP	

WetChem (Continued)

Prep Batch: 12F5759_P (Continued)

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
NWF2625-07	PZ13	Total	Water	NO PREP	
NWF2625-08	AB1	Total	Water	NO PREP	
NWF2625-09	AB2	Total	Water	NO PREP	
NWF2625-10	OW1	Total	Water	NO PREP	
NWF2625-11	OW2	Total	Water	NO PREP	
NWF2625-12	OW3	Total	Water	NO PREP	

Lab Chronicle

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Client Sample ID: PZ1

Lab Sample ID: NWF2625-01

Date Collected: 06/26/12 12:55

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 13:33	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: PZ3

Lab Sample ID: NWF2625-02

Date Collected: 06/27/12 09:00

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 01:38	LCB	TAL NSH
Dissolved	Analysis	SW846 6010B		10.0	12F5721	07/04/12 13:36	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: PZ4

Lab Sample ID: NWF2625-03

Date Collected: 06/26/12 15:20

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 01:41	LCB	TAL NSH
Dissolved	Analysis	SW846 6010B		10.0	12F5721	07/04/12 13:39	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: PZ5

Lab Sample ID: NWF2625-04

Date Collected: 06/26/12 16:00

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 01:45	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: PZ6

Lab Sample ID: NWF2625-05

Date Collected: 06/27/12 08:05

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 01:48	LCB	TAL NSH
Dissolved	Analysis	SW846 6010B		10.0	12F5721	07/04/12 13:43	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: PZ12

Lab Sample ID: NWF2625-06

Date Collected: 06/27/12 10:25

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 13:46	LCB	TAL NSH
Dissolved	Analysis	SW846 6010B		1000	12F5721	07/05/12 01:59	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: PZ13

Lab Sample ID: NWF2625-07

Date Collected: 06/27/12 09:40

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 01:54	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: AB1

Lab Sample ID: NWF2625-08

Date Collected: 06/27/12 08:30

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 01:57	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Lab Chronicle

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Client Sample ID: AB2

Lab Sample ID: NWF2625-09

Date Collected: 06/26/12 12:30
Matrix: Water
Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 13:49	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: OW1

Lab Sample ID: NWF2625-10

Date Collected: 06/26/12 14:35
Matrix: Water
Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 13:52	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: OW2

Lab Sample ID: NWF2625-11

Date Collected: 06/26/12 14:00
Matrix: Water
Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 13:56	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: OW3

Lab Sample ID: NWF2625-12

Date Collected: 06/26/12 13:35
Matrix: Water
Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/05/12 02:02	LCB	TAL NSH
Total	Prep	NO PREP		1.00	12F5759_P	06/29/12 12:14	ADK	TAL NSH
Total	Analysis	SW846 9030B/9034		1.00	12F5759	07/03/12 17:20	SNG	TAL NSH

Client Sample ID: OW3-U

Lab Sample ID: NWF2625-13

Date Collected: 06/26/12 13:35
Matrix: Water
Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH

Lab Chronicle

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Client Sample ID: OW3-U

Lab Sample ID: NWF2625-13

Date Collected: 06/26/12 13:35

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 14:10	LCB	TAL NSH

Client Sample ID: PZ12-U

Lab Sample ID: NWF2625-14

Date Collected: 06/27/12 10:25

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		100	12F5721	07/04/12 14:14	LCB	TAL NSH

Client Sample ID: PZ13-U

Lab Sample ID: NWF2625-15

Date Collected: 06/27/12 09:40

Matrix: Water

Date Received: 06/28/12 07:50

Prep Type	Batch Type	Batch Method	Run	Dilution Factor	Batch Number	Prepared or Analyzed	Analyst	Lab
Dissolved	Prep	EPA 3010A / 6010 Dissolved		1.00	12F5721_P	07/01/12 11:05	CXU	TAL NSH
Dissolved	Analysis	SW846 6010B		1.00	12F5721	07/04/12 03:06	LCB	TAL NSH

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Road, Nashville, TN 37204, TEL 800-765-0980

Method Summary

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Method	Method Description	Protocol	Laboratory
SW846 6010B	Dissolved Metals by EPA Method 6010B		TAL NSH
SW846 9030B/9034	General Chemistry Parameters		TAL NSH

Protocol References:

Laboratory References:

TAL NSH = TestAmerica Nashville, 2960 Foster Creighton Road, Nashville, TN 37204, TEL 800-765-0980

Certification Summary

Client: Hart & Hickman (2162)
Project/Site: CLR.045

TestAmerica Job ID: NWF2625

Laboratory	Authority	Program	EPA Region	Certification ID
TestAmerica Nashville		ACIL		393
TestAmerica Nashville	A2LA	ISO/IEC 17025		0453.07
TestAmerica Nashville	Alabama	State Program	4	41150
TestAmerica Nashville	Alaska (UST)	State Program	10	UST-087
TestAmerica Nashville	Arizona	State Program	9	AZ0473
TestAmerica Nashville	Arkansas DEQ	State Program	6	88-0737
TestAmerica Nashville	California	NELAC	9	1168CA
TestAmerica Nashville	Canadian Assoc Lab Accred (CALA)	Canada		3744
TestAmerica Nashville	Colorado	State Program	8	N/A
TestAmerica Nashville	Connecticut	State Program	1	PH-0220
TestAmerica Nashville	Illinois	NELAC	5	200010
TestAmerica Nashville	Iowa	State Program	7	131
TestAmerica Nashville	Kansas	NELAC	7	E-10229
TestAmerica Nashville	Kentucky	State Program	4	90038
TestAmerica Nashville	Kentucky (UST)	State Program	4	19
TestAmerica Nashville	Louisiana	NELAC	6	30613
TestAmerica Nashville	Louisiana	NELAC	6	LA110014
TestAmerica Nashville	Maryland	State Program	3	316
TestAmerica Nashville	Massachusetts	State Program	1	M-TN032
TestAmerica Nashville	Minnesota	NELAC	5	047-999-345
TestAmerica Nashville	Mississippi	State Program	4	N/A
TestAmerica Nashville	Montana (UST)	State Program	8	NA
TestAmerica Nashville	Nevada	State Program	9	TN00032
TestAmerica Nashville	New Hampshire	NELAC	1	2963
TestAmerica Nashville	New Jersey	NELAC	2	TN965
TestAmerica Nashville	New York	NELAC	2	11342
TestAmerica Nashville	North Carolina DENR	State Program	4	387
TestAmerica Nashville	North Dakota	State Program	8	R-146
TestAmerica Nashville	Ohio VAP	State Program	5	CL0033
TestAmerica Nashville	Oklahoma	State Program	6	9412
TestAmerica Nashville	Oregon	NELAC	10	TN200001
TestAmerica Nashville	Pennsylvania	NELAC	3	68-00585
TestAmerica Nashville	Rhode Island	State Program	1	LAO00268
TestAmerica Nashville	South Carolina	State Program	4	84009
TestAmerica Nashville	South Carolina	State Program	4	84009
TestAmerica Nashville	Tennessee	State Program	4	2008
TestAmerica Nashville	Texas	NELAC	6	T104704077-09-TX
TestAmerica Nashville	USDA	Federal		S-48469
TestAmerica Nashville	Utah	NELAC	8	TAN
TestAmerica Nashville	Virginia	NELAC	3	460152
TestAmerica Nashville	Washington	State Program	10	C789
TestAmerica Nashville	West Virginia DEP	State Program	3	219
TestAmerica Nashville	Wisconsin	State Program	5	998020430
TestAmerica Nashville	Wyoming (UST)	A2LA	8	453.07

Accreditation may not be offered or required for all methods and analytes reported in this package. Please contact your project manager for the laboratory's current list of certified methods and analytes.

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
Nashville, TN

COOLER RECEIP

NWF2625

Cooler Received/Opened On 6/28/12 @ 0750

1. Tracking # 6180 (last 4 digits, FedEx)

Courier: FEDEX IR Gun ID 97310166

2. Temperature of rep. sample or temp blank when opened: 4.5 *Degrees Celsius*

3. If Item #2 temperature is 0°C or less, was the representative sample or temp blank frozen? YES NO..(NA)

4. Were custody seals on outside of cooler? (YES)..NO...NA

If yes, how many and where: one front

5. Were the seals intact, signed, and dated correctly? (YES)..NO...NA

6. Were custody papers inside cooler? (YES)..NO...NA

I certify that I opened the cooler and answered questions 1-6 (intial) DA

7. Were custody seals on containers: YES (NO) and Intact YES...NO..(NA)

Were these signed and dated correctly? YES...NO..(NA)

8. Packing mat'l used? Bubblewrap (Plastic bag) Peanuts Vermiculite Foam Insert Paper Other None

9. Cooling process: (Ice) Ice-pack Ice (direct contact) Dry ice Other None

10. Did all containers arrive in good condition (unbroken)? (YES)..NO...NA

11. Were all container labels complete (#, date, signed, pres., etc)? (YES)..NO...NA

12. Did all container labels and tags agree with custody papers? (YES)..NO...NA

13a. Were VOA vials received? YES..(NO)..NA

b. Was there any observable headspace present in any VOA vial? YES...NO..(NA)

14. Was there a Trip Blank in this cooler? YES...NO..(NA) If multiple coolers, sequence #_____

I certify that I unloaded the cooler and answered questions 7-14 (intial) MW

15a. On pres'd bottles, did pH test strips suggest preservation reached the correct pH level? (YES)..NO..NA

b. Did the bottle labels indicate that the correct preservatives were used (YES)..NO...NA

16. Was residual chlorine present? YES..(NO)..NA

I certify that I checked for chlorine and pH as per SOP and answered questions 15-16 (intial) MW

17. Were custody papers properly filled out (ink, signed, etc)? (YES)..NO...NA

18. Did you sign the custody papers in the appropriate place? (YES)..NO...NA

19. Were correct containers used for the analysis requested? (YES)..NO...NA

20. Was sufficient amount of sample sent in each container? (YES)..NO...NA

I certify that I entered this project into LIMS and answered questions 17-20 (intial) MW

I certify that I attached a label with the unique LIMS number to each container (intial) MW

21. Were there Non-Conformance issues at login? YES..(NO) Was a PIPE generated? YES..(NO)..#_____

BIS = Broken in shipment

Chain of Custody Record

NWF2625

07/06/12 23:59

TestAmerica Laboratory location: ~~STATE OF~~ WASHINGTON ~~X~~

Regulatory program: ☐ DW ☐ NPDES ☐ RCRA ☒ Other VOLUNTARY CLEANUP PROGRAM

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact				
Company Name: Hart + Hickman	Client Project Manager: Scott Drury	Site Contact:	Lab Contact:	COC No:
Address: 2923 S. Tryon St Ste 100	Telephone: 704 586-0007	Telephone:	Telephone:	1 of 2 COCs
City/State/Zip: Charlotte, NC 28210	Email: sdrury@harthickman.com	Analysis Turnaround Time (in BUSdays)	Analyses	For lab use only
Phone: 704-586 0007		TAT if different from below 5 Day		Walk-in Client ☐
Project Name: CLAIMANT - KALAMA	Method of Shipment/Carrier: FEDEX	STD ☐ 3 weeks ☐ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day		Lab pickup ☐
Project Number: CLR.045	Shipping/Tracking No: 5322 5414 6180			Lab sampling ☐
PO# CLR.045				Job/SDG No.

Sample Identification	Sample Date	Sample Time	Matrix: Air	Aqueous	Sediment	Solid	Other:	Containers & Preservatives: H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Unpres	Other:	Filtered Sample (Y/N)	Composite C / Grab G	Dissolved Zn + CA	Total Sulfides	Sample Specific Notes / Special Instructions:
PZ1	6/26/12	1255		X					1			1			Y	G	X	X	NWF2625-01
PZ3	6/27/12	0900		X					1			1			Y	G	X	X	02
PZ4	6/26/12	1520		X					1			1			Y	G	X	X	03
PZ5	6/26/12	1600		X					1			1			Y	G	X	X	04
PZ6	6/27/12	0805		X					1			1			Y	G	X	X	05
PZ12	6/27/12	1025		X					1			1			Y	G	X	X	SULFIDES BOTTLE PRESERVED W/ 10 DROPS OF ZnAc IN FIELD 06
PZ13	6/27/12	0940		X					1			1			Y	G	X	X	07
AB1	6/27/12	0830		X					1			1			Y	G	X	X	08
AB2	6/26/12	1230		X					1			1			Y	G	X	X	09

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☐ Disposal By Lab ☐ Archive For _____ Months

Special Instructions/QC Requirements & Comments:
ALL METALS SAMPLES WERE FIELD FILTERED, ALL SULFIDES SAMPLES WERE NOT FIELD FILTERED

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
S. Drury	H+H	6/27/12	FEDEX		
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
				TAN	6.28.12 @ 0750
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

TAL-0018 (1008)

7/6/2012

Chain of Custody Record

NWF2625

07/06/12 23:59

TestAmerica Laboratory location: STATE OF WA VCP

Regulatory program: ☐ DW ☐ NPDES ☐ RCRA ☐ Other

TestAmerica THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

7/6/2012

Client Contact				
Company Name: HART + HICKMAN	Client Project Manager: SCOT DERRY	Site Contact:	Lab Contact:	COC No:
Address: 2923 S. TRYON ST STE 100	Telephone: 7045860007	Telephone:	Telephone:	2 of 2 COCs
City/State/Zip: CHARLOTTE NC 28210	Email: sderry@hartthickman.com	Analysis Turnaround Time (in BUS days)	Analyses	For Lab use only: Walk-in client ☐ Lab pickup ☐ Lab sampling ☐ Job/SDG No.:
Phone: 7045860007		TAT if different from below 5 DAY ☐ 3 weeks ☐ 2 weeks ☐ 1 week ☐ 2 days ☐ 1 day (5 DAY)		
Project Name: CLARIANT - KALAMA	Method of Shipment/Carrier: FEDEX			
Project Number: CLR045	Shipping/Tracking No: 5322 5914 6180			
PO#				

Sample Identification	Sample Date	Sample Time	Matrix: Air	Aqueous	Sediment	Solid	Other:	Containers & Preservatives: H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Unpres	Other:	Filtered Sample (Y/N)	Composite=C / Grab=G	Dissolved Zn + Cd	Total Sulfides	Sample Specific Notes / Special Instructions:
OW1	6/26/12	1435		X					1			1			Y*	G	X	X	2625-10
OW2	6/26/12	1400		X					1			1			Y*	G	X	X	11
OW3	6/26/12	1335		X					1			1	X		Y*	G	X	X	12
OW3-U	6/26/12	1335		X					1 (SDA)				1		Y*	G	X		UNPRESERVED BOTTLE 13
PZ12-U	6/27/12	1025		X					1 (SDA)				1		Y*	G	X		14
PZ13-U	6/27/12	0940		X					1 (SDA)				1		Y*	G	X		15

Possible Hazard Identification
☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ Return to Client ☐ Disposal By Lab ☐ Archive For _____ Months

Special Instructions/QC Requirements & Comments:

* ALL METALS BOTTLE SAMPLES WERE FIELD FILTERED, ALL SULFIDES BOTTLE SAMPLES WERE NOT FIELD FILTERED

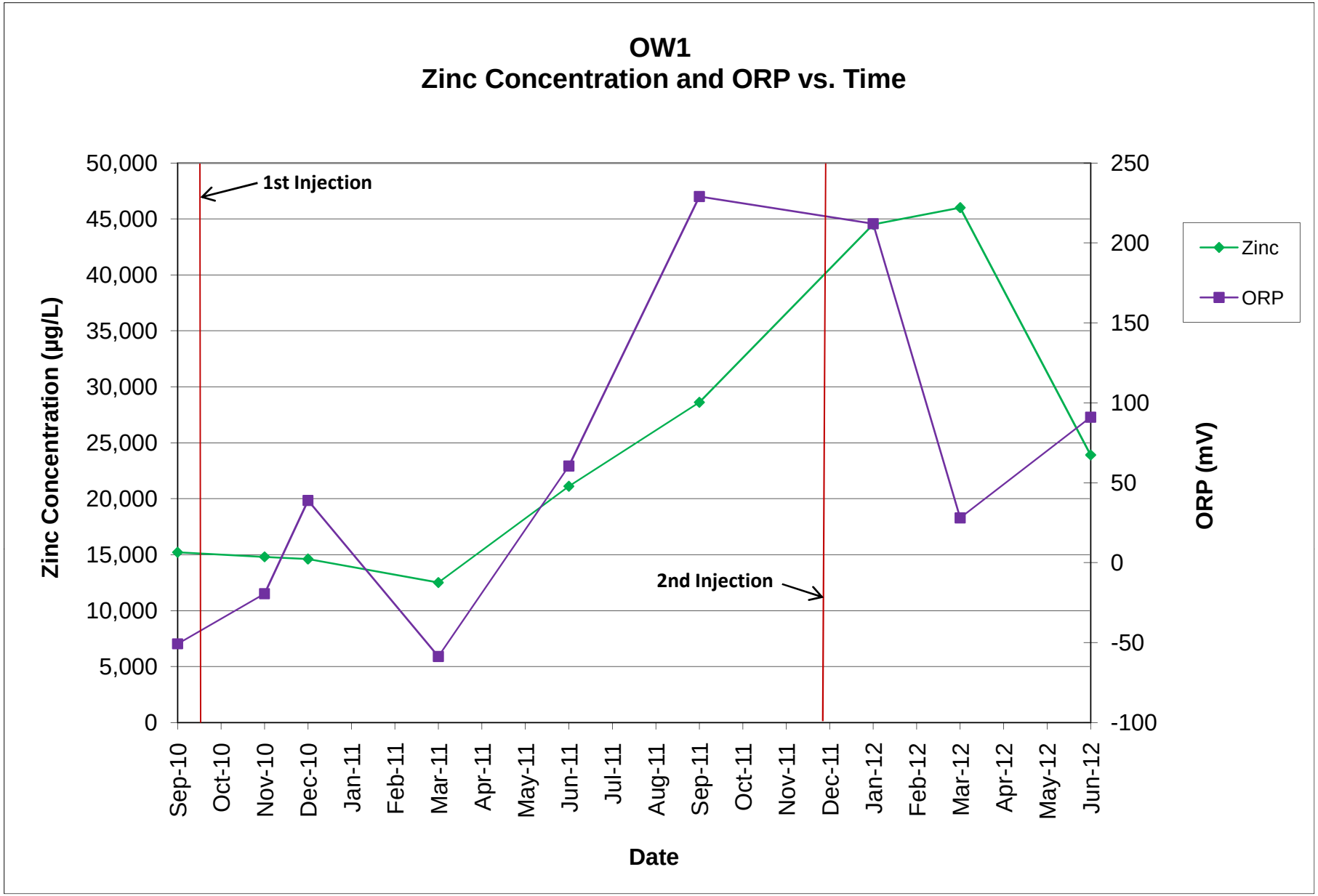
** LAB FILTER OW3-U, PZ12-U, + PZ13-U SAMPLES

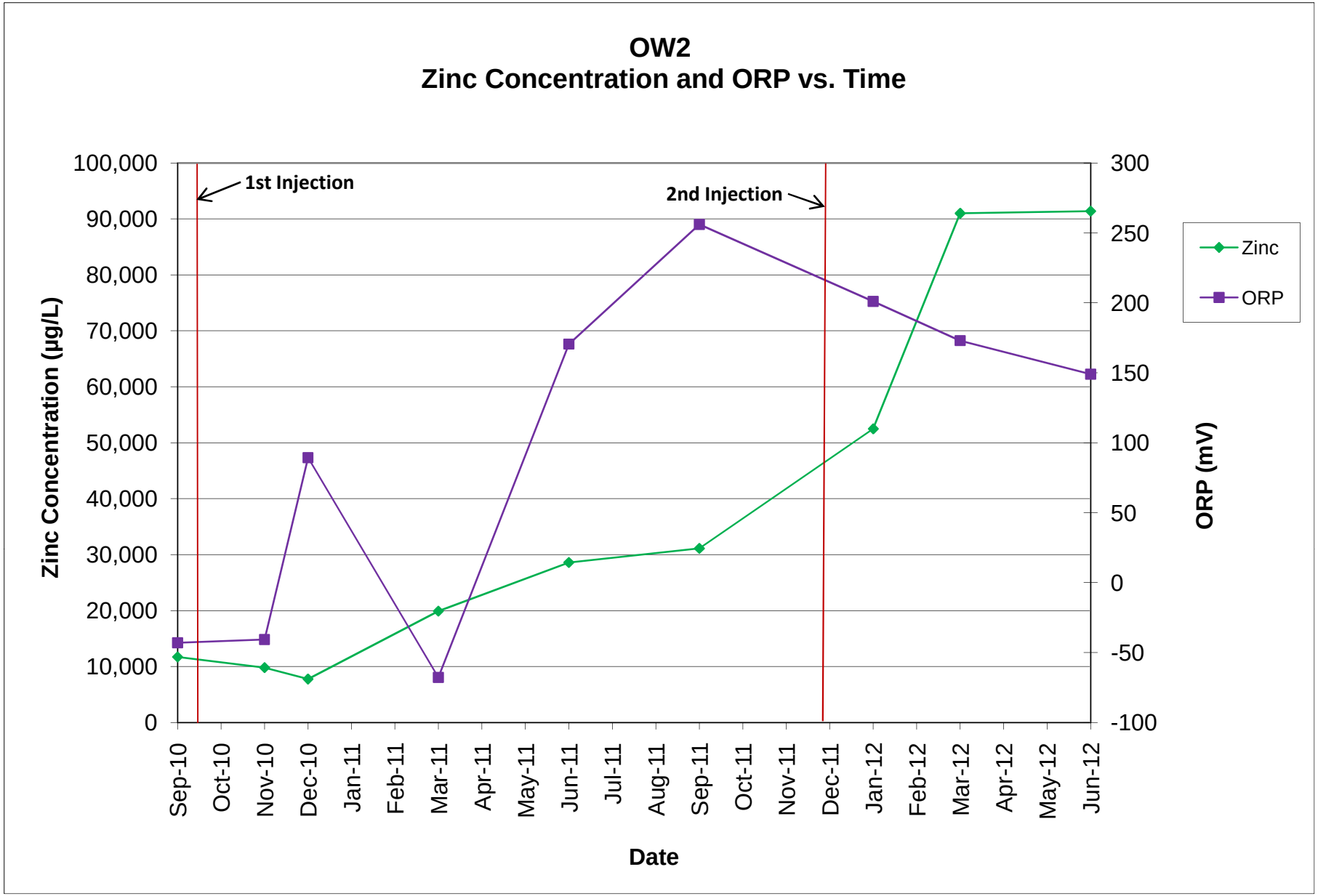
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
S. DERRY	HART HICKMAN	6/27/12	FEDEX		
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
				TAW	6/28/12 @ 0750
Relinquished by:	Company:	Date/Time:	Received in Laboratory by:	Company:	Date/Time:

