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November 17, 2014

Washington State Department of Ecology
Toxics Cleanup Program
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Attention: Steve Teel

Subject: February 2014 Groundwater and Surface Water Monitoring and Tidal Cycle Study
Former Irondale Iron and Steel Plant
Irondale, Washington
File No. 0504-042-02

This report summarizes the results of the groundwater and surface water monitoring conducted over a partial tidal cycle (highest high tide to lowest low tide) on February 26, 2014, at the Former Irondale Iron and Steel Plant Site (Site, also known as Irondale Beach Park) in Irondale, Washington (see Figure 1).

Following completion of remedial excavation and restoration activities at the Site in December 2012, GeoEngineers, Inc. (GeoEngineers) completed four rounds of post-construction quarterly groundwater monitoring in 2013. Five monitoring wells (MW-5 through MW-9) were sampled during each event. The purpose of the groundwater monitoring program was to evaluate the effectiveness of the cleanup action. Surface water sampling was also performed at three locations (SW-1, SW-2 and SW-3) during the July and October 2013 monitoring events at the specific request of Washington State Department of Ecology (Ecology). Surface water samples were collected from four locations during February 2014 (SW-1A, SW-1B, SW-2 and SW-3). Because surface water sample location SW-1 was located at the outfall of a freshwater creek and did not represent surface water from Port Townsend Bay, this location was replaced with locations SW-1A and SW-1B. Monitoring wells and surface water sampling locations are shown in Figure 2. Quarterly groundwater monitoring results for 2013 are summarized in Tables 1 and 2; chemical analytical data for dissolved copper and nickel are presented in Figure 3.

During the four 2013 quarterly groundwater monitoring events, dissolved copper and nickel were detected in MW-9 at concentrations greater than the site-specific groundwater cleanup levels. The dissolved copper concentrations in groundwater samples obtained from MW-9 (located within the metals excavation area) were ***lower*** than the dissolved copper concentrations in surface water samples collected at locations SW-2 and SW-3, which are near MW-9. Additionally, the dissolved copper concentrations fluctuated very little between all four 2013 monitoring events.

Conversely, the dissolved nickel concentrations in groundwater samples obtained from MW-9 from the 2013 groundwater monitoring events fluctuated significantly. Additionally, dissolved nickel concentrations in groundwater samples from MW-9 were ***higher*** than the dissolved nickel concentrations in surface water samples collected at locations SW-2 and SW-3.

This interesting dichotomy between the two metals over a year of quarterly groundwater monitoring caused a re-evaluation of groundwater - surface water interaction, geochemistry and tidal cycles. This Tidal Cycle Study and 2014 groundwater and surface water monitoring effort were completed to see if the tidal cycle (high tide) and resulting salt water intrusion or some other factor(s) was causing high nickel concentrations in groundwater (in a hydrologic environment where copper concentrations in groundwater remained static, or lower than surface water samples).

Based on our review of the groundwater quality parameter data collected during the January, April, July, and October 2013 monitoring events, it appears that the unexpectedly higher dissolved nickel concentrations at MW-9 may be affected by the following factors. The last three factors below were the focus of the February 2014 monitoring event and this study.

- Monitoring well purging time (do longer purge times result in lower nickel concentrations?),
- Groundwater quality parameters (are higher total dissolved solids, conductivity, and salinity measurements associated with higher nickel concentrations?),
- Surface water elevation and saltwater intrusion (are higher tides and accompanying saltwater intrusion associated with higher nickel concentrations?), and
- Unknown. Is there an unknown factor that the 2014 study may reveal about the high concentrations of nickel observed during the 2013 sampling events?

SCOPE OF SERVICES

The specific scope of services for the February 2014 groundwater and surface water tidal cycle study included:

1. Measured the depth-to-groundwater in each well (MW-5 through MW-9) on an hourly basis from 1100 to 2100 hours; from high to low tide. High and low tides occurred on February 26, 2014 at approximately 1300 hours and 2000 hours, respectively. Estimated groundwater flow direction at the site based on the groundwater elevation.
2. Obtained field filtered groundwater samples using low-flow sampling methodology from MW-9 on an hourly basis from 1100 to 2100 hours in accordance with the field procedures outlined in the 2013 quarterly monitoring reports. This resulted in 12 samples (11 hourly samples plus 1 duplicate; the duplicate sample was obtained at peak tide time (1300 hours) when the nickel concentration was hypothesized to be the highest). Purged greater than three well volumes of water from MW-9 prior to obtaining the first groundwater sample; groundwater was then continuously purged through the remainder of the tidal cycle study. Groundwater field parameters were collected regularly throughout the study.