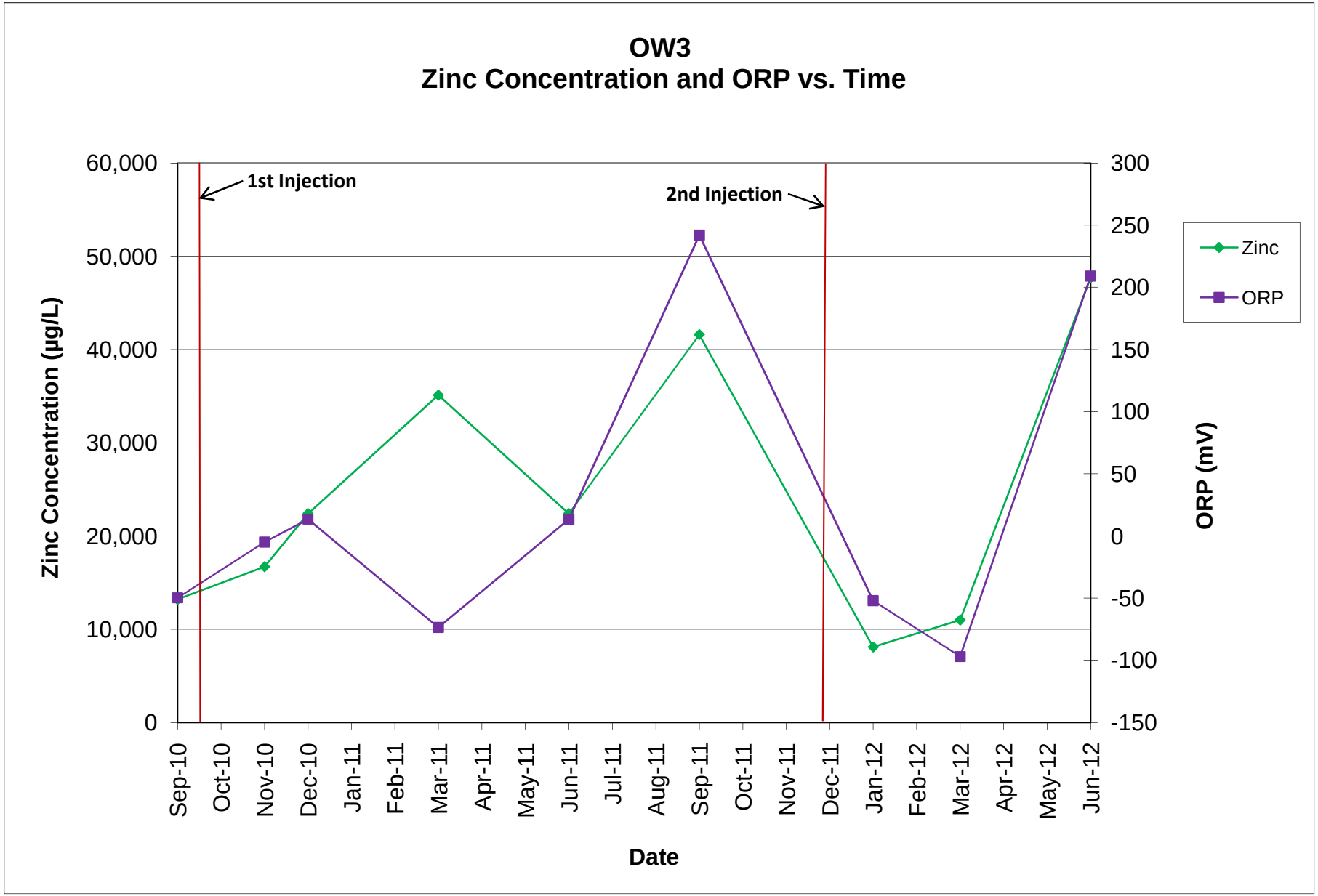
TAL-0018 (1008)

Appendix E

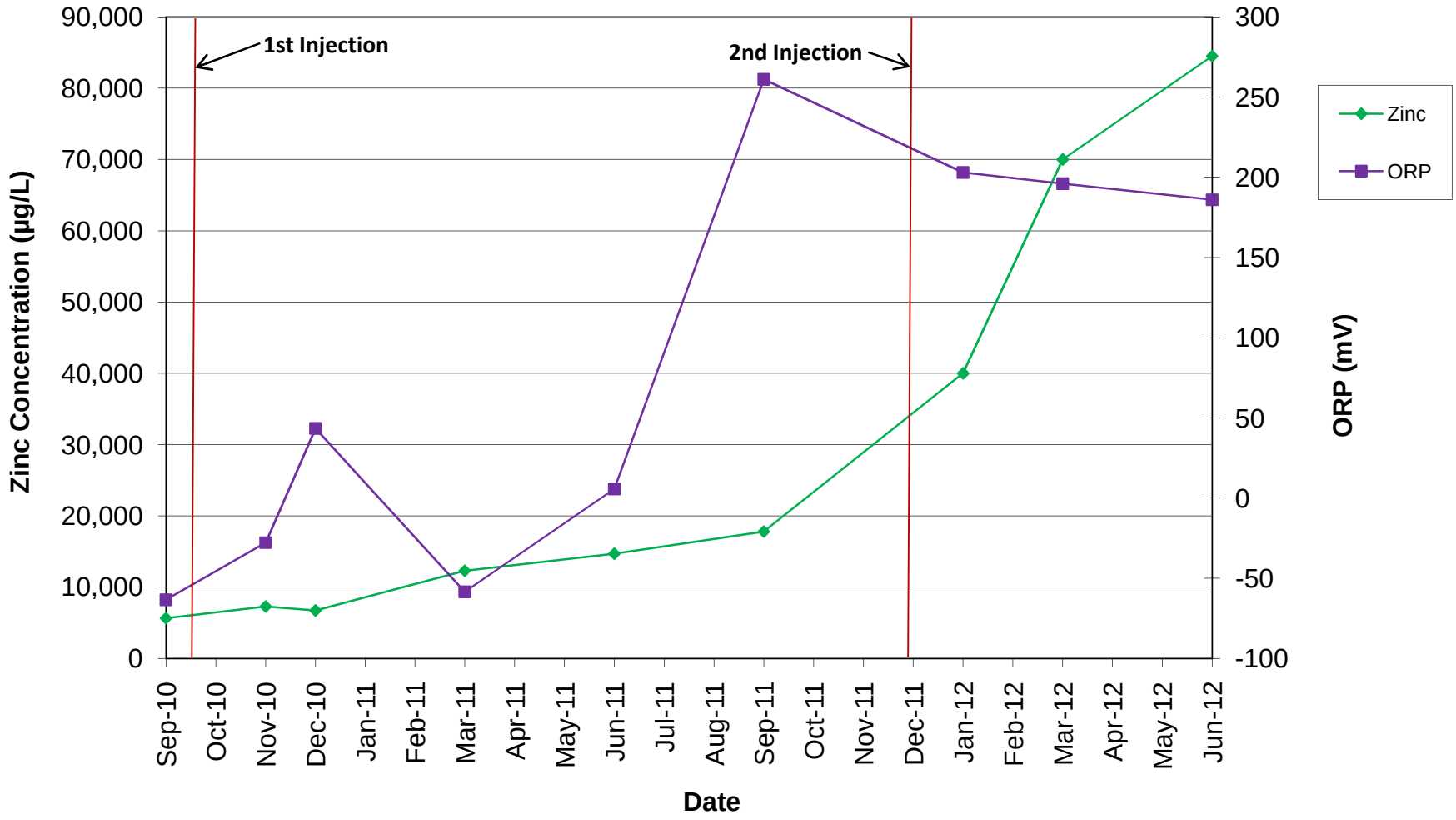
Ground Water Quality Parameters and Zinc Concentration vs Time Graphs


OW1
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

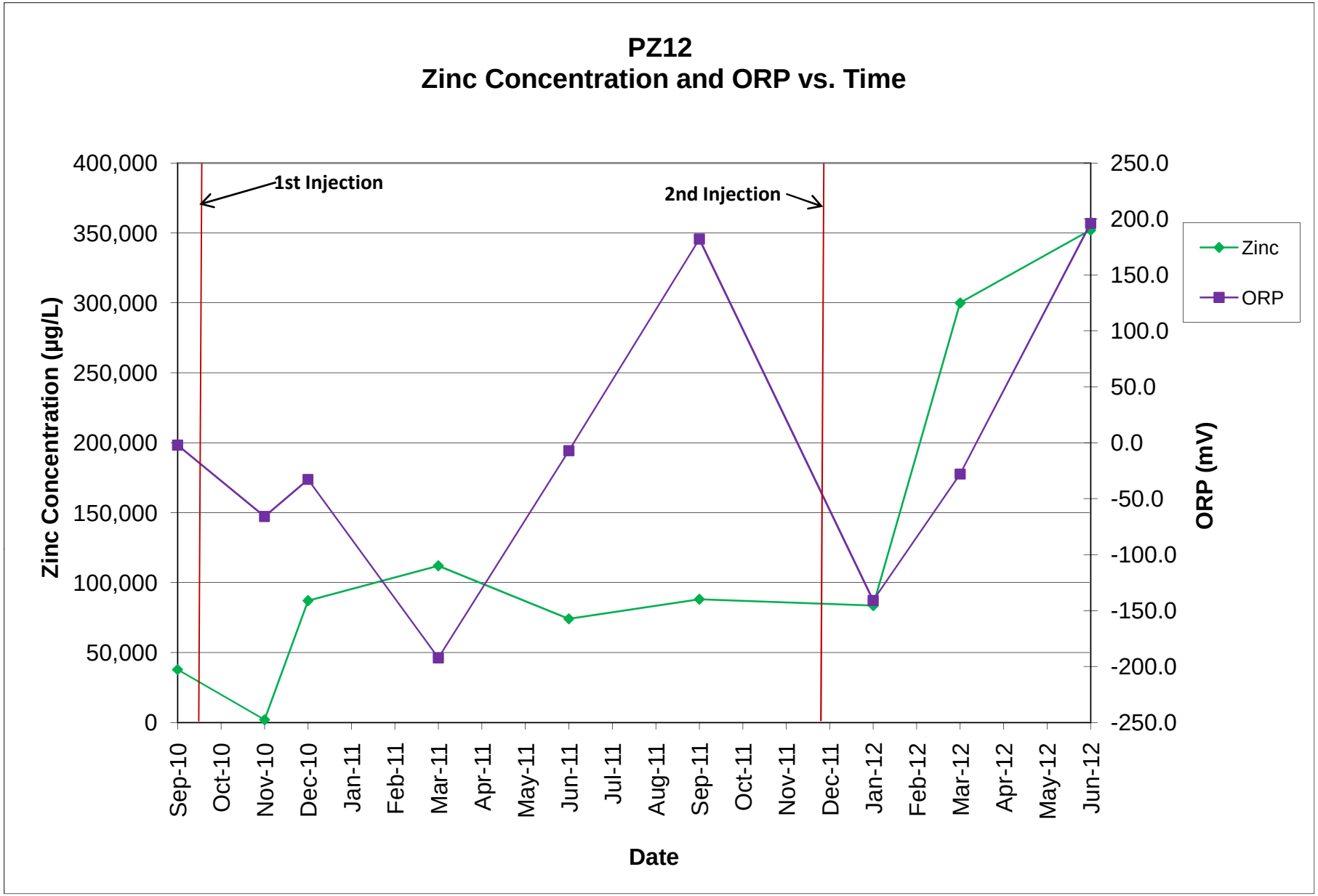

OW2
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW3
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
60,000
50,000
40,000
30,000
20,000
10,000
0
300
250
200
150
100
50
0
-50
-100
-150
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

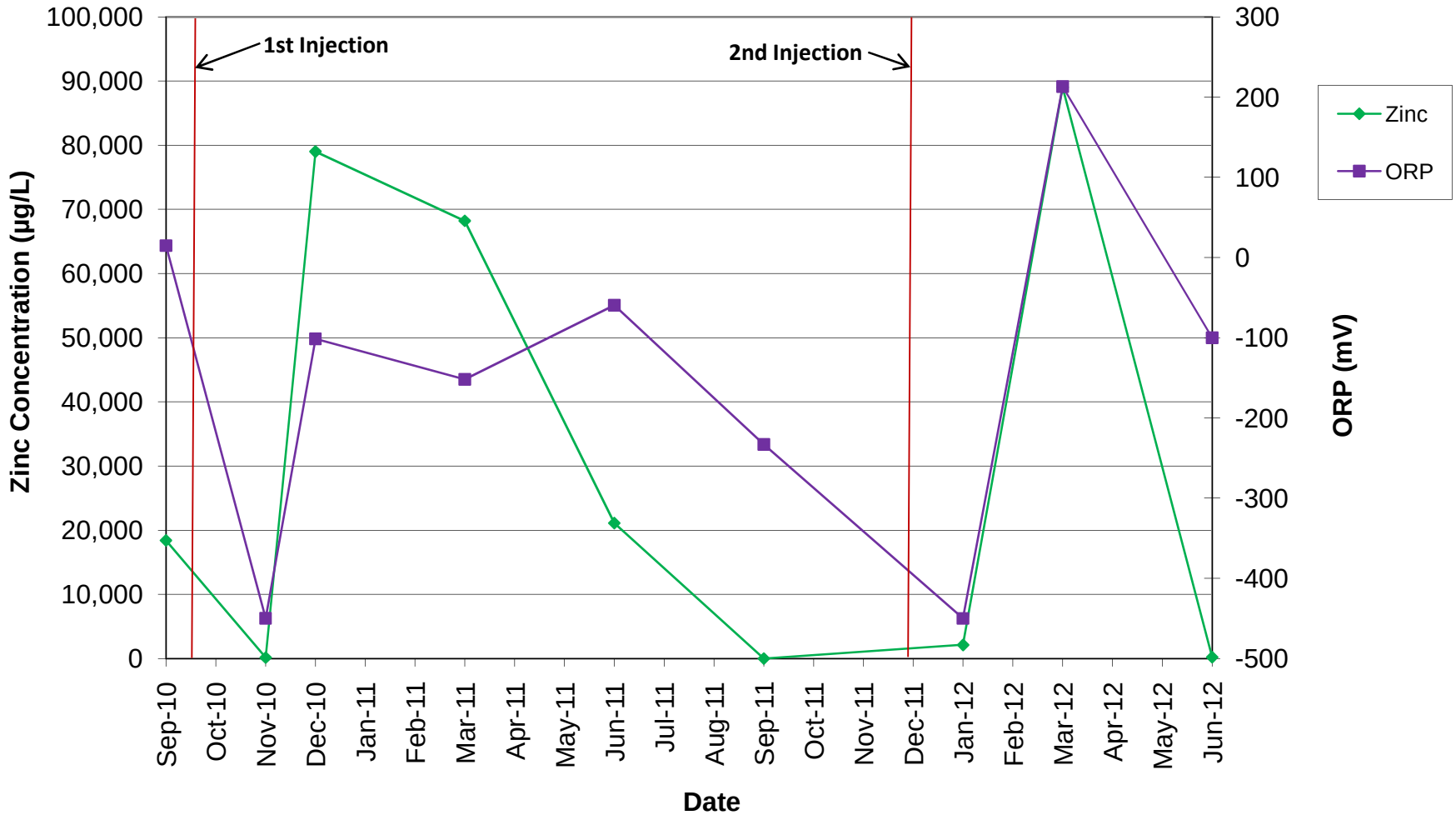
PZ1
Zinc Concentration and ORP vs. Time



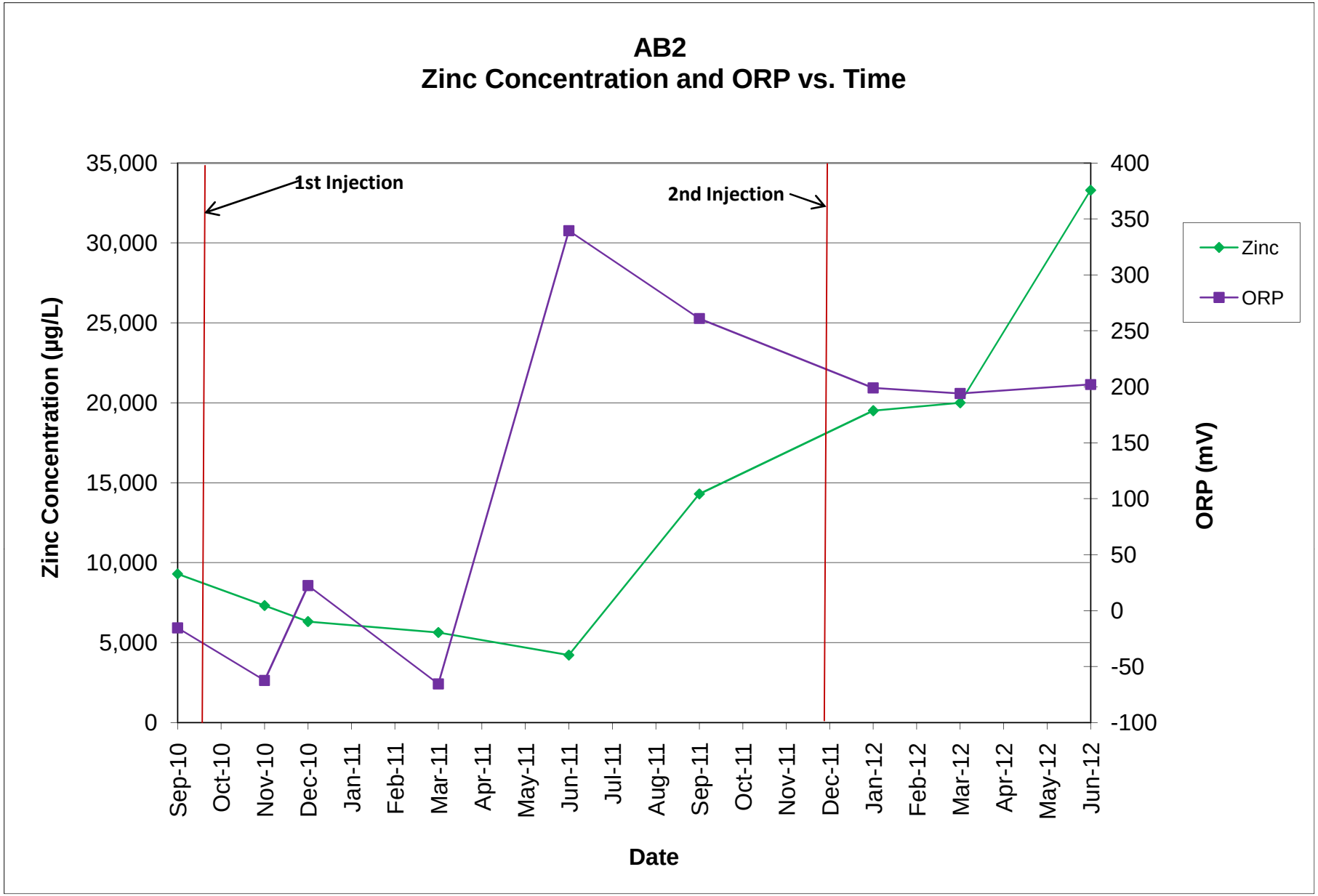
Note: CaSx was present in purge water during January 2012. Therefore, the data was estimated based on previously collected CaSx measurements in order to prevent damaging instument.


PZ12
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
250.0
200.0
150.0
100.0
50.0
0.0
-50.0
-100.0
-150.0
-200.0
-250.0
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

PZ13
Zinc Concentration and ORP vs. Time



Note: CaSx was present in purge water during January 2012. Therefore, the data was estimated based on previously collected CaSx measurements in order to prevent damaging instument.


AB2
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
400
350
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
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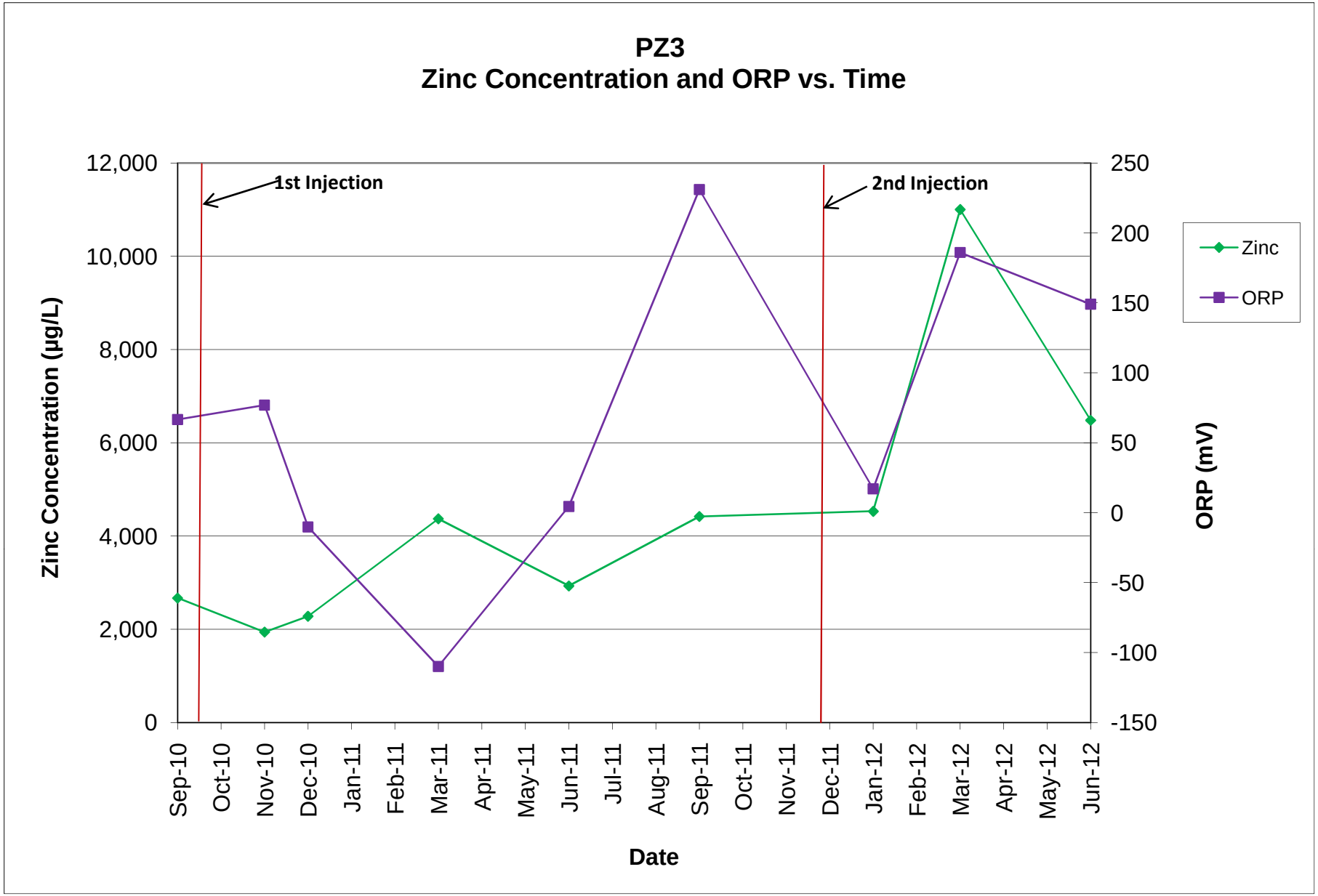
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ3
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
12,000
10,000
8,000
6,000
4,000
2,000
0
250
200
150
100
50
0
-50
-100
-150
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
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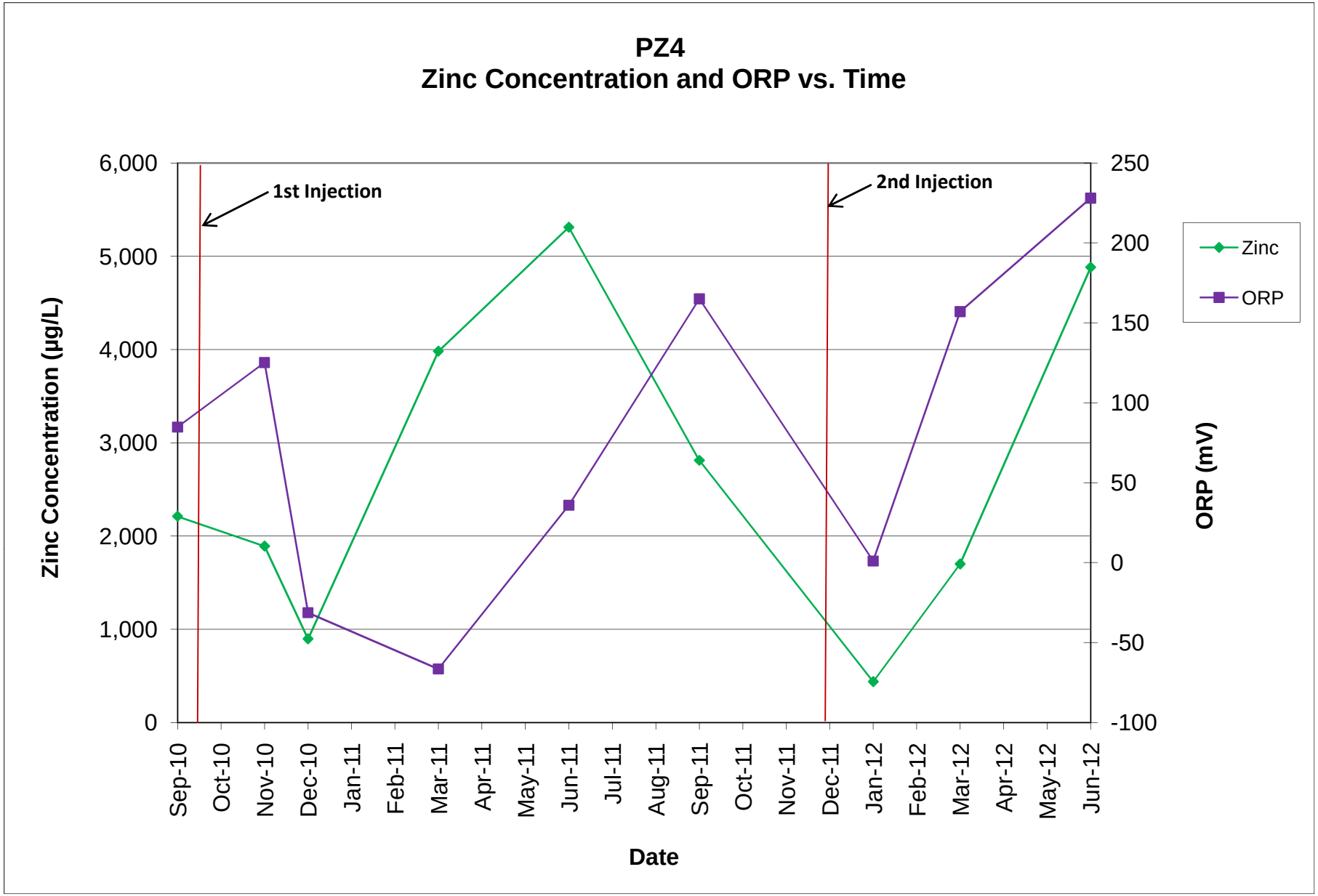
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ4
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
6,000
5,000
4,000
3,000
2,000
1,000
0
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
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Oct-11
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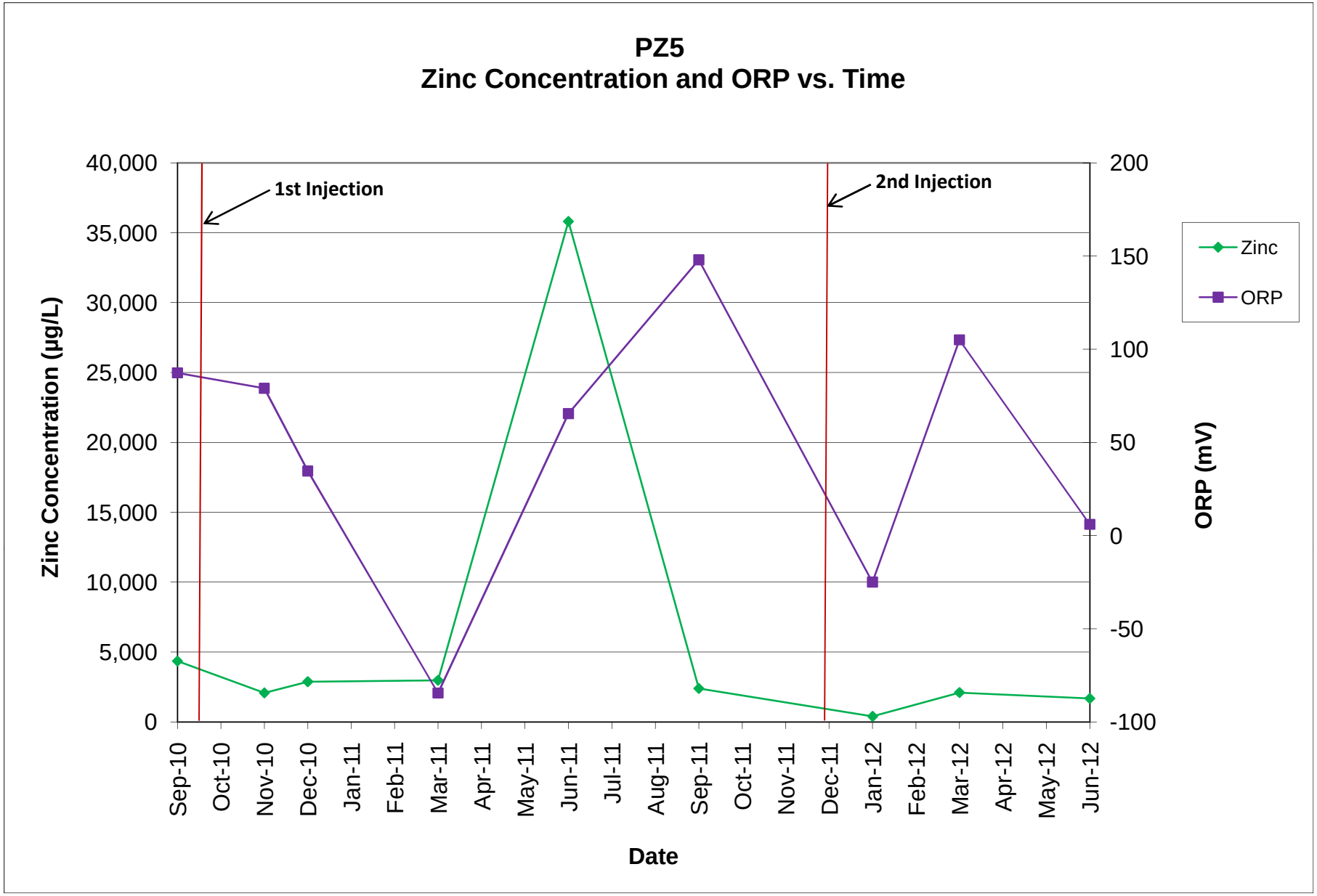
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ5
Zinc Concentration and ORP vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
ORP (mV)
Date
Zinc
ORP
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
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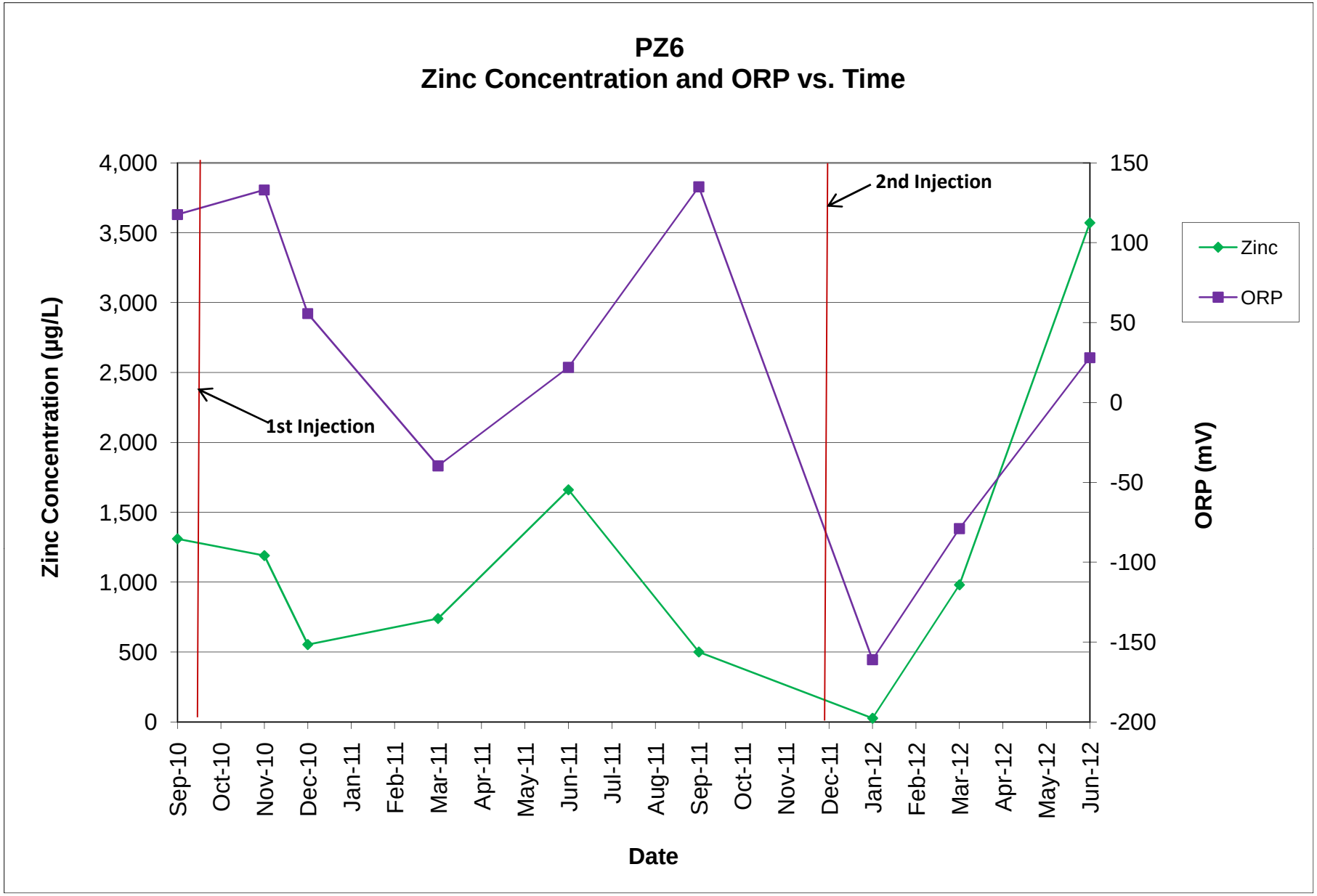
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ6
Zinc Concentration and ORP vs. Time
Zinc Concentration (µg/L)
ORP (mV)
Date
1st Injection
2nd Injection
Zinc
ORP
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
150
100
50
0
-50
-100
-150
-200
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
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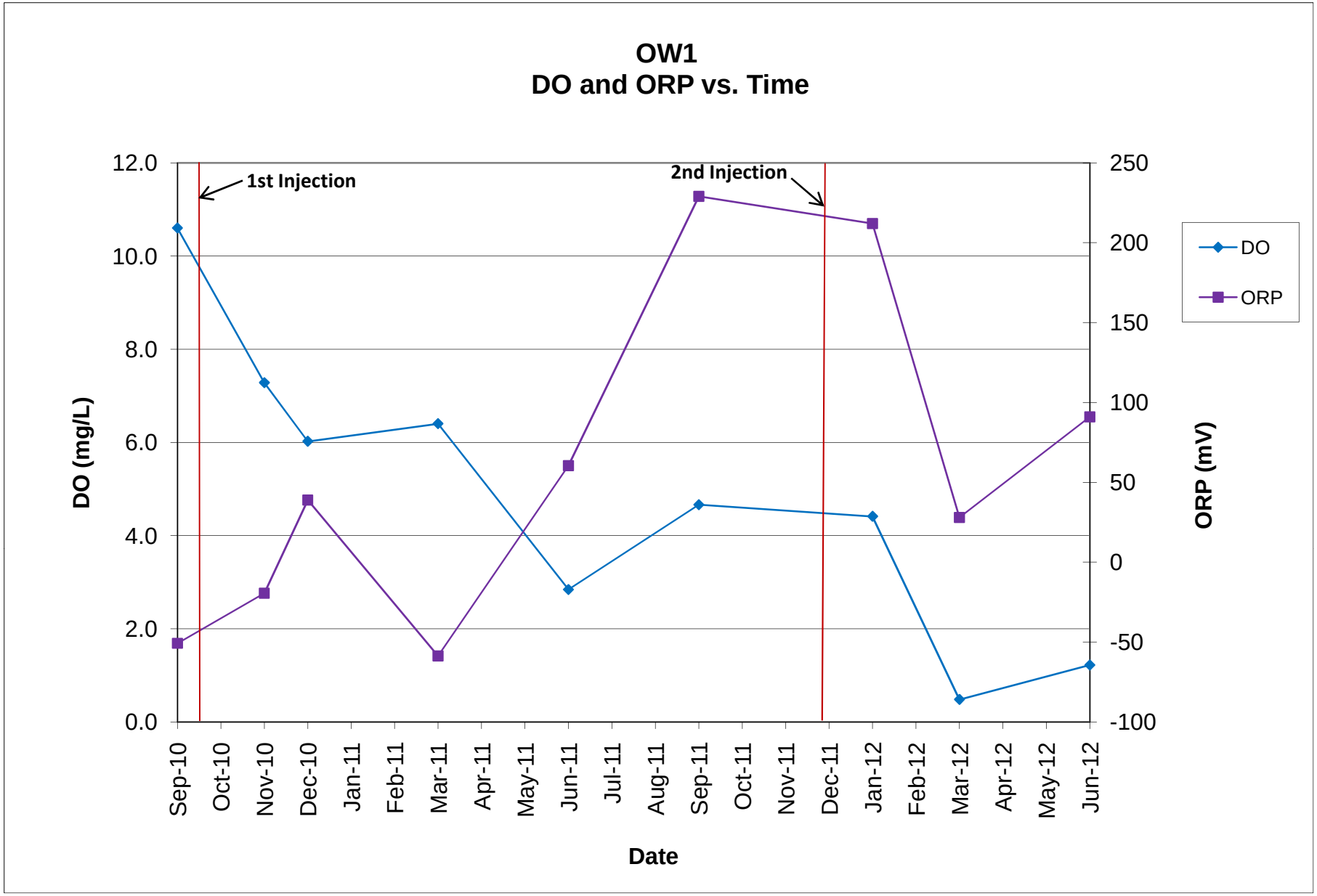
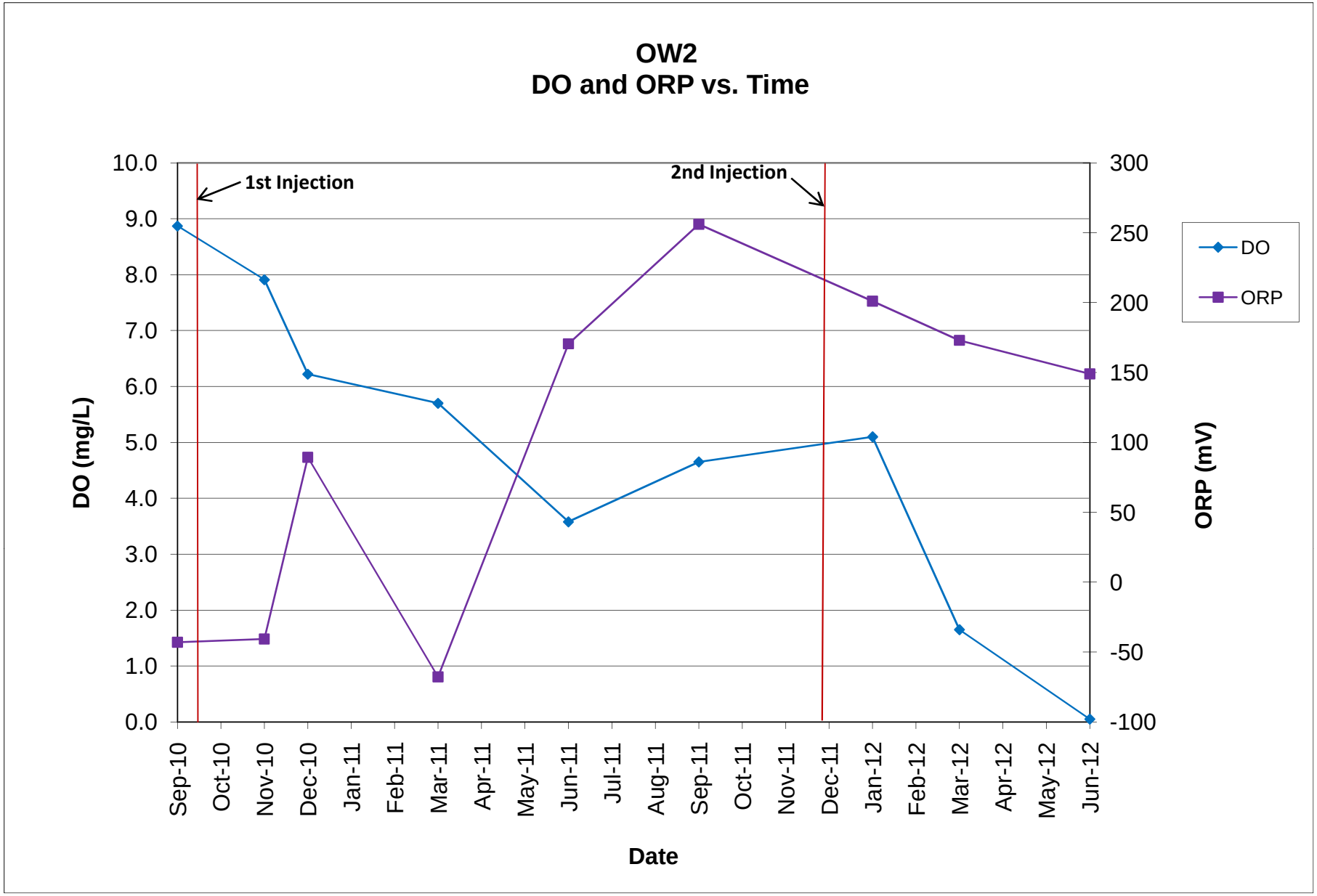
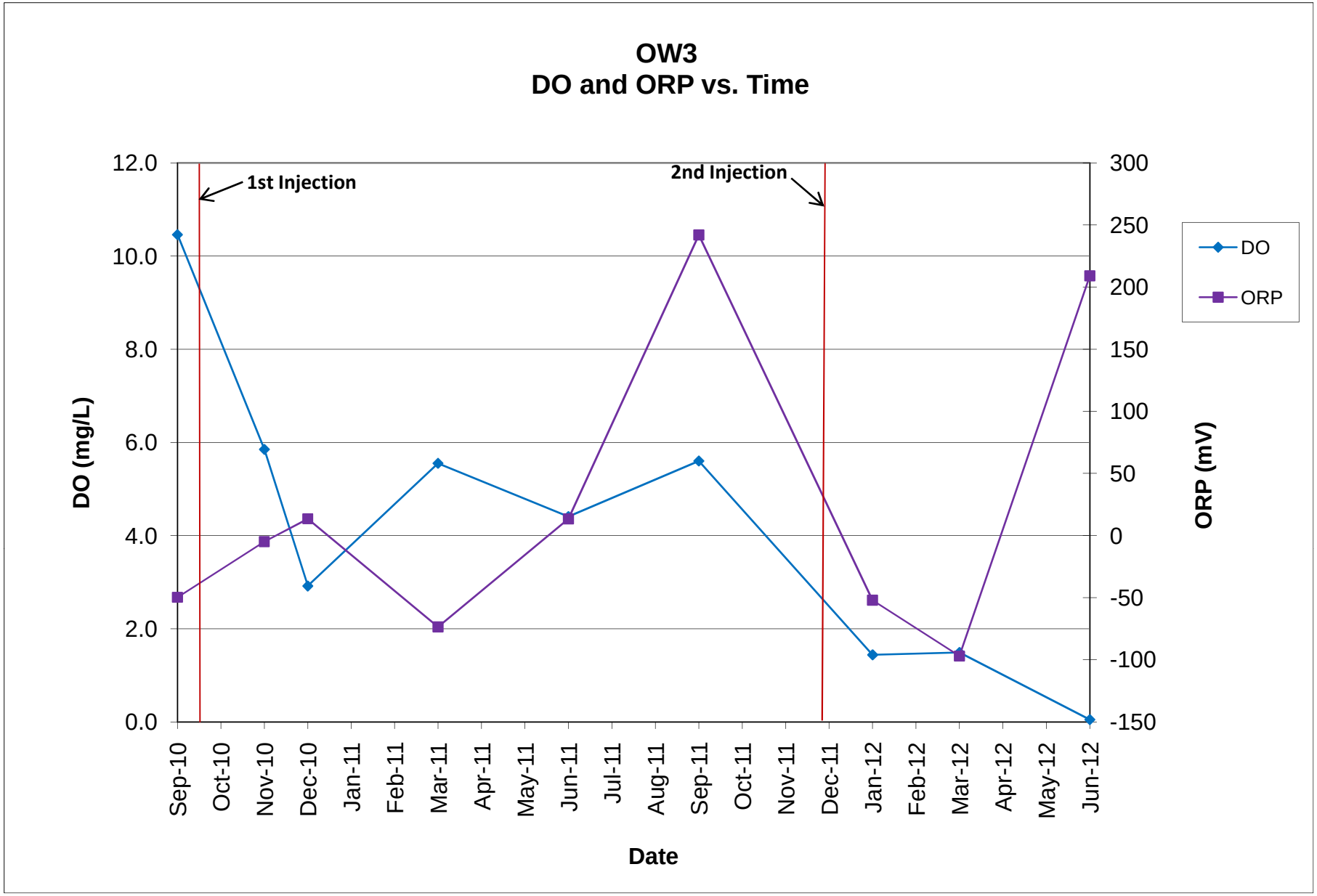
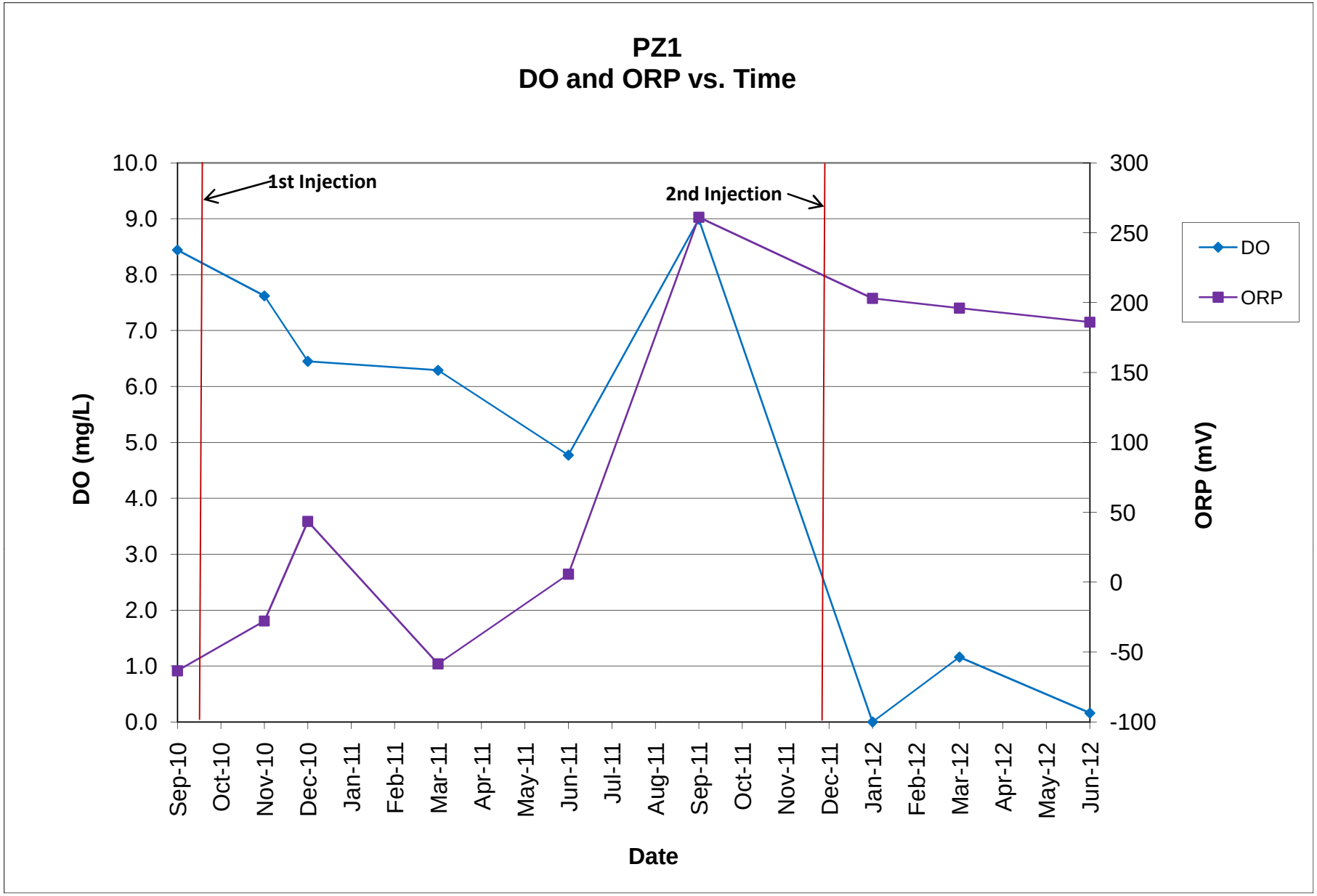
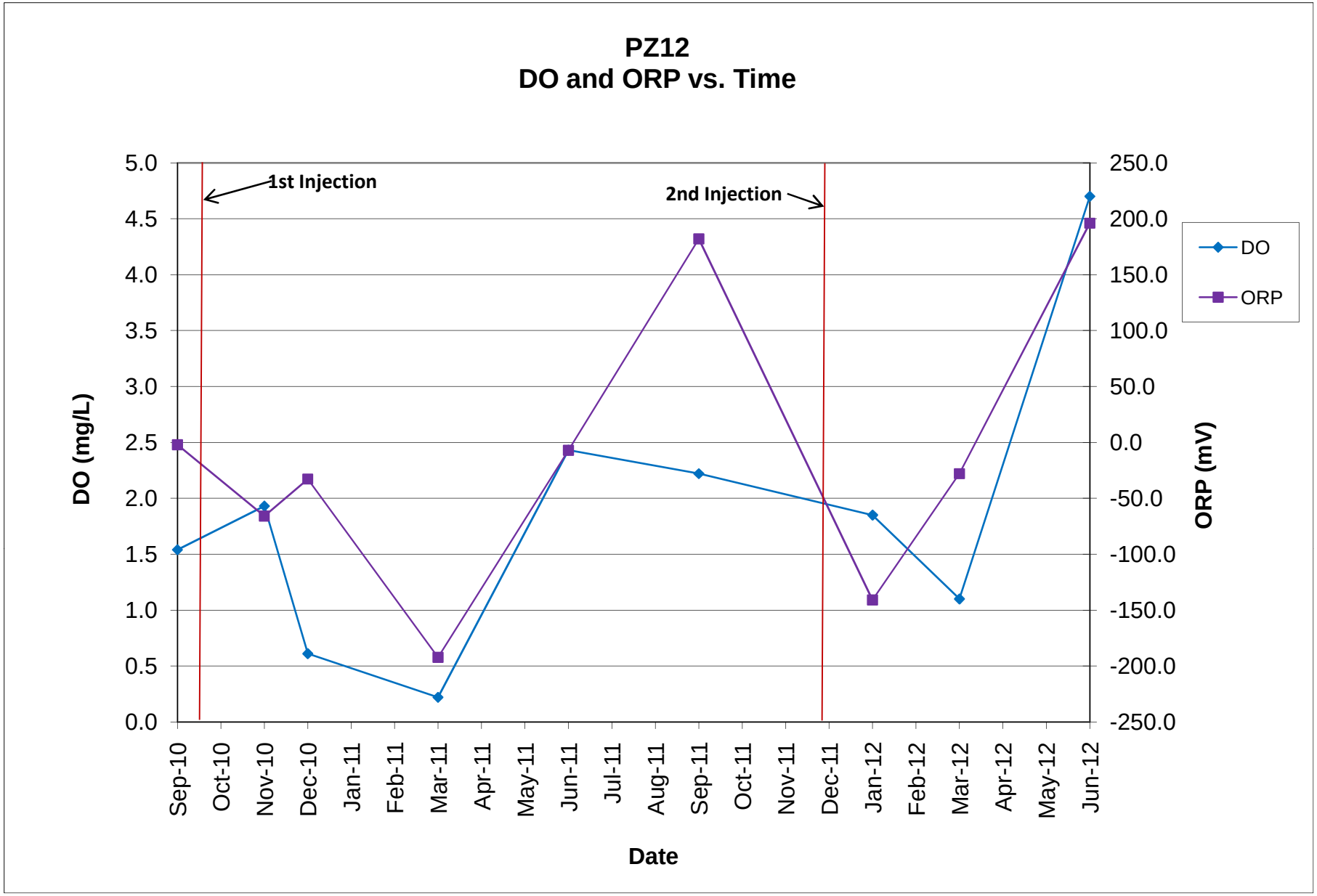
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW1
DO and ORP vs. Time
1st Injection
2nd Injection
DO (mg/L)
ORP (mV)
Date
DO
ORP
12.0
10.0
8.0
6.0
4.0
2.0
0.0
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