3. Obtained surface water samples from four locations in Port Townsend Bay; one each to the north (SW-1A) and south (SW-1B) of the creek at the northern end of the park, and one each at the previous surface monitoring locations (SW-2 and SW-3) near the wells MW-9 and MW-6. This resulted in 5 samples (4 samples plus 1 duplicate; duplicate sample was obtained from location SW-2).
4. Submitted the groundwater and surface water samples to an Ecology-certified laboratory for chemical analysis of dissolved metals (copper and nickel) by U.S. Environmental Protection Agency (EPA) Method 200.8, and Conductivity by EPA Method 120.1. Ecology determined that the petroleum hydrocarbons and dissolved carcinogenic polycyclic aromatic hydrocarbons (cPAH) analyses were not required for this event based on the 2013 chemical analytical data.
5. Evaluated the chemical analytical results relative to Site-Specific groundwater cleanup levels consistent with Model Toxics Control Act (MTCA) requirements. Site-specific groundwater cleanup levels are presented in Tables 2 and 5.

GROUNDWATER AND SURFACE WATER MONITORING RESULTS

General

Groundwater and surface water samples were obtained from MW-9 and surface water samples were obtained from Port Townsend Bay on February 26, 2014. The groundwater samples were obtained on an hourly basis starting at 1100 and ending at 2100. The approximate monitoring well and surface water sample locations are shown in Figure 2. Groundwater level measurements and sampling procedures are described in the 2013 quarterly monitoring reports. The February 2014 tidal cycle study and groundwater and surface water monitoring results are presented in Tables 3 through 5. Depth-to-groundwater measurements for monitoring wells MW-5 through MW-9 are presented in Table 3, groundwater field parameters for MW-9 are presented in Table 4, and 2014 dissolved metals and conductivity groundwater and surface water data are summarized in Table 5. A summary of groundwater elevations and dissolved copper and nickel analytical data from the 2013 quarterly groundwater monitoring events and the 2014 Tidal Cycle Study are presented in Tables 1 and 2 and are shown on Figure 3. A copy of the laboratory report and data validation memorandum for the 2014 Tidal Cycle Study is presented in Attachment 1.

The purpose of the additional groundwater and surface water monitoring over a partial tidal cycle (falling tide) is to evaluate the possible chemical effects of saltwater intrusion and its relationship to elevated copper and nickel concentrations in groundwater samples obtained primarily from the closest well to both high and low tide cycles (MW-9) and to better understand the copper and nickel concentrations in near shore surface water of Port Townsend Bay.

Groundwater samples were collected from MW-9 during different portions of the tidal cycle during the 2013 quarterly groundwater monitoring, as follows:

- January 2013 – falling tide at +6 feet mean lower low water (MLLW, high and low tides at +10 and +3 feet)
- April 2013 – low tide at approximately +1 foot MLLW (high tide at +9 feet)
- July 2013 – rising tide at approximately +6 feet MLLW (high and low tides at +4 and +9 feet)
- October 2013 – low tide at approximately +3 feet MLLW(high and low tides at +10 and +3 feet)

Groundwater Conditions – Depth to Groundwater and Field Parameters Relative to Tides

The depth to groundwater beneath the Site was evaluated by measuring groundwater levels using an electric water level indicator from MW-5 through MW-9 on an hourly basis from 1100 hours to 2100 hours on February 26, 2014. The hourly groundwater depth-to groundwater measurements and groundwater elevations are presented in Table 3.

Groundwater and surface water elevations during the tidal cycle study are shown in Figure 4. Surface water elevations of Port Townsend Bay were obtained from the Oak Bay tide station location (www.protides.com). Oak Bay is approximately 2.5 miles southeast of the Site. The groundwater elevation in MW-9 is most strongly correlated with Port Townsend Bay surface water elevations. The highest and lowest groundwater elevations observed in MW-9 were at approximately the same time as the high and low tides in Port Townsend Bay. The groundwater elevation in MW-8 shows a similar, but less pronounced, response to that of MW-9 (a lower groundwater elevation with a falling tide). The groundwater elevation in MW-5 shows a brief (few hour) groundwater increase at high tide; however, the groundwater elevation returns to the pre-high tide level and doesn't continue to decrease like the groundwater elevations in MW-8 and MW-9. Monitoring wells MW-6 and MW-7 do not appear to be affected by the tide change.

Groundwater field parameters were collected throughout the tidal cycle study. These data are included in Table 4 and selected parameters (conductivity, oxygen reduction potential [ORP] and pH are shown in Figures 5a and 5b). Conductivity, ORP, total dissolved solids (TDS) and salinity in groundwater samples from MW-9 appears higher in samples obtained during high tide and decreases with low tide based on groundwater quality readings recorded on February 26, 2014.

Groundwater Sampling

Groundwater samples obtained from MW-9 on February 26, 2014 were submitted to Analytical Resources, Inc. (ARI) an environmental laboratory in Tukwila, Washington for chemical analysis of dissolved copper, dissolved nickel, and conductivity. The hourly dissolved copper, dissolved nickel and conductivity results are presented in Table 5.

- **Dissolved Copper.** Dissolved copper was detected in MW-9 at concentrations ranging from 3 to 6 micrograms per liter [µg/L] from hourly samples collected over the 11-hour partial tidal cycle. This range of concentrations is greater than the site-specific cleanup level of 2.4 µg/L.
- **Dissolved Nickel.** Dissolved nickel was detected in MW-9 at concentrations less than the site-specific cleanup level in all the hourly samples obtained over the 11-hour partial tidal cycle.
- **Conductivity.** Conductivity ranged from approximately 3,340 to 42,100 micro mhos per centimeter (µmhos/cm) in the samples obtained from MW-9. Tidal fluctuations appear to affect conductivity at MW-9. Conductivity values were high during the high tide and gradually decreased during a falling tide (with the lowest conductivities observed around low tide).

The chemistry and field parameter trends observed show clear interaction between seawater and meteoric groundwater in monitoring well MW-9 (Figures 5a, 5b, and 5c). Groundwater level rose almost immediately with high tide, peaking at 1300. The rise in water level was then followed by an increase in conductivity (peaking at 1500 hours) and ORP (peaking at 1515 hours) and a decrease in pH (bottoming out at 1345 and 1500 hours). These data indicate that as sea level rose the water in well MW-9 became

saltier and more oxygenated. As sea level tide dropped throughout the monitoring period, the data indicate that the groundwater elevation in MW-9 became lower and salinity and oxygen content decreased.

Copper concentration peaked at 1500 hours – 2 hours after high tide – and the nickel concentration peaked at 1900 hours – one hour before low tide – and the trend in these data appear to be tidally related. Copper becomes more soluble as the oxidation potential of a solution increases and also as the pH lowers as both Cu^0 and Cu^{1+} are oxidized to Cu^{2+} (Drever, 1997). Thus, a pulse of oxygenated seawater with lower pH could mobilize copper until water chemistry returned to a baseline condition, which appears to be around 3 µg/l. Unlike copper, nickel is not sensitive to changes in reduction potential, but it is scavenged from solution and immobilized by precipitation of iron and manganese (Dieke and Flemming, 1997; McGregor et al., 1998). Thus, as the reduction potential of groundwater around MW-9 dropped as the tide fell, dissolution of iron and/or manganese oxides could have mobilized nickel. The nickel concentration fell back to what appears to be a baseline condition of approximately 5 µg/l prior to any increase in ORP.

Furthermore, a qualitative indicator of the changes in groundwater chemistry at MW-9 between 2013 and 2014 is a reddish-orange precipitate that was observed when the well was purged. The precipitate appears to be iron oxide/oxi-hydroxide material, which would not be unexpected at the location of the nearby slag outcrop that was partially removed during remedial excavation. In 2013, precipitate was noted at each sample period, and purging took up to an hour before the precipitate cleared. In 2014, however, the amount of this material encountered was significantly less; purging only took 10 to 20 minutes for the first sample and the 2014 samples had lower turbidity than the 2013 samples. These results indicate a reduction in the amount of leachable iron present in the area, and probably indicates a reduction in the leachable total metals in the area, which would be consistent with the significant reduction in dissolved copper and nickel observed in groundwater at MW-9 between 2013 and 2014.