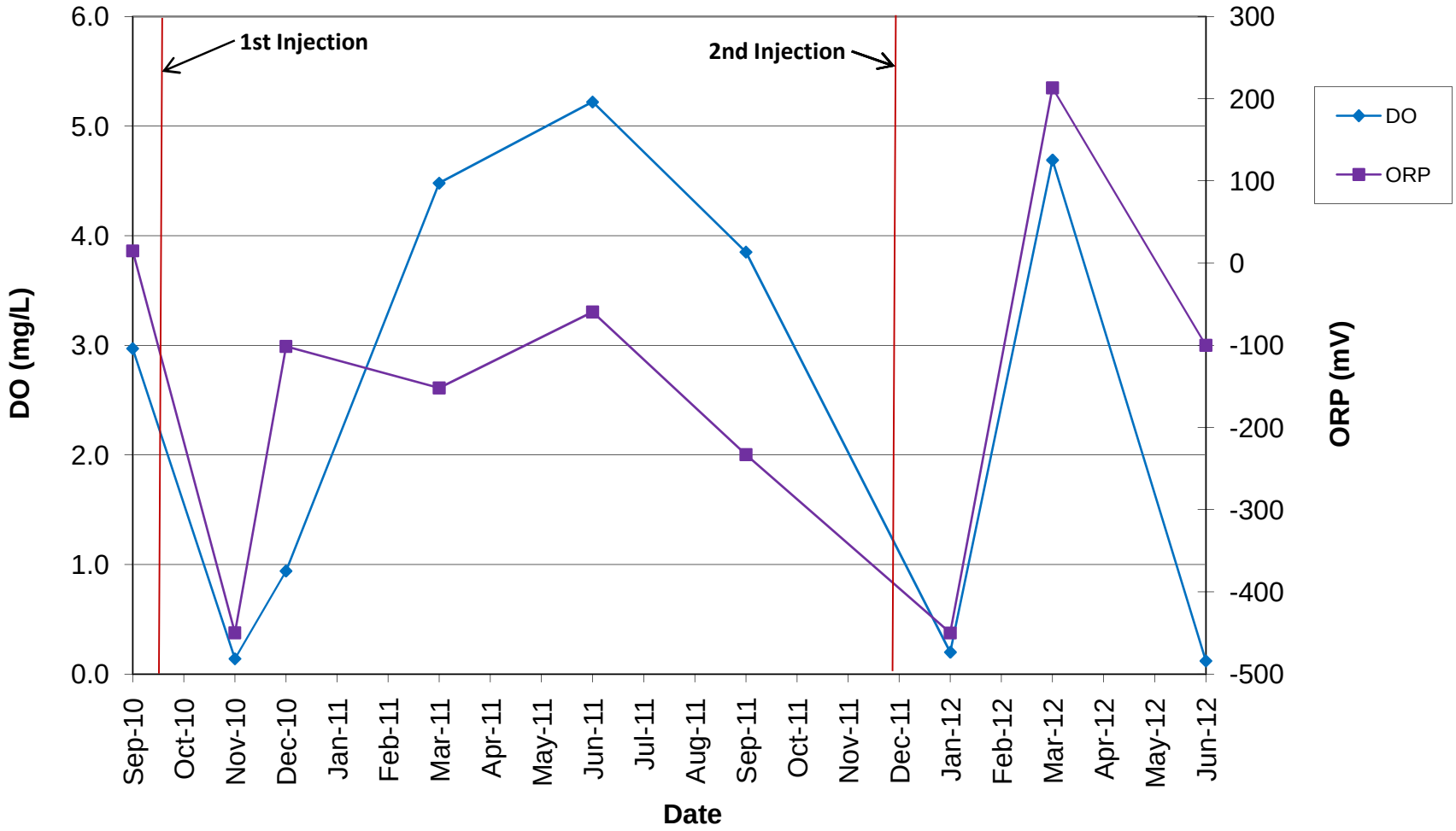

OW2
DO and ORP vs. Time
1st Injection
2nd Injection
DO (mg/L)
ORP (mV)
Date
DO
ORP
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW3
DO and ORP vs. Time
1st Injection
2nd Injection
DO (mg/L)
ORP (mV)
Date
DO
ORP
12.0
10.0
8.0
6.0
4.0
2.0
0.0
300
250
200
150
100
50
0
-50
-100
-150
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

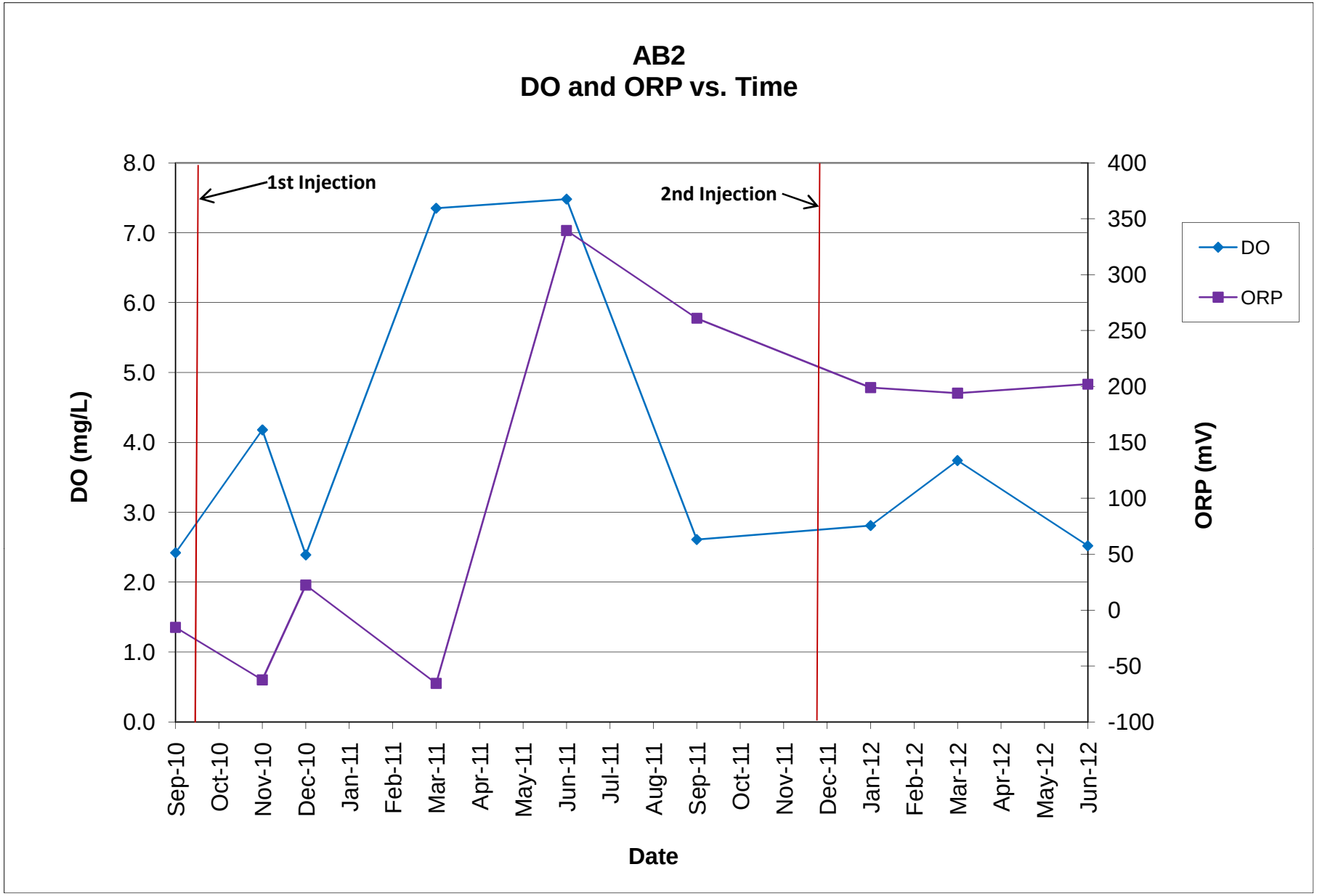

PZ1
DO and ORP vs. Time
1st Injection
2nd Injection
DO (mg/L)
ORP (mV)
Date
DO
ORP
10.0
9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

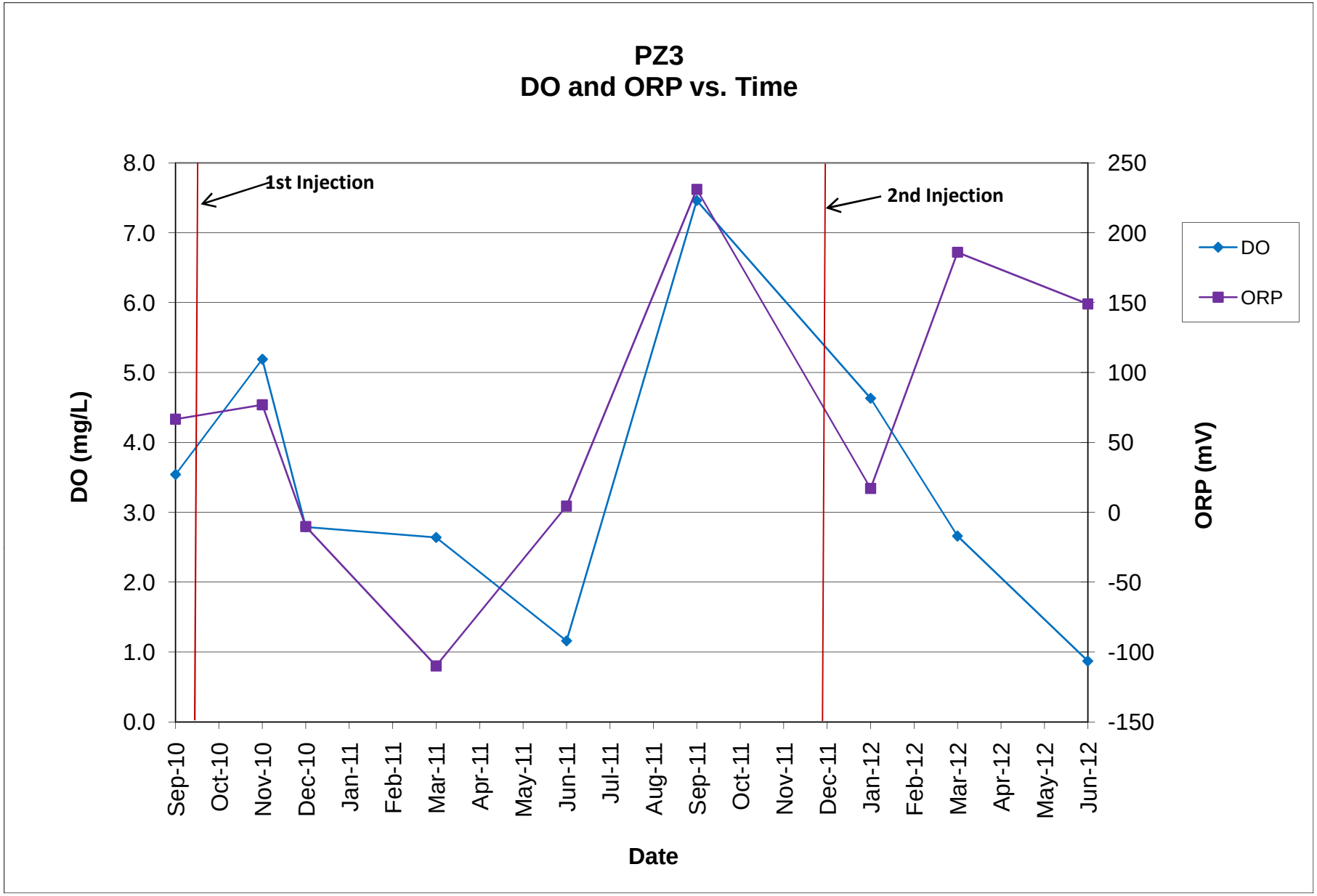

PZ12
DO and ORP vs. Time
1st Injection
2nd Injection
DO
ORP
DO (mg/L)
ORP (mV)
Date
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
250.0
200.0
150.0
100.0
50.0
0.0
-50.0
-100.0
-150.0
-200.0
-250.0
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