Surface Water Sampling

Surface water samples were collected from four locations in Port Townsend Bay (SW-1A, SW-1B, SW-2 and SW-3). Surface water sample SW-1A was obtained north of historic surface water sample location, SW-1. Sample SW-1B was obtained south of the former SW-1 sample location at the north-central portion of the park. These locations were selected to evaluate surface water quality in the Bay (background conditions) farther from the remedial excavation areas. Surface water samples SW-2 and SW-3 were obtained from near shore of Port Townsend Bay in the vicinity of monitoring wells MW-9 and MW-6, respectively. These locations were selected to evaluate surface water quality adjacent to the remedial excavation areas.

Surface water samples obtained during the February 2014 study were analyzed only for dissolved copper, dissolved nickel, and conductivity. According to the laboratory, the copper and nickel detection and reporting limits for the surface water samples had to be elevated due to high chloride content in the samples, which necessitated sample dilution prior to chemical analyses.

- **Dissolved Copper.** Dissolved copper was identified in the sample from SW-3 at an estimated concentration (4 J µg/L) greater than the site-specific cleanup level of 2.4 µg/L. Dissolved copper was not detected at a detection limit of 4 µg/L in surface water samples obtained at locations SW-1A, SW-1B and SW-2.

- **Dissolved Nickel.** Dissolved nickel was not detected in the samples from SW-1A, SW-1B, SW-2 and SW-3. The nickel site-specific cleanup level is 8.2 µg/L.
- **Conductivity.** Conductivity ranged from approximately 43,200 to 45,300 µmhos/cm in the surface water samples.

SUMMARY AND CONCLUSIONS

To further evaluate the unusually stable dissolved copper and unusually variable nickel concentrations that were observed in MW-9 during 2013, groundwater samples from MW-9 and four surface water samples were analyzed for dissolved copper, dissolved nickel, and conductivity to understand the possible effects of saltwater intrusion relative to copper and nickel concentrations in MW-9. We conclude the following based on the 2013 and 2014 chemical analytical results, groundwater quality parameters data, and tidal study:

- The dissolved copper concentrations in MW-9 from the February 2014 study are similar to the 2013 groundwater monitoring events. As shown in Figure 5c, the dissolved copper concentrations during the tidal cycle study fluctuate narrowly from 4 µg/L at 1200 hours (an hour before high tide), to a concentration of 6 µg/L at 1500 hours (two hours after high tide), then down to a concentration of 3 µg/L from 1700 to 2100 hours. The lowest dissolved copper concentrations observed in MW-9 (3 µg/L, at medium to low tide, 1700 to 2100 hours) are less than the concentration observed in the surface water sample locations. The 2013 and 2014 groundwater and surface water monitoring results indicate that, while dissolved copper concentrations in MW-9 are greater than the site-specific groundwater cleanup level for copper, these concentrations are not higher than dissolved copper concentrations in Port Townsend Bay. As a result, no further testing of copper is warranted.
- The dissolved nickel concentration in MW-9 from the February 2014 study was less than the site-specific cleanup level for nickel and was about 2 to 15 times lower than nickel concentrations observed in MW-9 during the 2013 quarterly groundwater monitoring events. The dissolved nickel concentration in MW-9 (5 µg/L) at low tide (2000 and 2100 hours) was slightly greater than the nickel concentration observed in the surface water samples. However, the low tide dissolved nickel concentrations in MW-9 are similar to the dissolved nickel concentrations (4.6 to 5.6 µg/L) in upgradient monitoring well MW-5. Therefore it appears that nickel concentrations in groundwater samples at MW-9 may have stabilized since the 2013 monitoring events. Or it is possible that nickel becomes more soluble during periods of seawater intrusion when oxidation potential increases and/or pH is lower (around high tide).
- The water chemistry in monitoring well MW-9 is influenced by seawater tides. During high tides, pulses of seawater with higher oxidation potential and lower pH mix with the meteoric-sourced groundwater around MW-9, which mobilizes a brief pulse of elevated dissolved copper. During low tide, groundwater around MW-9 becomes more chemically reducing, which is coeval with a brief pulse in elevated dissolved nickel. The increased nickel may result from dissolution of iron and/or manganese oxide minerals.