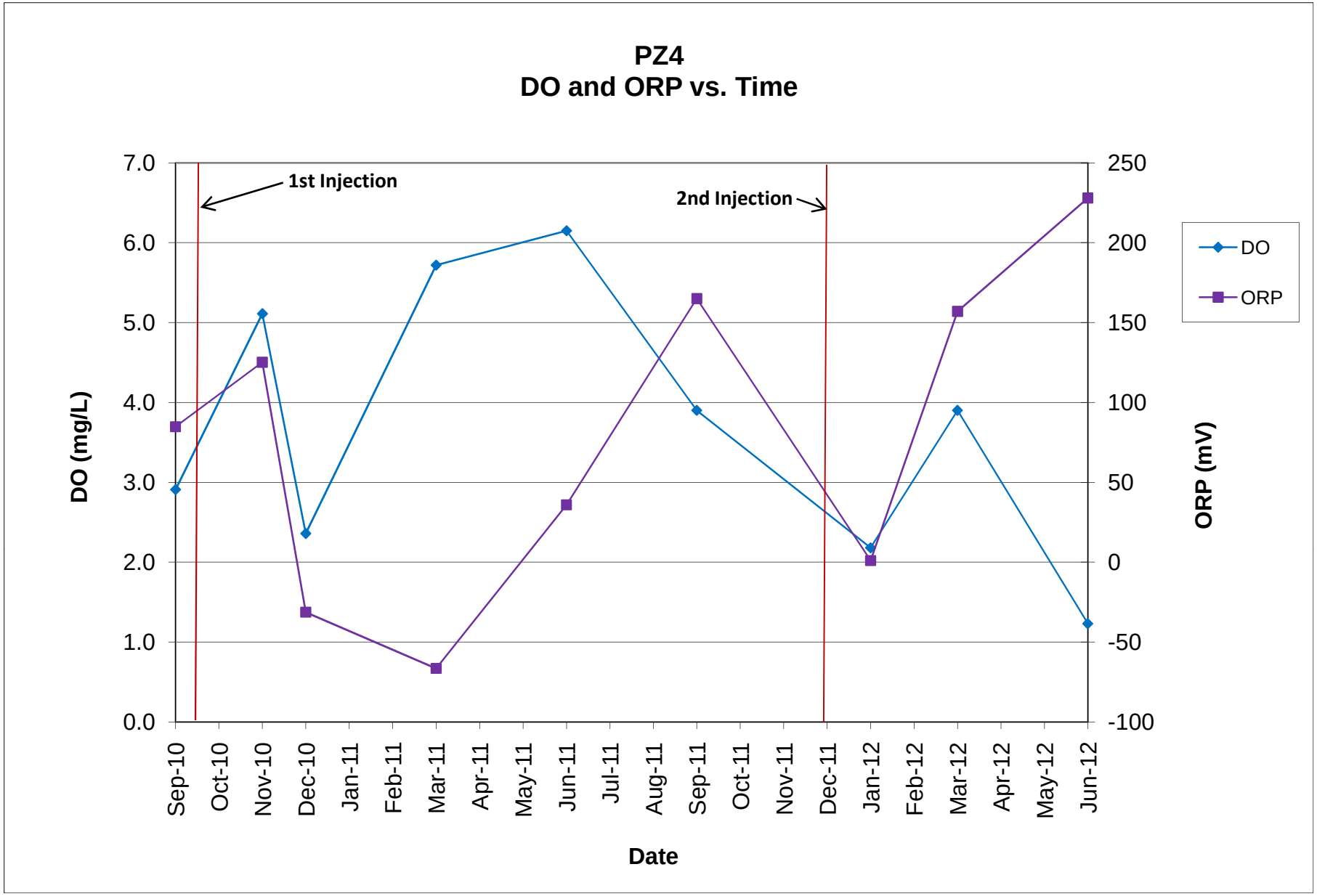
PZ13
DO and ORP vs. Time

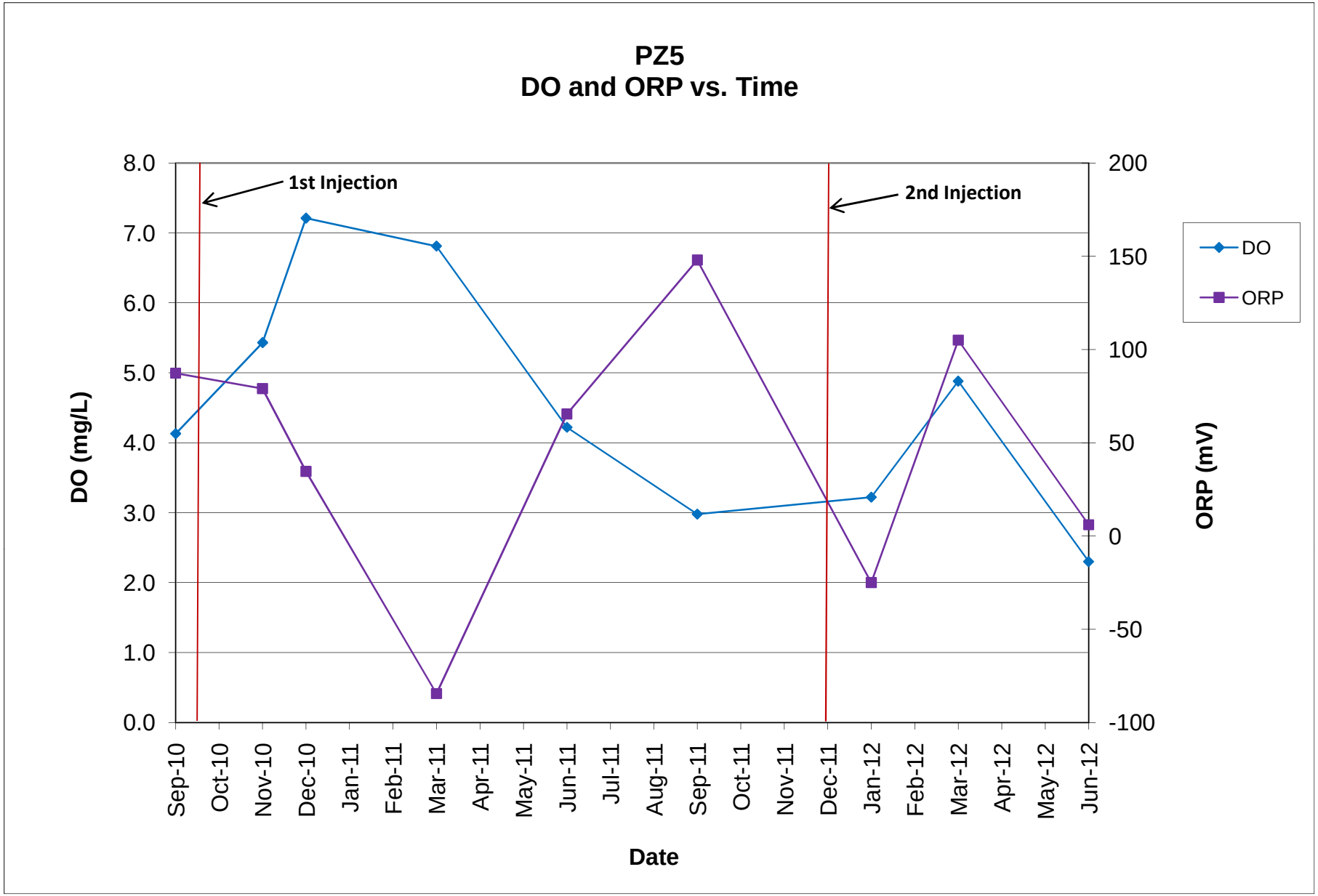


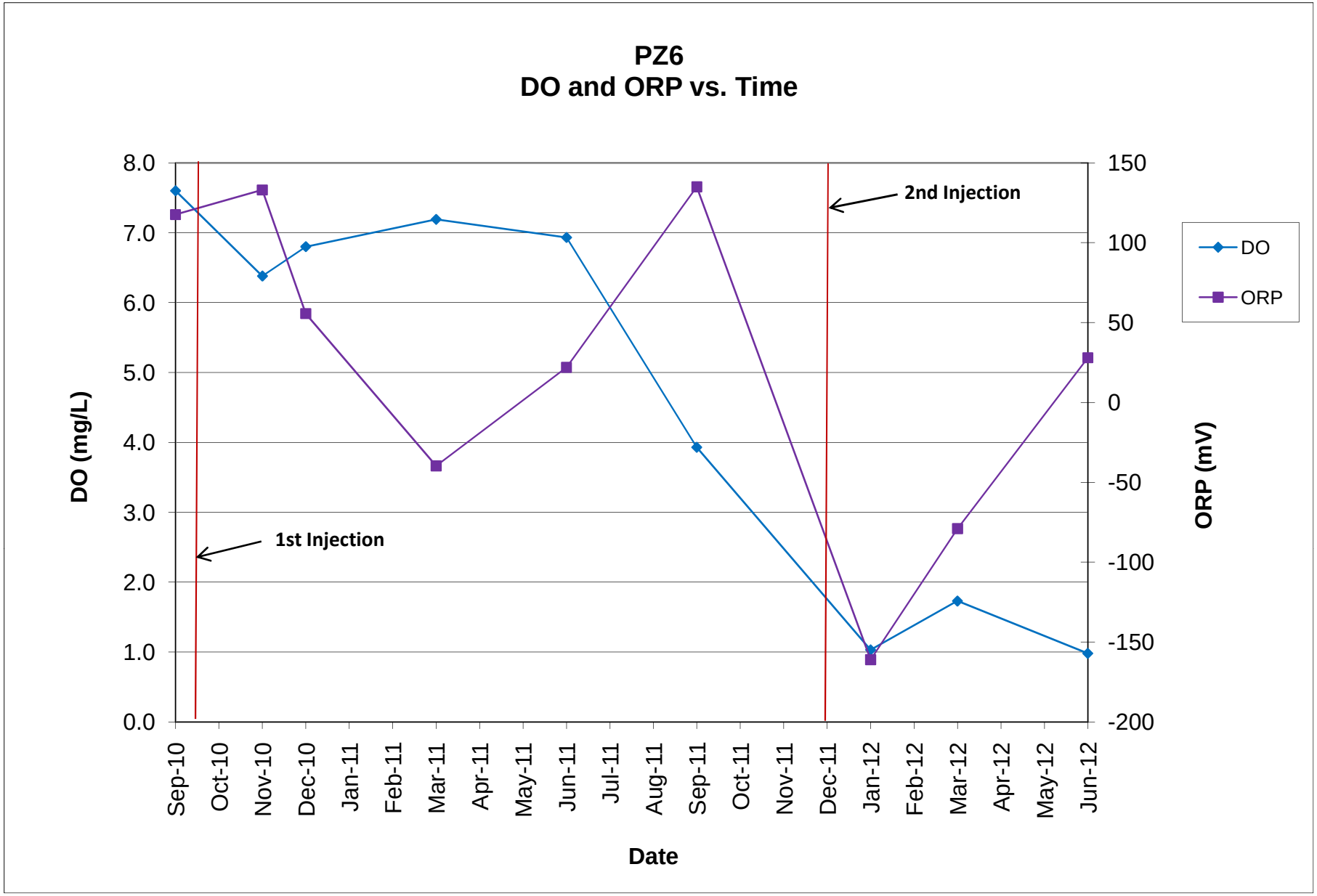
Note: CaSx was present in purge water during January 2012. Therefore, the data was estimated based on previously collected CaSx measurements in order to prevent damaging instument.


AB2
DO and ORP vs. Time
1st Injection
2nd Injection
DO (mg/L)
ORP (mV)
Date
DO
ORP
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
400
350
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ3
DO and ORP vs. Time
1st Injection
2nd Injection
DO
ORP
DO (mg/L)
ORP (mV)
Date
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
250
200
150
100
50
0
-50
-100
-150
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ4
DO and ORP vs. Time
1st Injection
2nd Injection
DO
ORP
DO (mg/L)
ORP (mV)
Date
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ5
DO and ORP vs. Time
1st Injection
2nd Injection
DO
ORP
DO (mg/L)
ORP (mV)
Date
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ6
DO and ORP vs. Time
DO (mg/L)
ORP (mV)
Date
1st Injection
2nd Injection
DO
ORP
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
150
100
50
0
-50
-100
-150
-200
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
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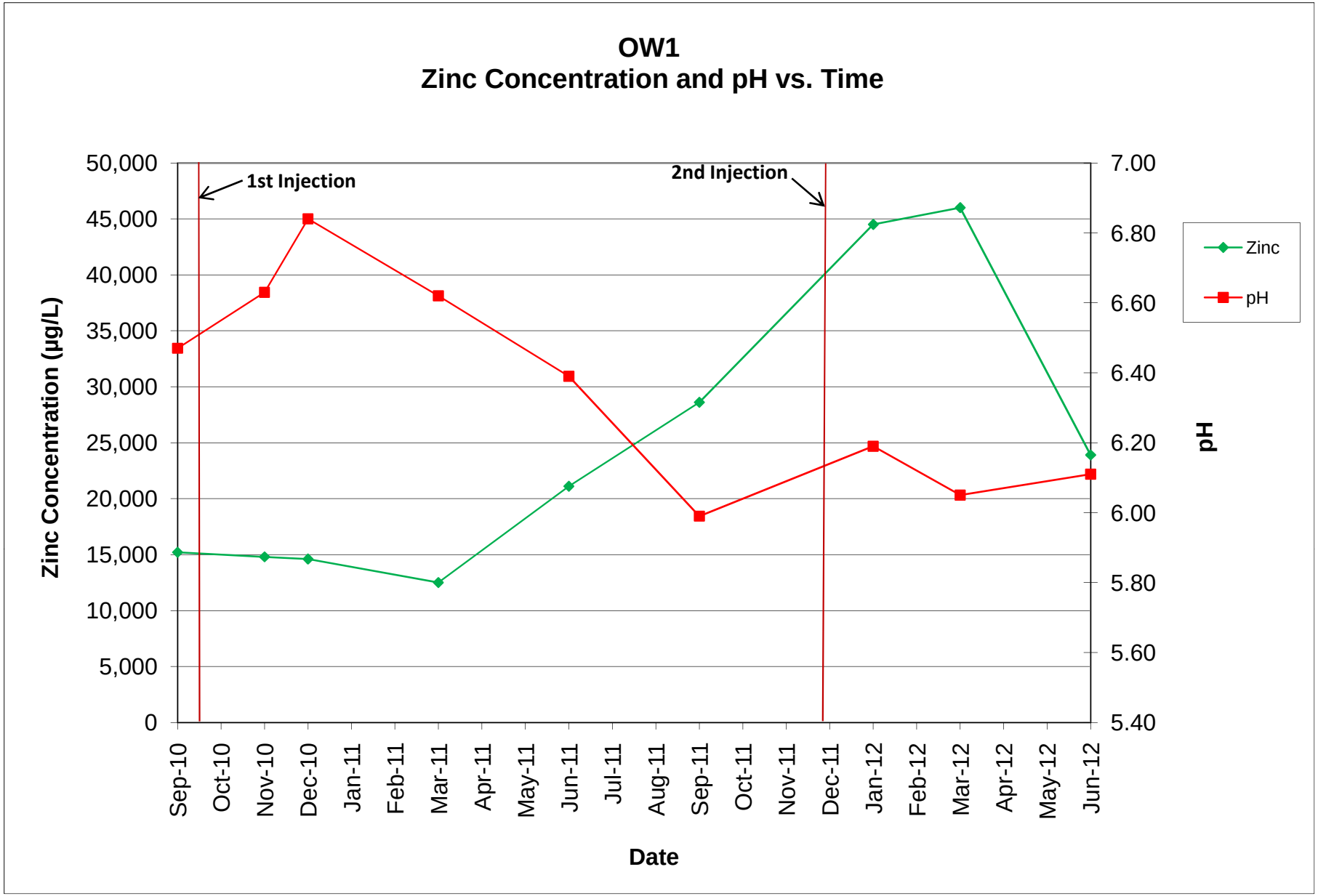
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW1
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
pH
Date
Zinc
pH
50,000
45,000
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
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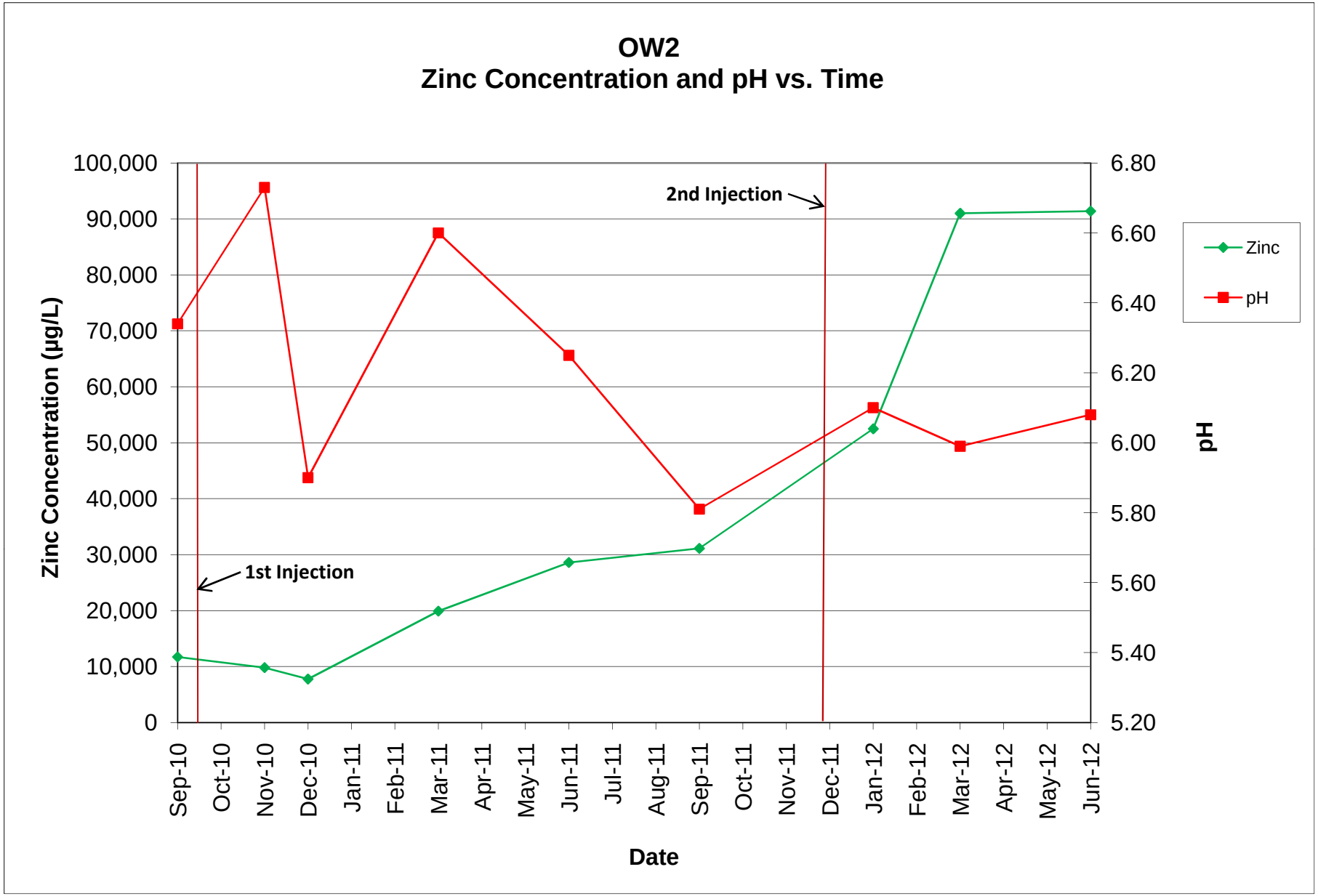
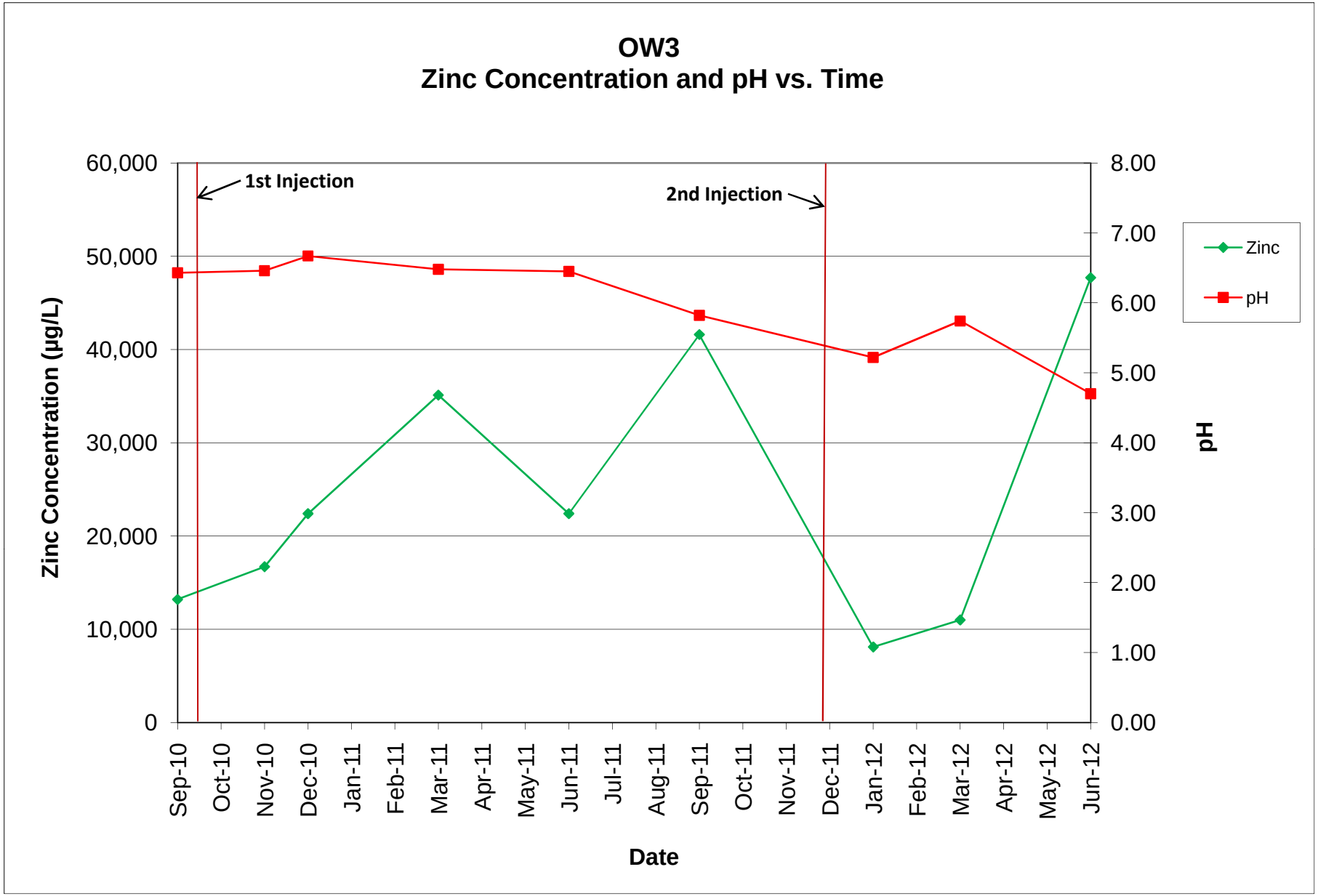
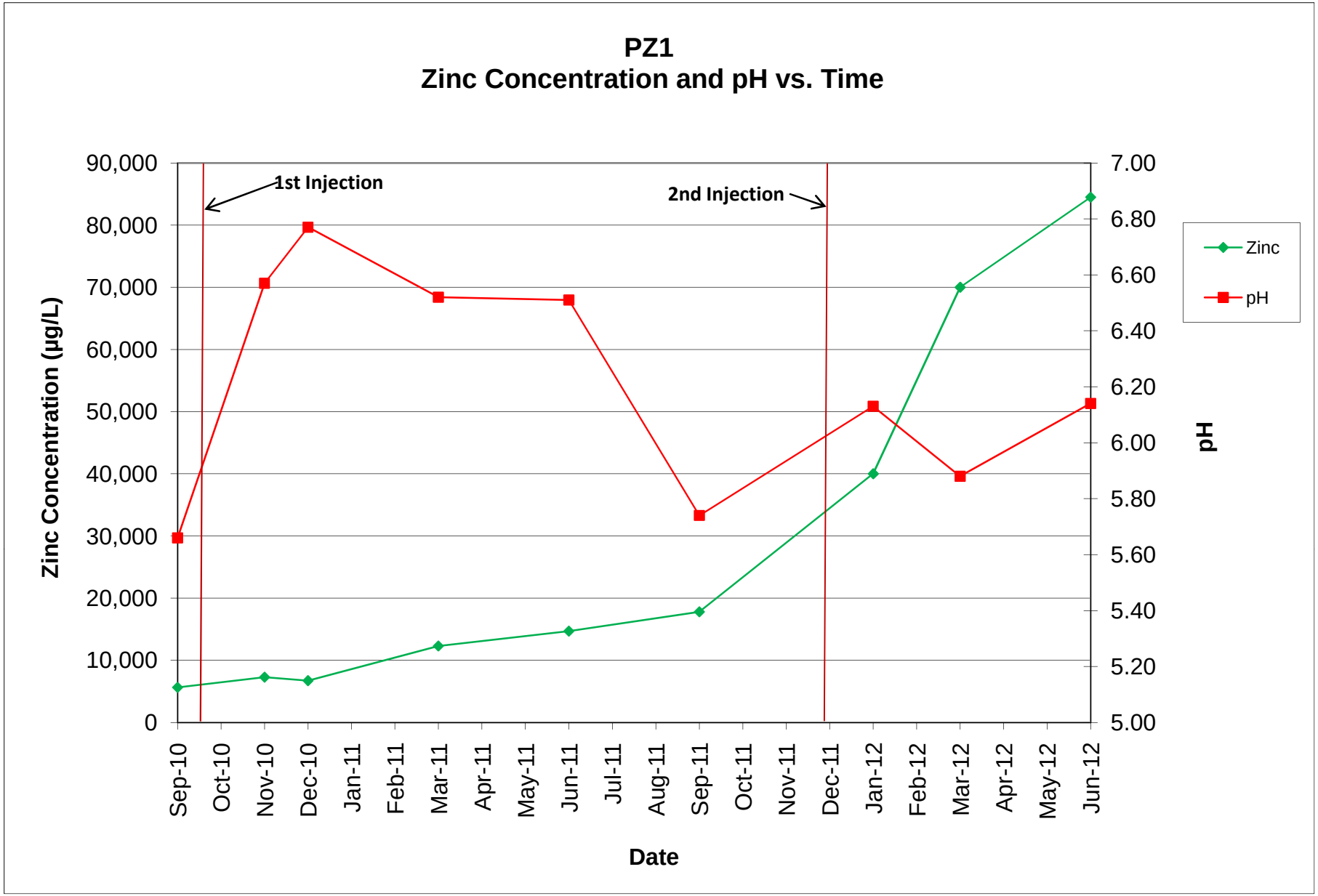
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW2
Zinc Concentration and pH vs. Time
Zinc Concentration (µg/L)
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
pH
1st Injection
2nd Injection
Zinc
pH
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Date


OW3
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
pH
Date
Zinc
pH
60,000
50,000
40,000
30,000
20,000
10,000
0
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ1
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
pH
Date
Zinc
pH
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
7.00
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
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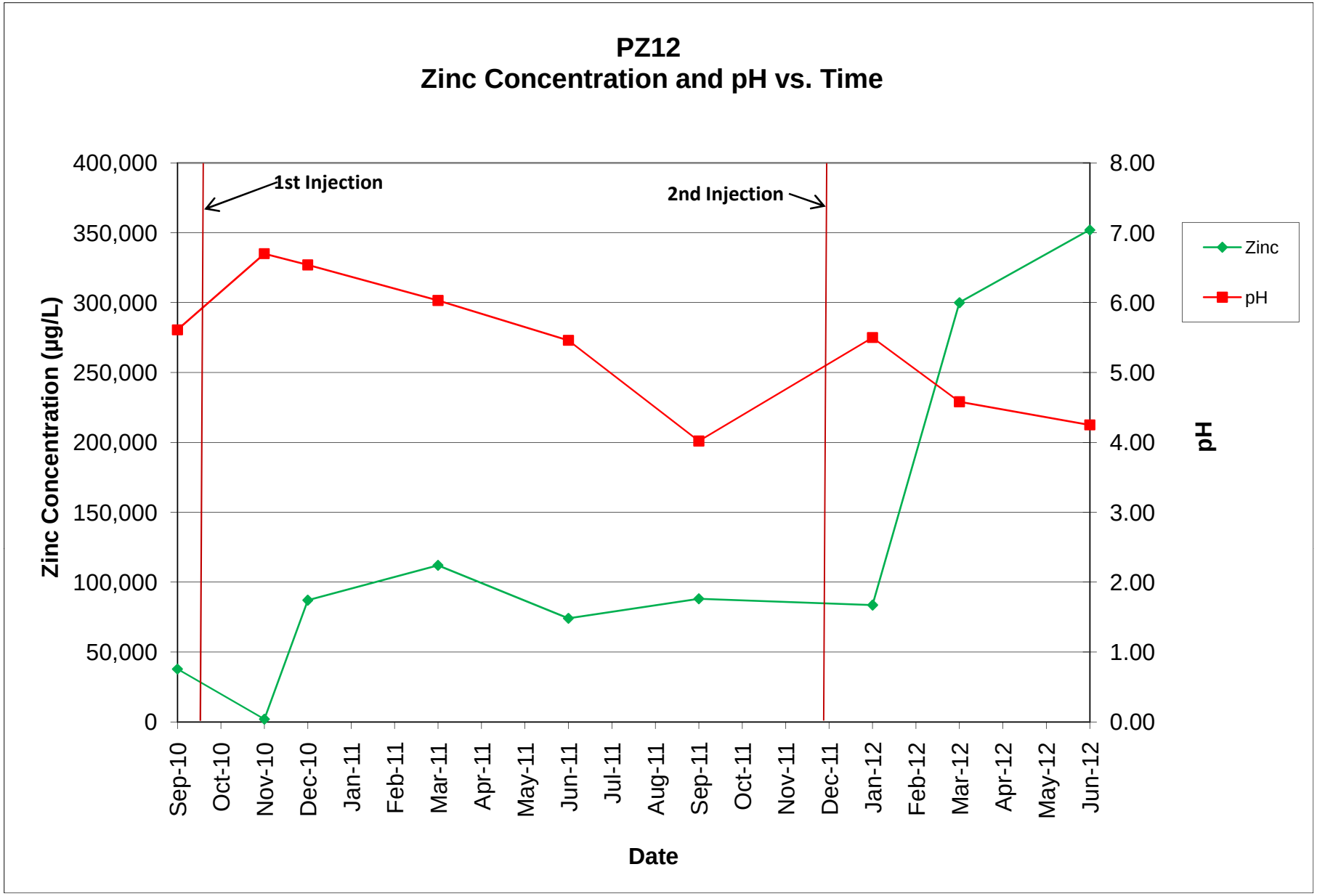
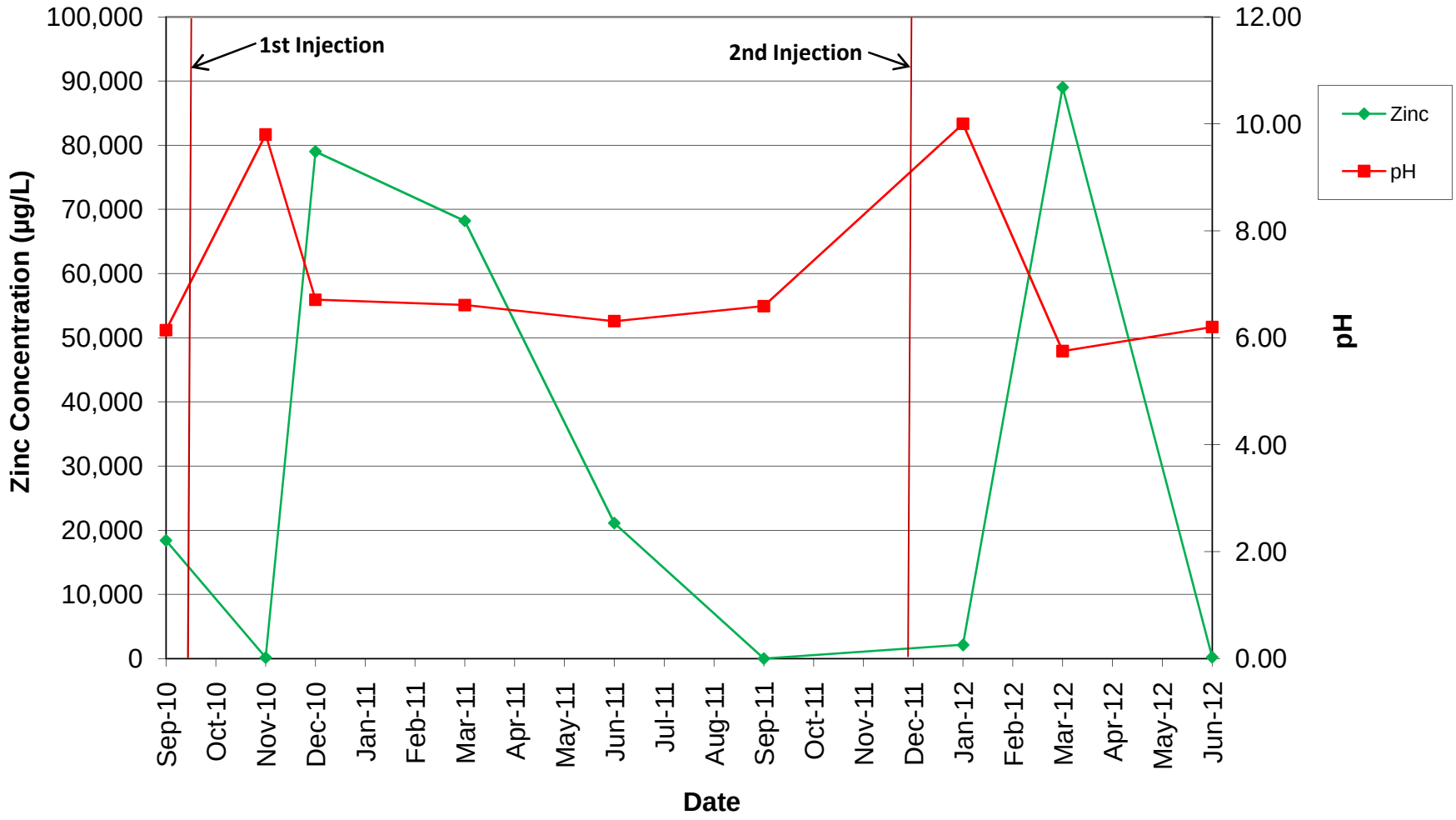
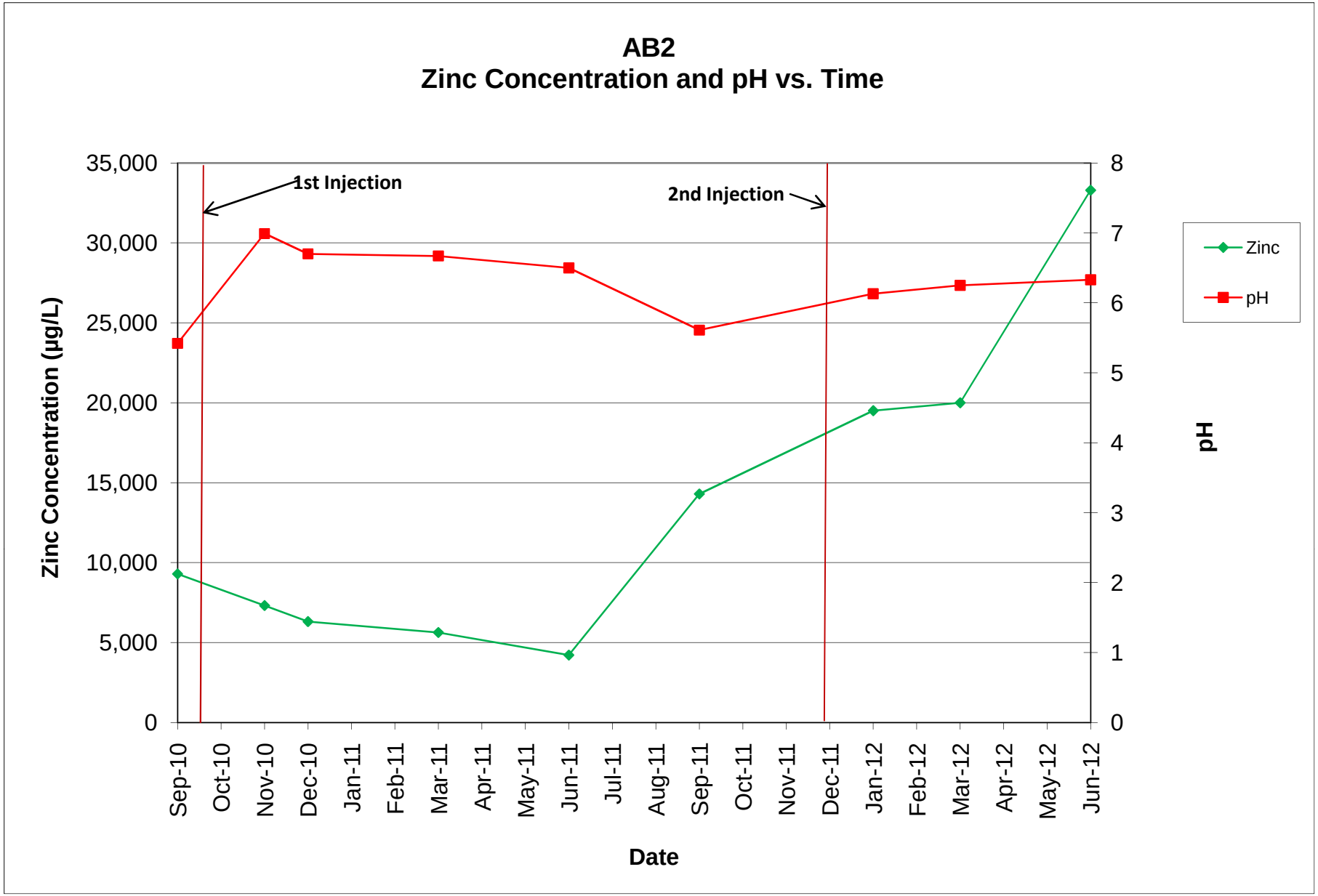
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ12
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
400,000
350,000
300,000
250,000
200,000
150,000
100,000
50,000
0
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
pH
Zinc
pH
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Date

PZ13
Zinc Concentration and pH vs. Time



Note: CaSx was present in purge water during January 2012. Therefore, the data was estimated based on previously collected CaSx measurements in order to prevent damaging instument.


AB2
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
pH
Date
Zinc
pH
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
8
7
6
5
4
3
2
1
0
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
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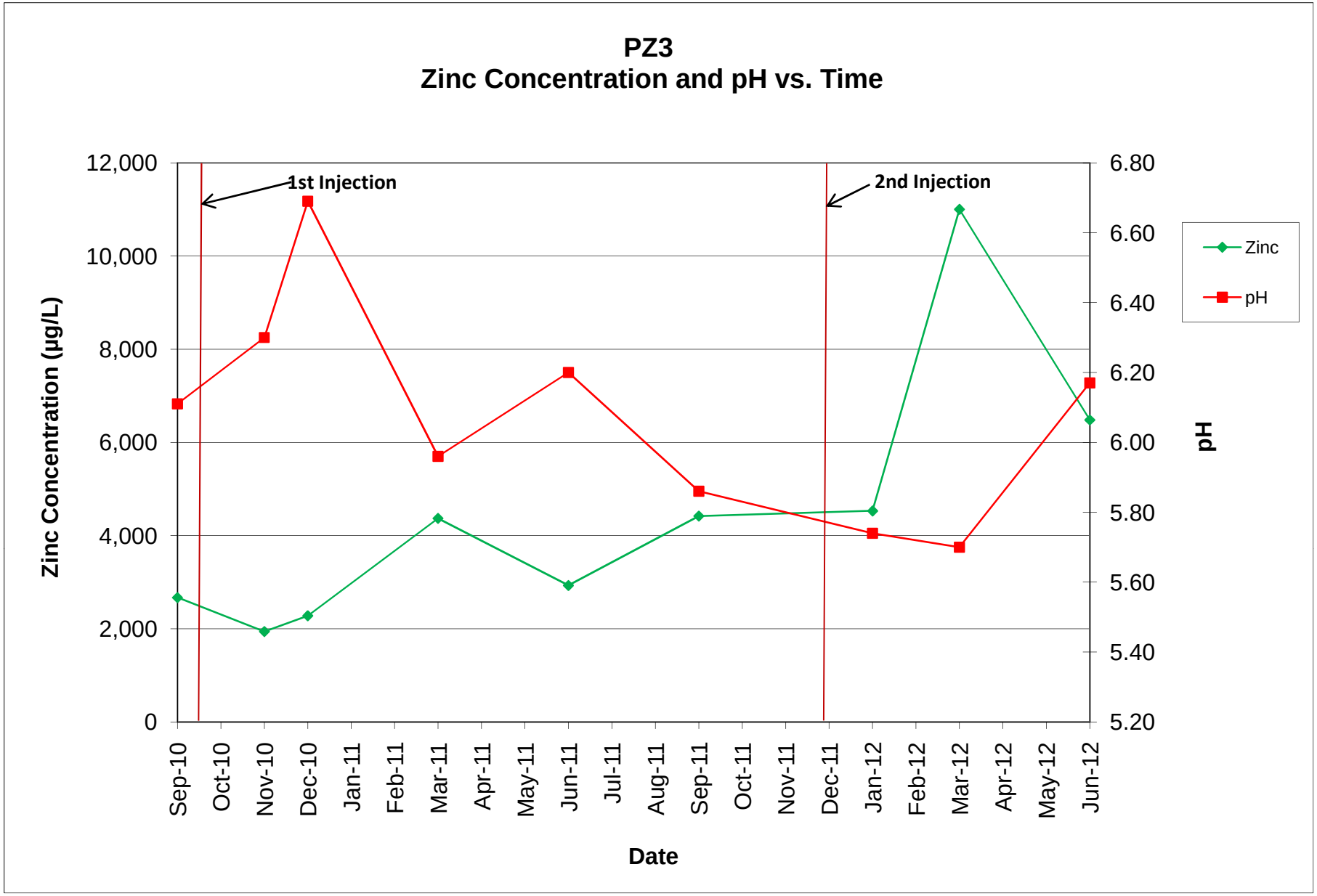
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ3
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
pH
Date
Zinc
pH
12,000
10,000
8,000
6,000
4,000
2,000
0
6.80
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
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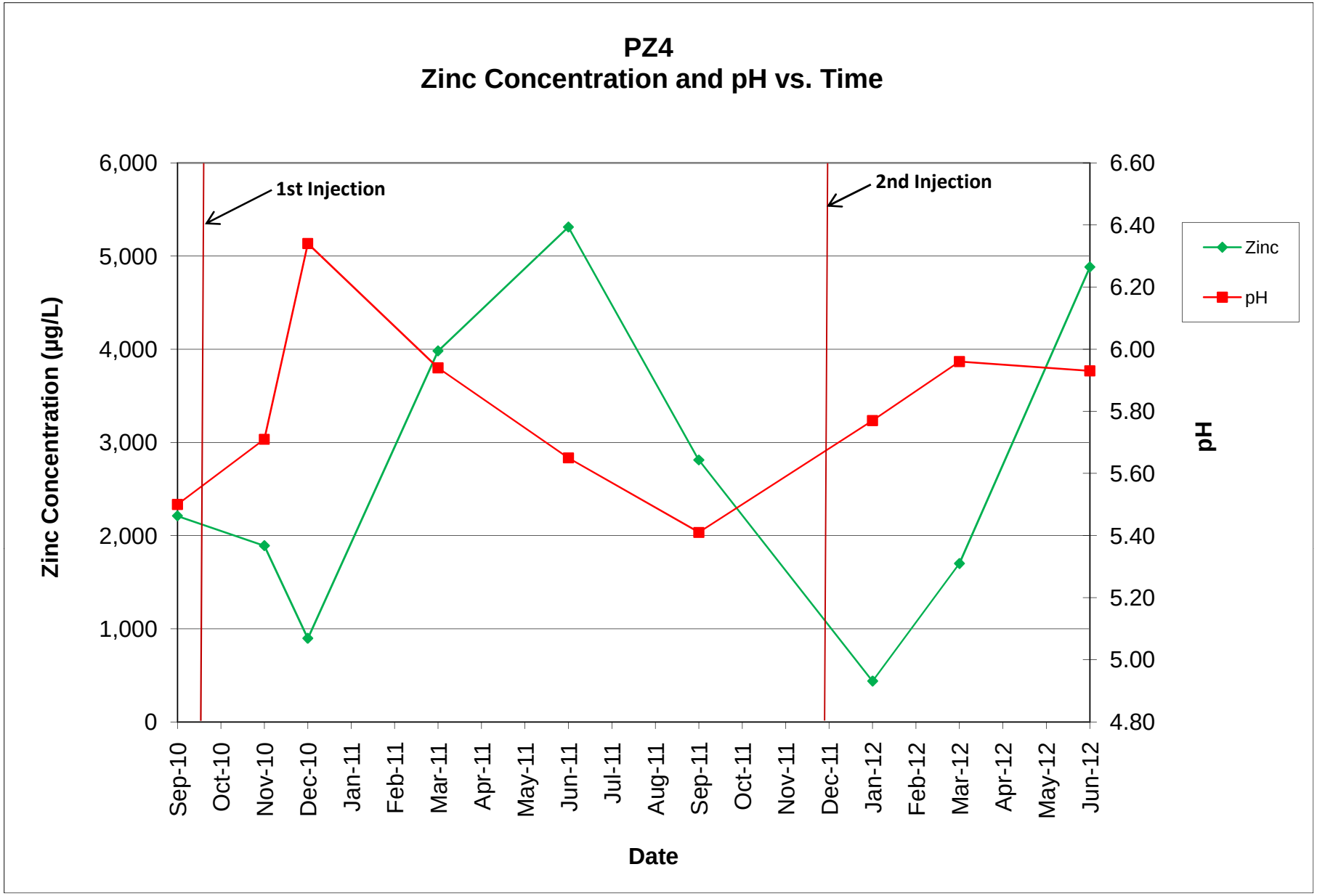
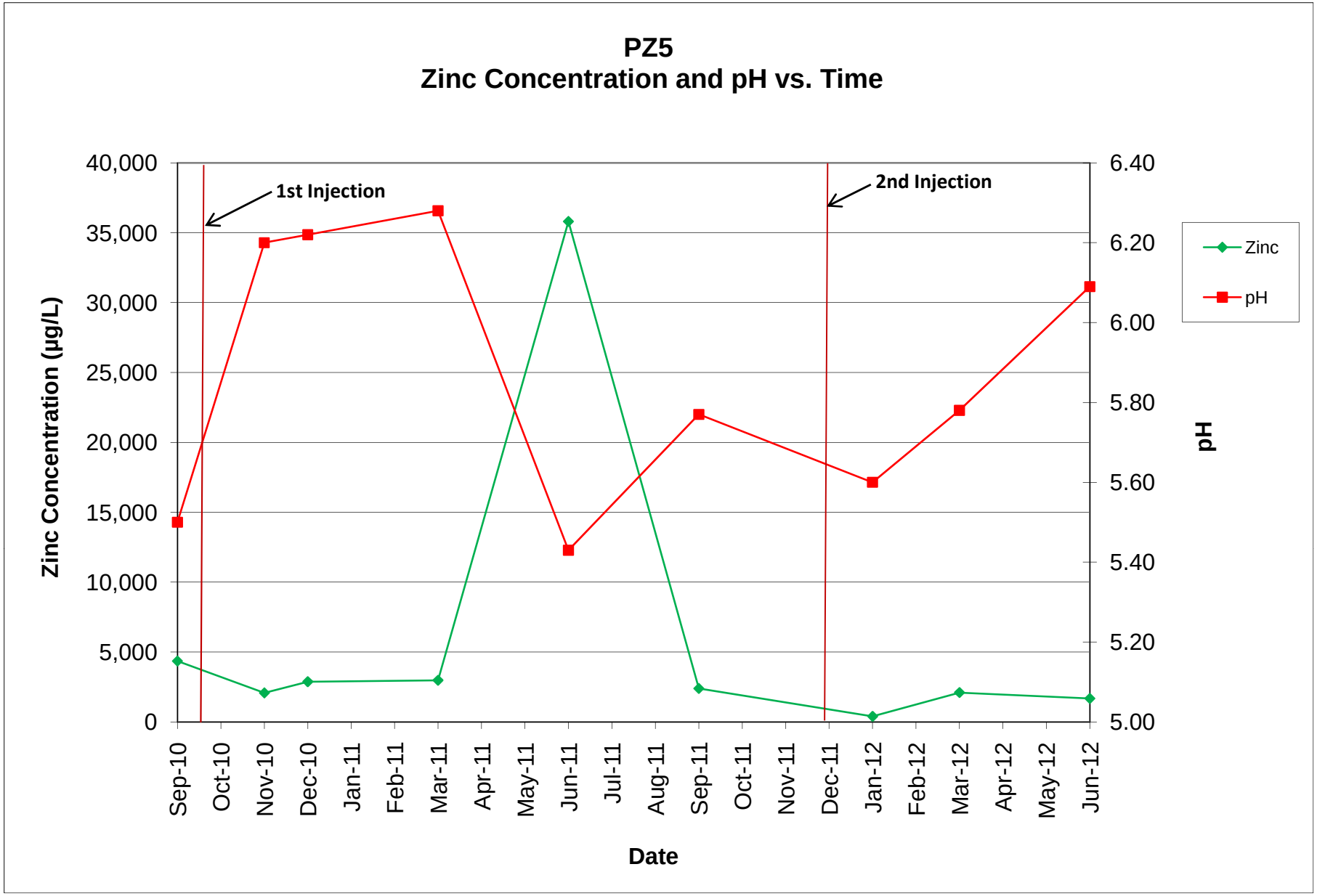
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ4
Zinc Concentration and pH vs. Time
Zinc Concentration (µg/L)
6,000
5,000
4,000
3,000
2,000
1,000
0
pH
6.60
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
4.80
1st Injection
2nd Injection
Zinc
pH
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Date


PZ5
Zinc Concentration and pH vs. Time
1st Injection
2nd Injection
Zinc Concentration (µg/L)
pH
Date
Zinc
pH
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
0
6.40
6.20
6.00
5.80
5.60
5.40
5.20
5.00
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
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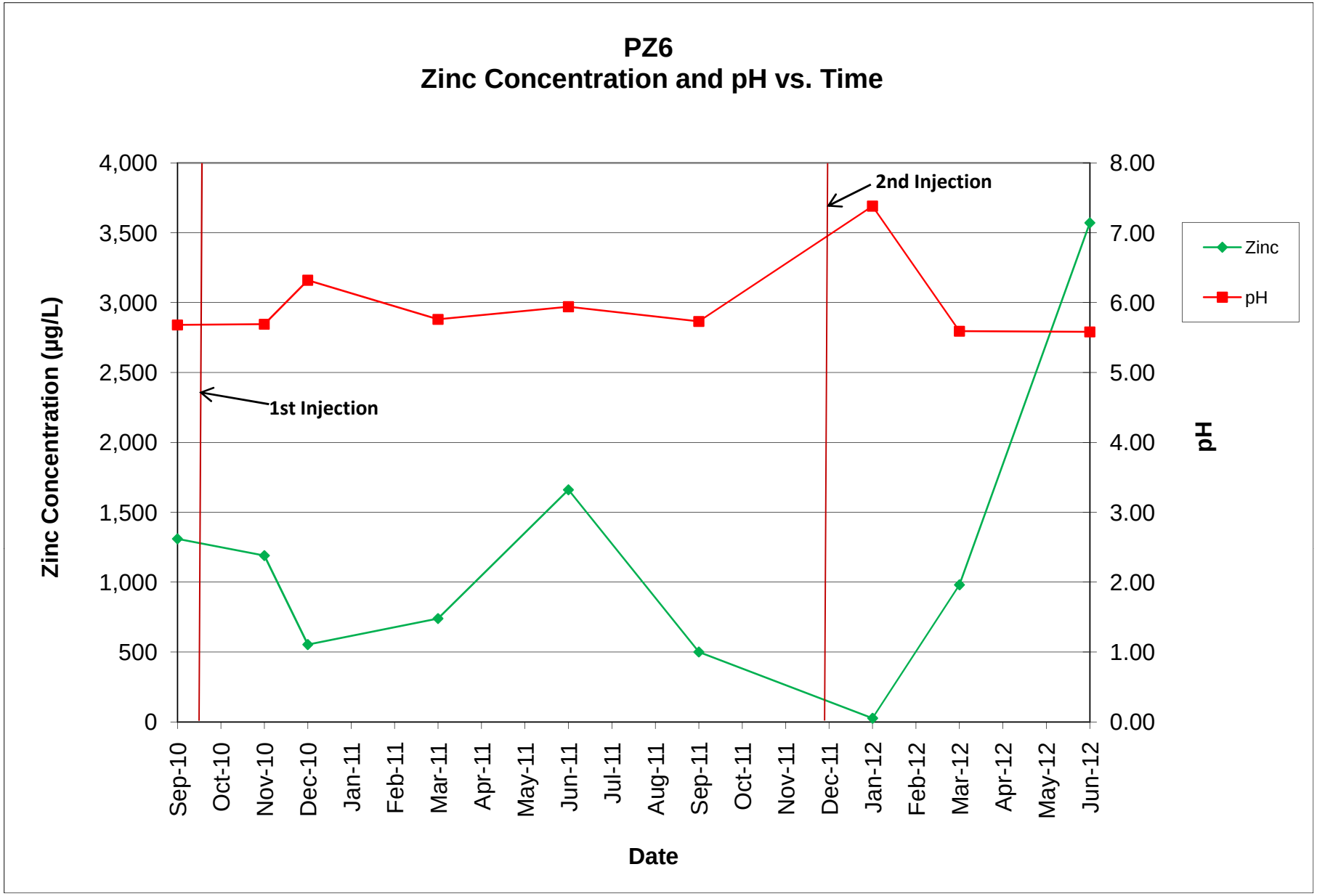
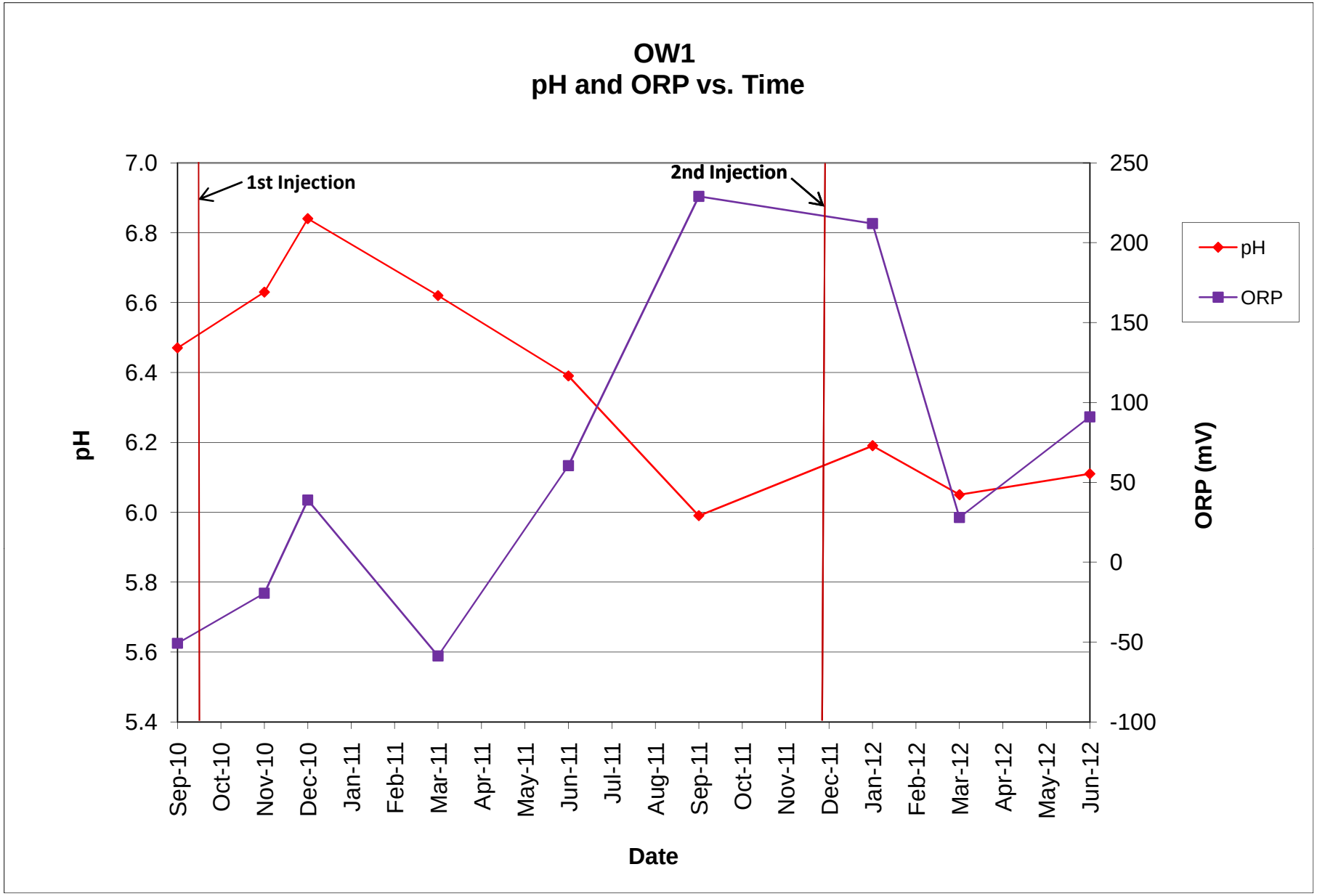
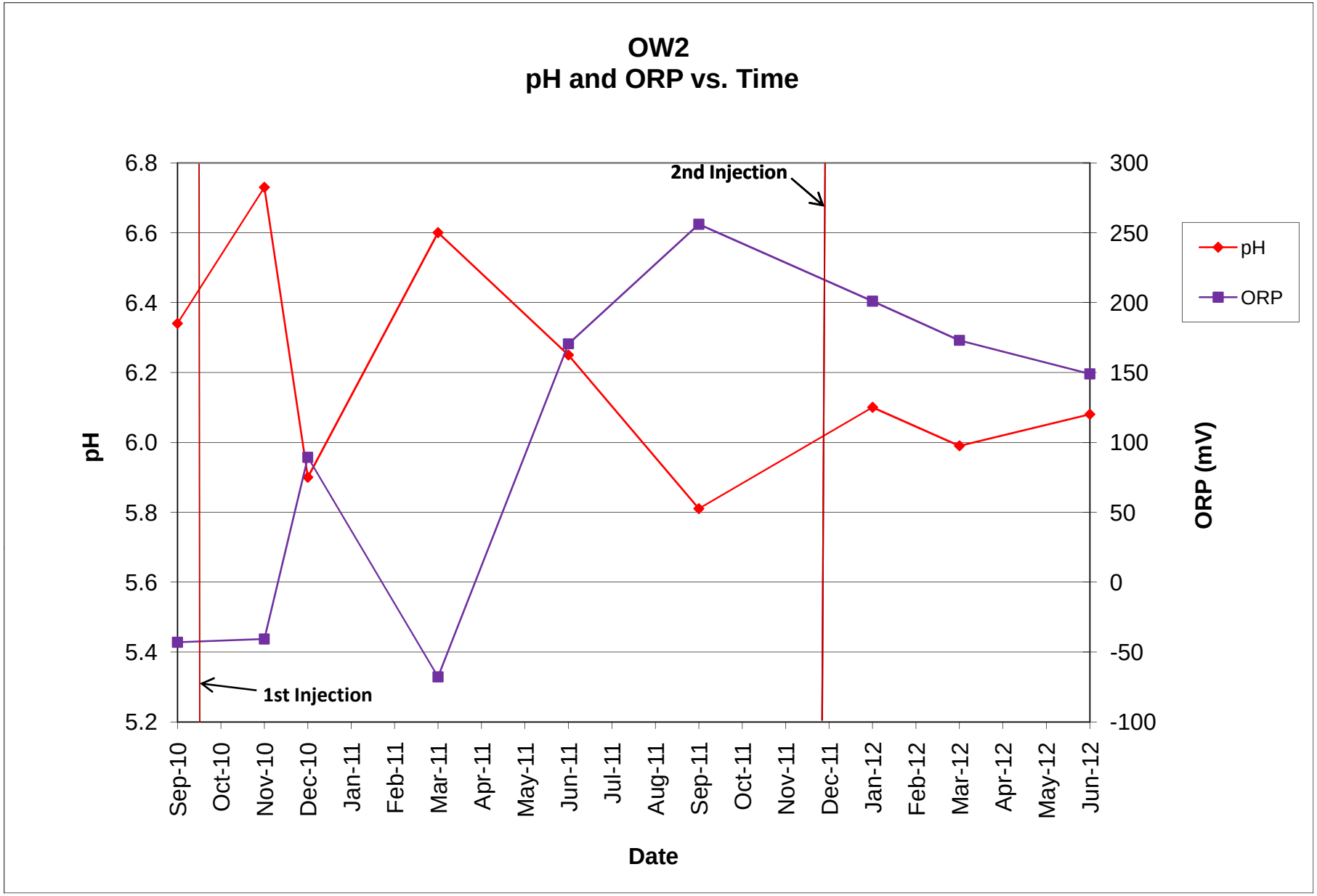
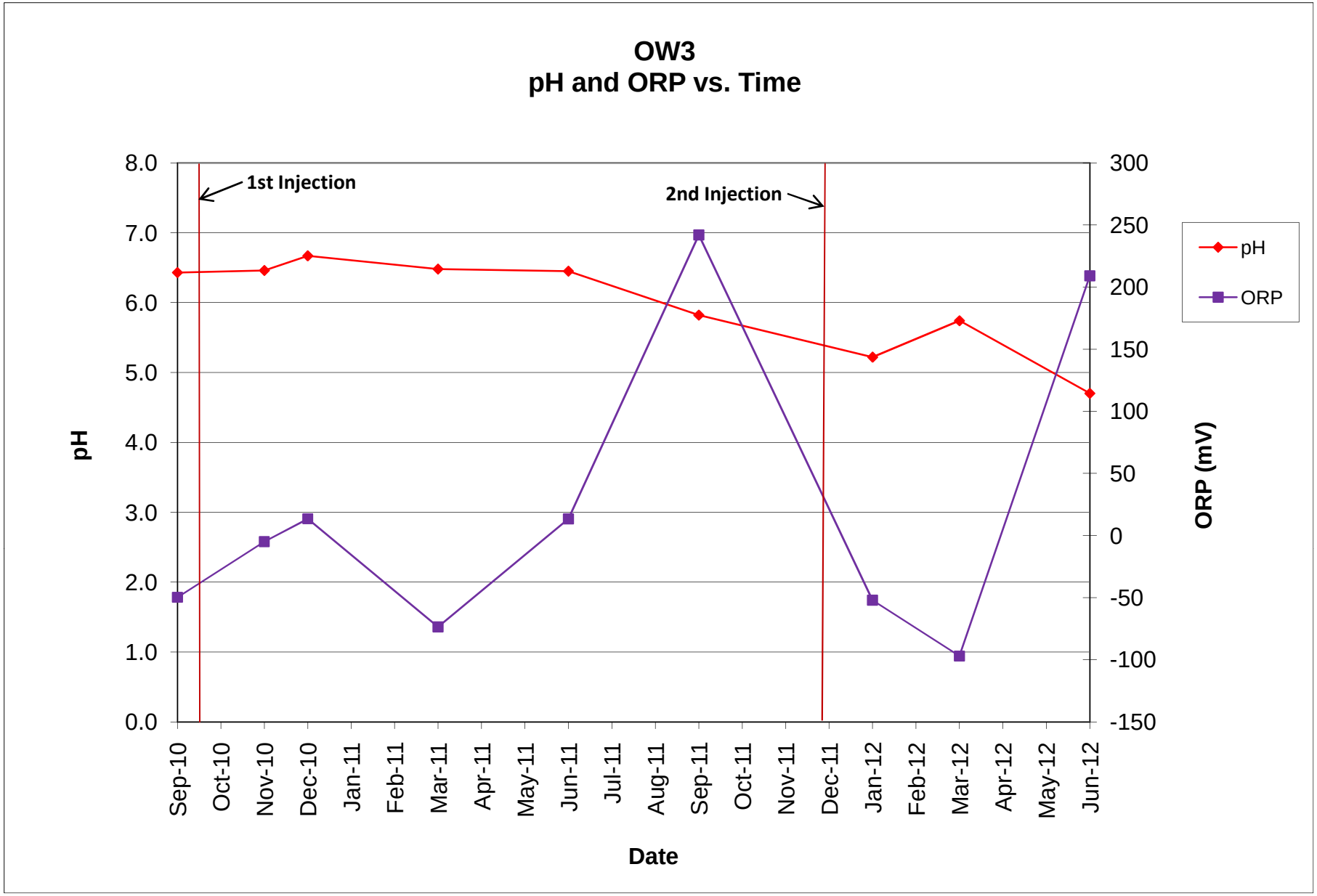
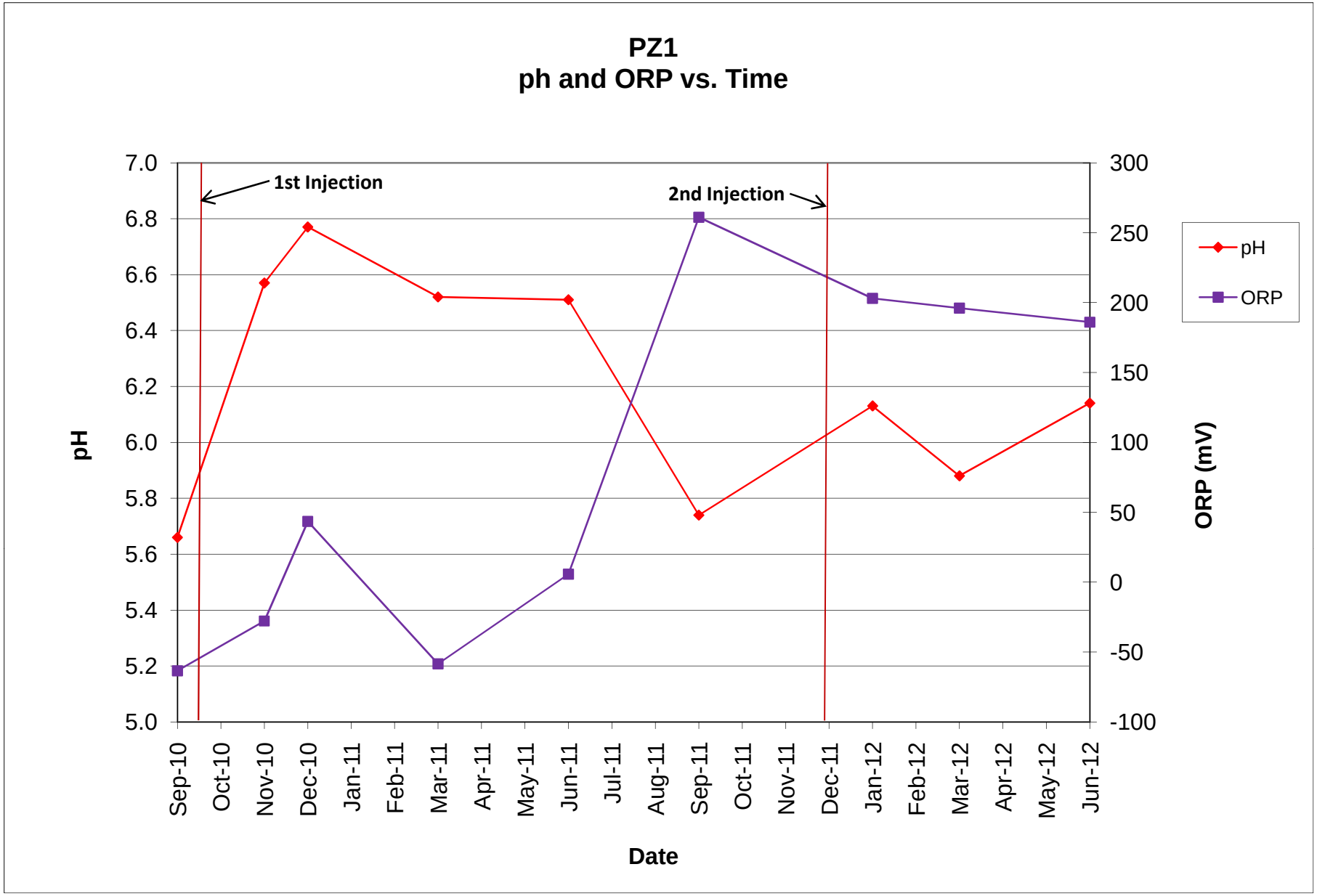
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

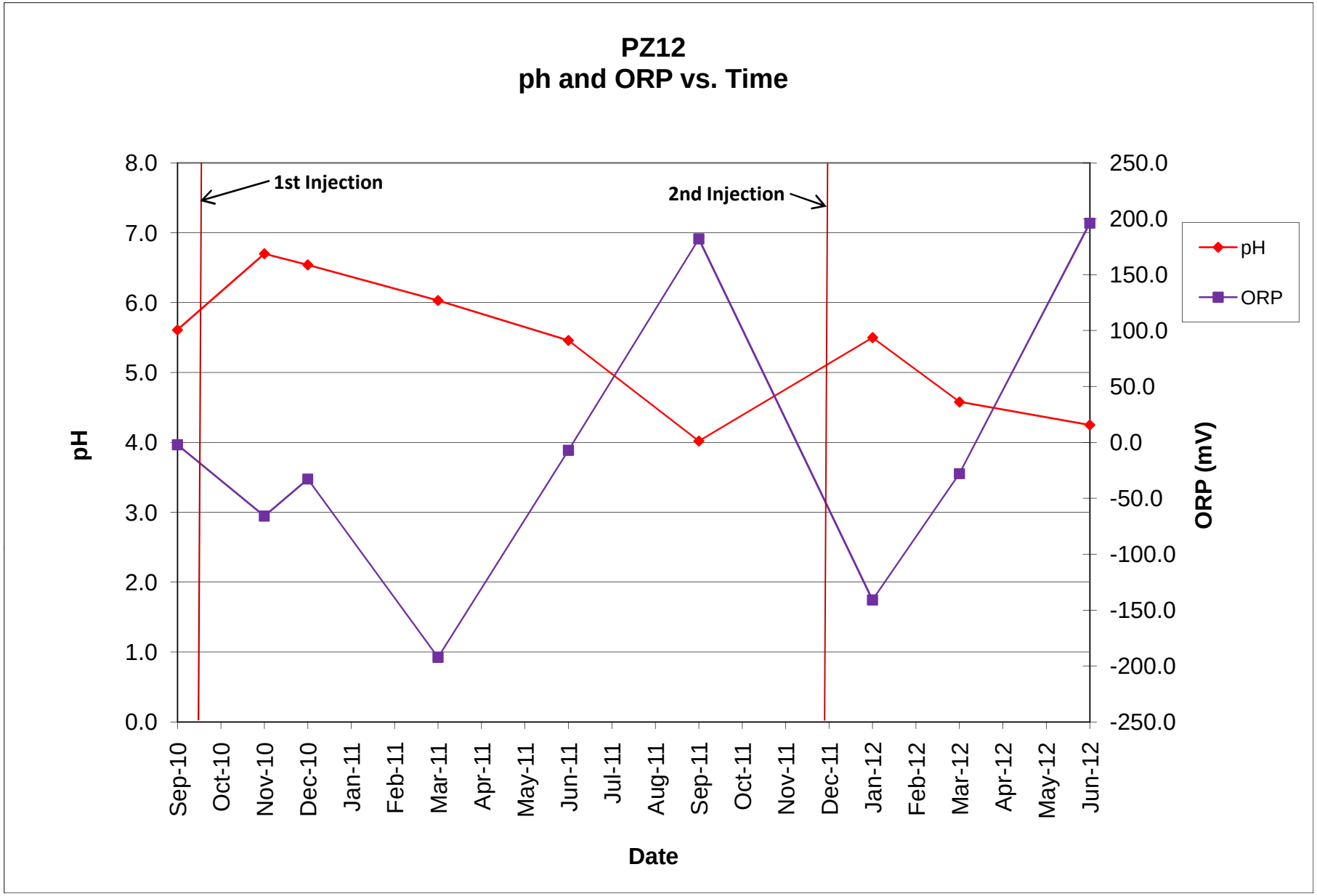

PZ6
Zinc Concentration and pH vs. Time
Zinc Concentration (µg/L)
pH
Date
1st Injection
2nd Injection
Zinc
pH
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW1
pH and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
7.0
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

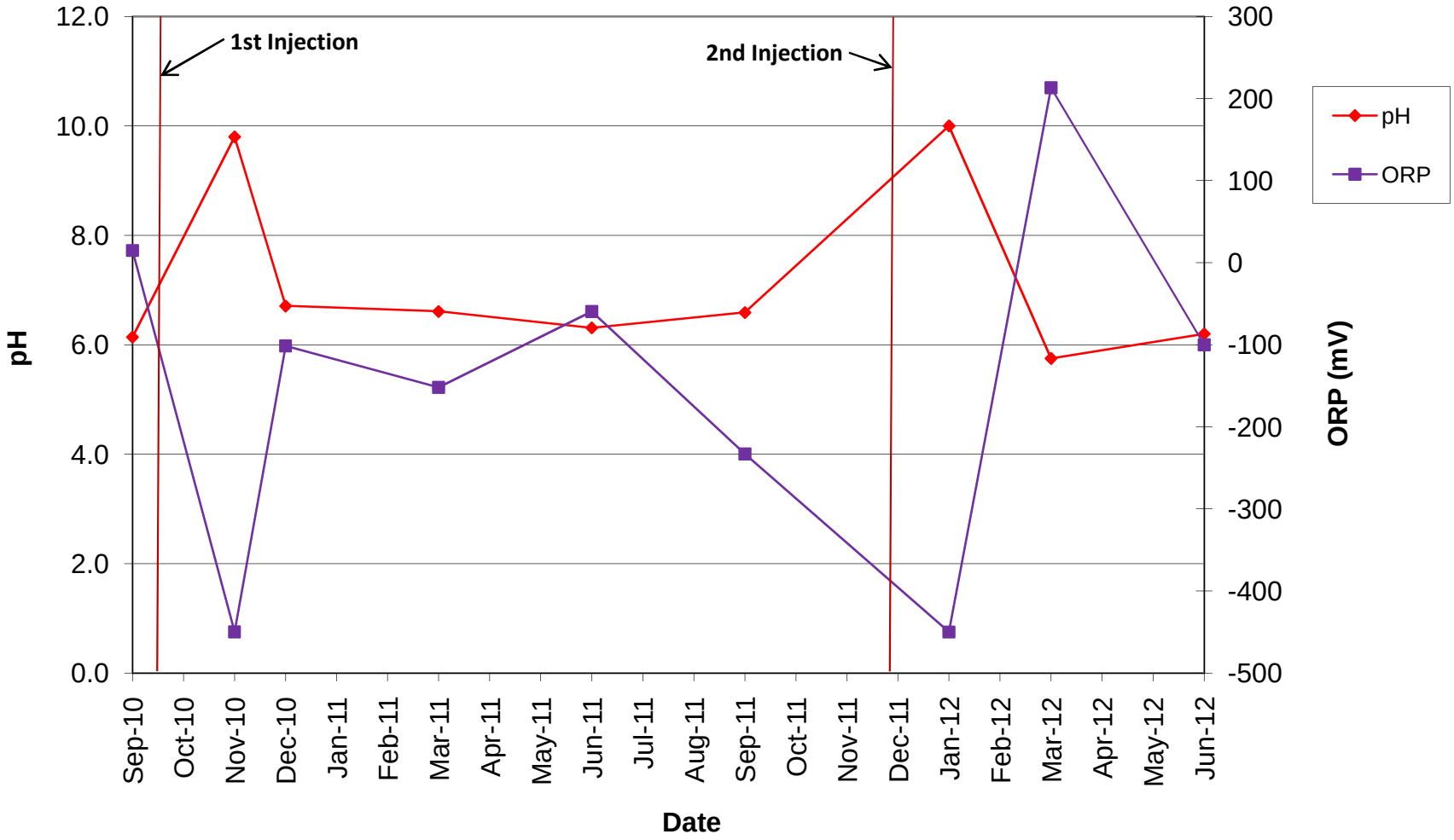

OW2
pH and ORP vs. Time
2nd Injection
1st Injection
pH
ORP (mV)
Date
pH
ORP
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


OW3
pH and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
300
250
200
150
100
50
0
-50
-100
-150
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

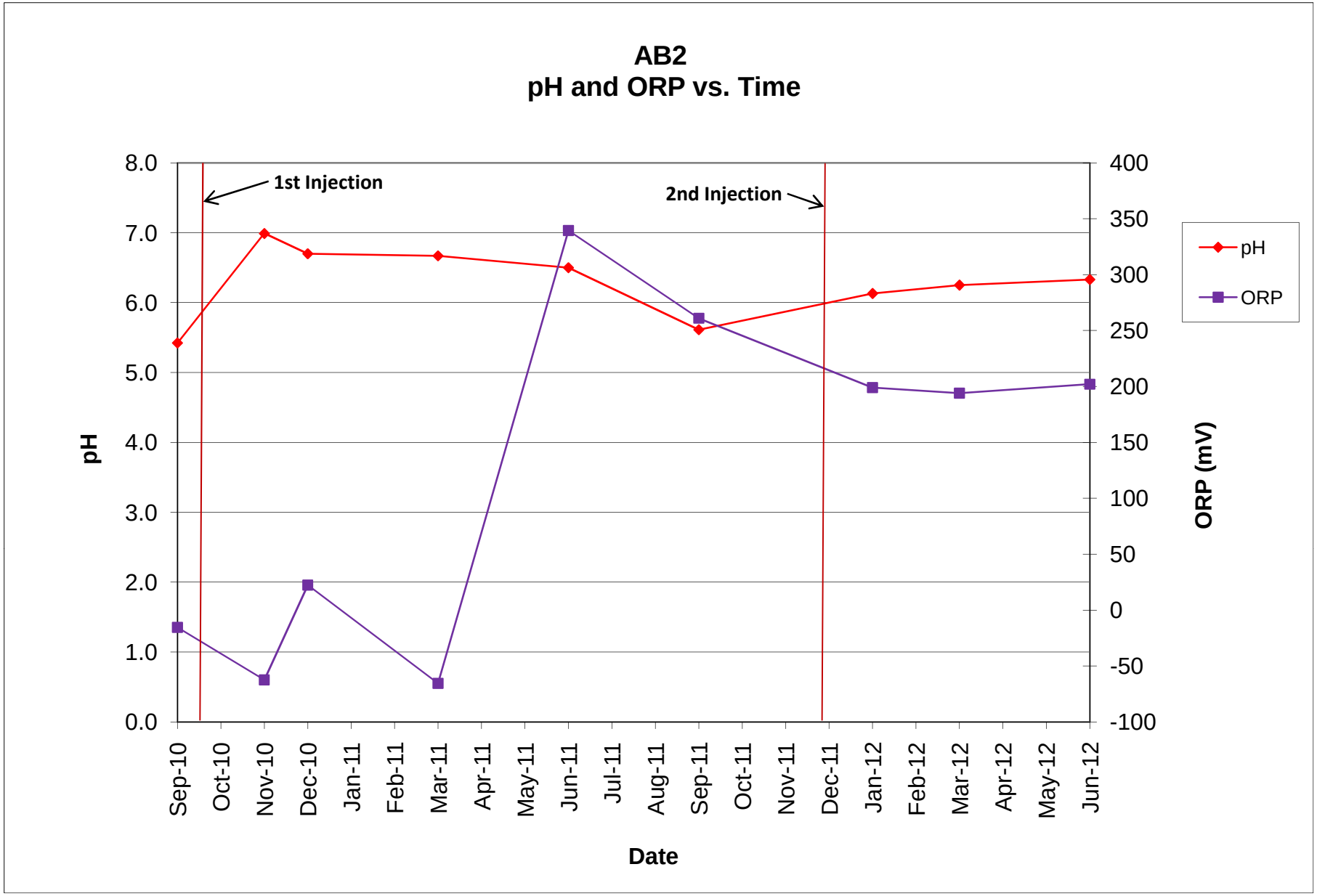

PZ1
ph and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
7.0
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
5.0
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

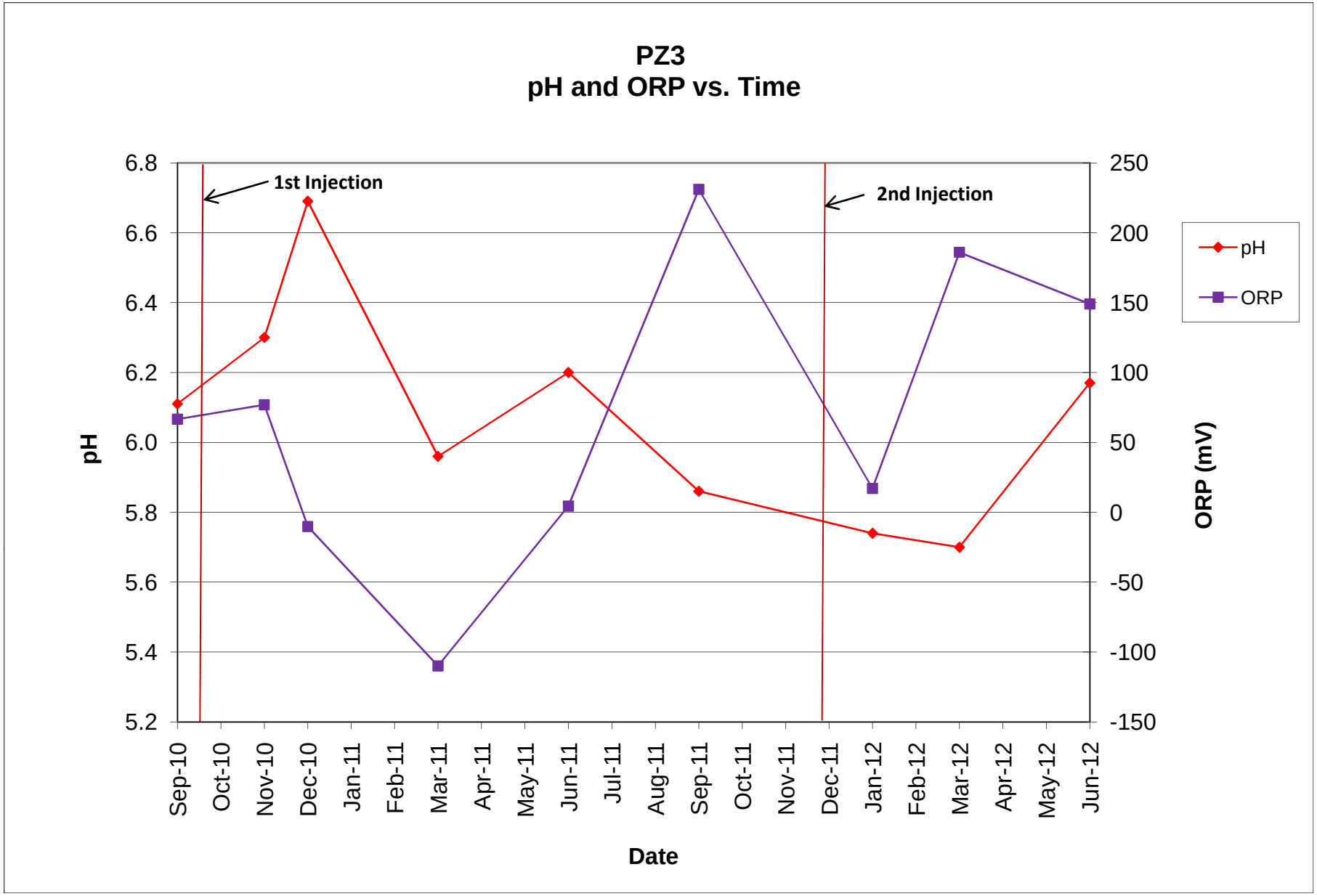

PZ12
ph and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
250.0
200.0
150.0
100.0
50.0
0.0
-50.0
-100.0
-150.0
-200.0
-250.0
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12

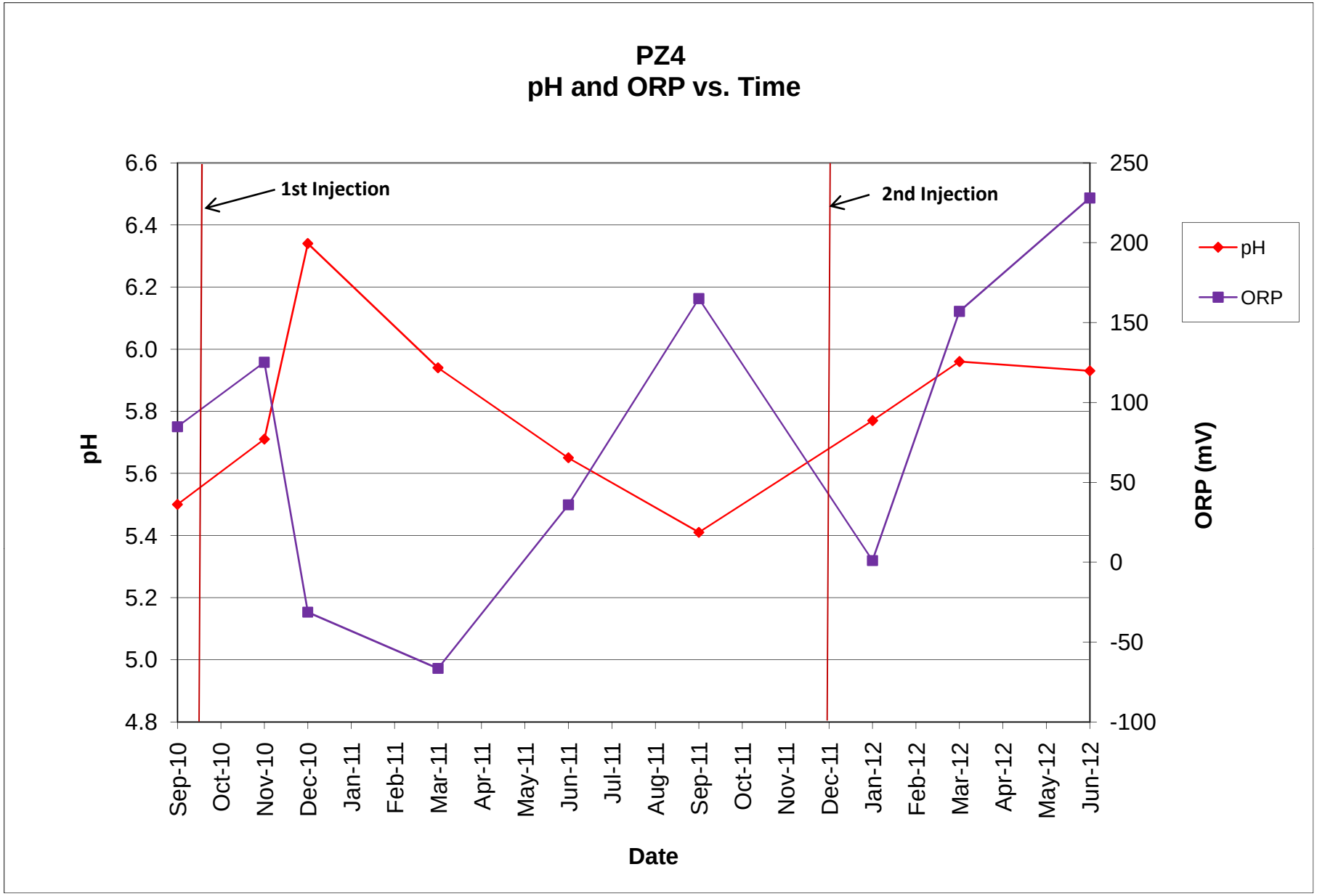
PZ13
ph and ORP vs. Time

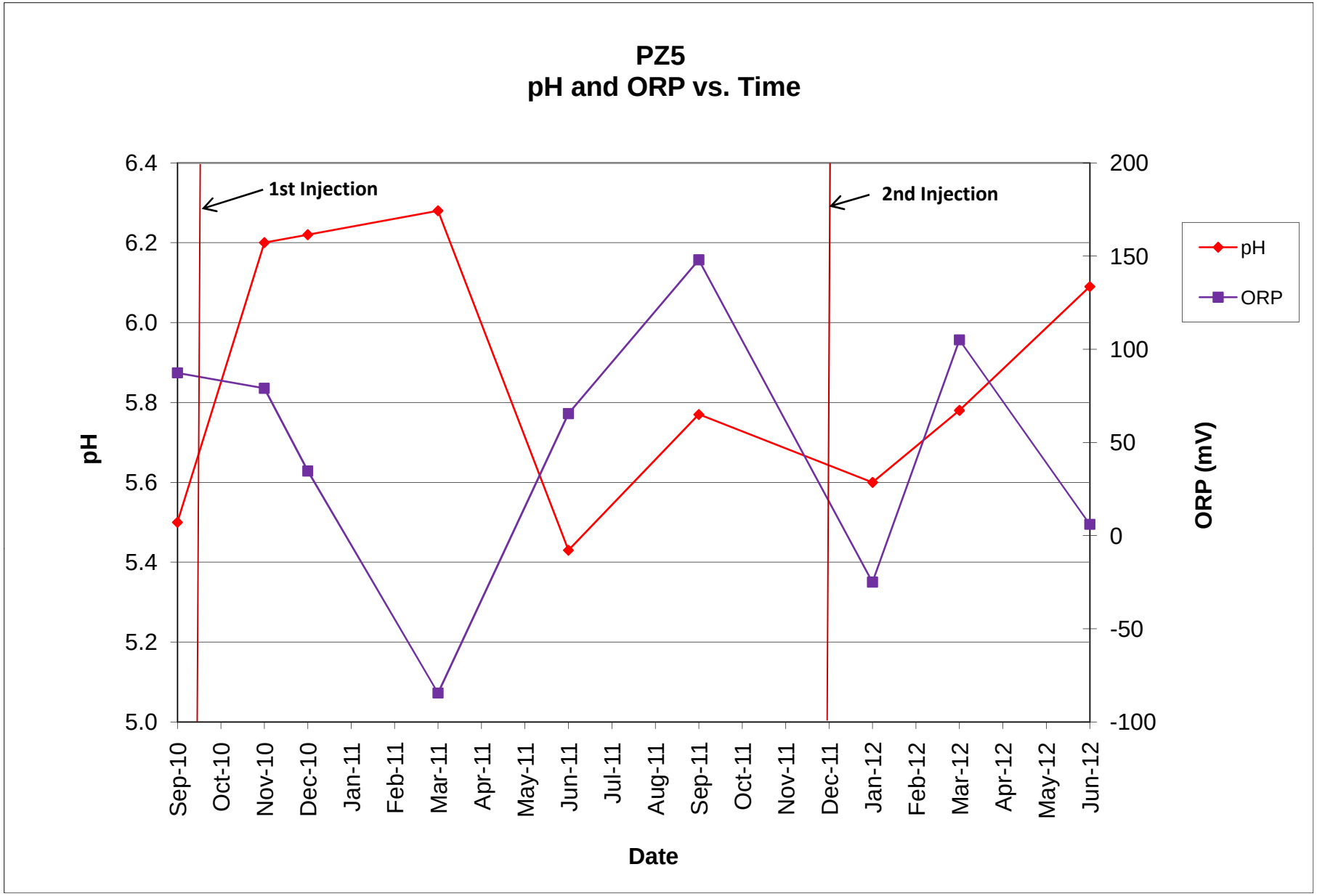


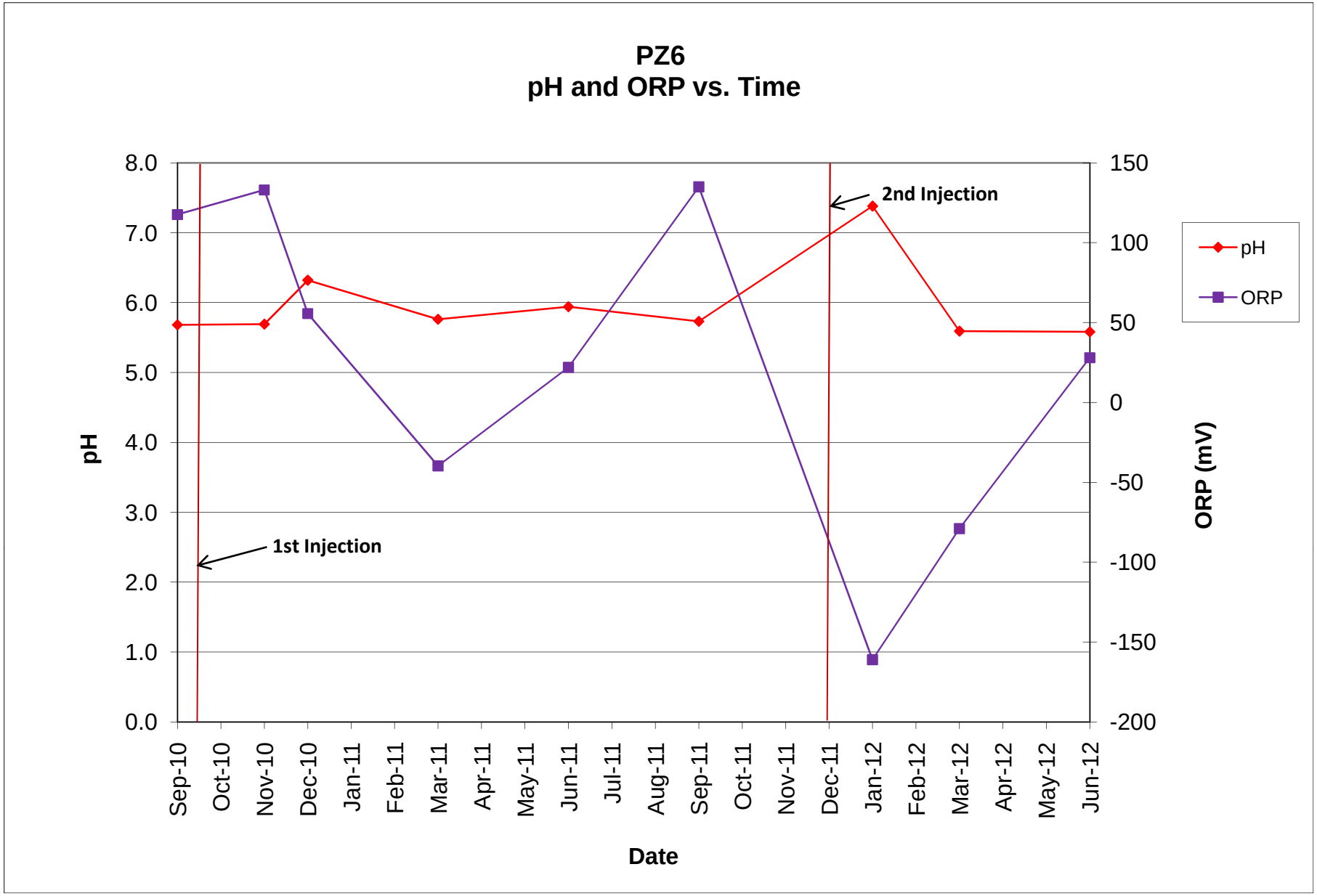
Note: CaSx was present in purge water during January 2012. Therefore, the data was estimated based on previously collected CaSx measurements in order to prevent damaging instument.


AB2
pH and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
400
350
300
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ3
pH and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
6.8
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
250
200
150
100
50
0
-50
-100
-150
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ4
pH and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
6.6
6.4
6.2
6.0
5.8
5.6
5.4
5.2
5.0
4.8
250
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ5
pH and ORP vs. Time
1st Injection
2nd Injection
pH
ORP
ORP (mV)
Date
6.4
6.2
6.0
5.8
5.6
5.4
5.2
5.0
200
150
100
50
0
-50
-100
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12


PZ6
pH and ORP vs. Time
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
pH
150
100
50
0
-50
-100
-150
-200
ORP (mV)
2nd Injection
1st Injection
pH
ORP
Sep-10
Oct-10
Nov-10
Dec-10
Jan-11
Feb-11
Mar-11
Apr-11
May-11
Jun-11
Jul-11
Aug-11
Sep-11
Oct-11
Nov-11
Dec-11
Jan-12
Feb-12
Mar-12
Apr-12
May-12
Jun-12
Date