The results of this Tidal Cycle Study show that dissolved copper and nickel concentrations in meteoric-sourced groundwater at the Site, in particular monitoring well MW-9, are unlikely to pose an unacceptable risk to ecological receptors in Port Townsend Bay.

Additional groundwater monitoring does not appear to be required to show that Site groundwater meets the groundwater standards at the point of compliance (where it discharges to surface water). However, additional monitoring could be performed to verify the dissolved copper and nickel concentration trends that were established during this study for MW-9 and are representative of longer-term groundwater conditions and not an isolated occurrence during February 2014.

REFERENCE

Dieke, P., and L. Flemming. 1997. Nickel mobilization in a groundwater well field: Release by pyrite oxidation and desorption from manganese oxides. Environmental Science & Technology, 31(9), 2589-2595.

Drever, J. 1997. Geochemistry of Natural Waters: Surface and Groundwater Environments. Upper Saddle River, NJ, Prentice Hall.

McGregor, R. G., D. W. Blowes, J. L. Jambor, W. D. Robertson. 1998. Mobilization and attenuation of heavy metals within a nickel mine tailings impoundment near Sudbury, Ontario, Canada. Environmental Geology, 36 (3-4) 305-31.

LIMITATIONS

We have prepared this report for use by the Washington State Department of Ecology for the Former Irondale Iron and Steel Plant site in Irondale, Washington. The information contained herein is not intended for use by others and it is not applicable to other sites. No other (third) party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. The conclusions and opinions presented in this report are based on our professional knowledge, judgment and experience. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments should be considered a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

Sincerely,
GeoEngineers, Inc.

Neil Morton
Senior Toxicologist

Dave A. Cook, LG, LPG
Principal

NFM:DAC:leh

Table 1. Summary of Groundwater Level Measurements
Table 2. Groundwater Chemical Analytical Data – Petroleum Hydrocarbons, cPAHs and Dissolved Metals
Table 3. Tidal Cycle Study Groundwater Level Measurements (February 26, 2014)
Table 4. Tidal Cycle Study Groundwater Field Parameters for MW-9 (February 26, 2014)
Table 5. Tidal Cycle Study Groundwater Analytical Data (February 26, 2014) – Dissolved Metals and Conductivity
Figure 1. Vicinity Map
Figure 2. Site Plan – Groundwater and Surface Water Monitoring Locations
Figure 3. Groundwater and Surface Water Monitoring Results – Dissolved Metals
Figure 4. Groundwater and Surface Water Elevations
Figure 5. MW-9 Groundwater Data and Field Parameters

Attachment 1. Data Validation Memorandum and
Chemical Analytical Results

Two copies submitted (plus one copy via email)

Table 1

Summary of Groundwater Level Measurements

Former Irondale Iron and Steel Plant Site

Irondale, Washington

Groundwater Monitoring Well[1]	Quarterly Groundwater Monitoring Event	Date Measured	Top of Casing Elevation[2] (feet)	Depth to Water from Top of Casing (feet)	Groundwater Elevation[2] (feet)
MW-5	Round 1	1/4/2013	13.97	5.01	8.96
	Round 2	4/10/2013		4.4	9.57
	Round 3	7/16/2013		5.2	8.77
	Round 4	10/4/2013		5.51	8.46
	Tidal Cycle[3]	2/26/2014		4.51 - 4.98	8.99 - 9.46
MW-6	Round 1	1/4/2013	17.04	3.23	13.81
	Round 2	4/10/2013		3.16	13.88
	Round 3	7/16/2013		3.05	13.99
	Round 4	10/4/2013		3.11	13.93
	Tidal Cycle[3]	2/26/2014		2.55 - 2.80	14.24 - 14.49
MW-7	Round 1	1/4/2013	15.98	5.08	10.90
	Round 2	4/10/2013		5.06	10.92
	Round 3	7/16/2013		5.81	10.17
	Round 4	10/4/2013		5.44	10.54
	Tidal Cycle[3]	2/26/2014		4.80 - 4.92	11.06 - 11.18
MW-8	Round 1	1/4/2013	11.93	4.00	7.93
	Round 2	4/10/2013		4.68	7.25
	Round 3	7/16/2013		5.81	6.12
	Round 4	10/4/2013		5.87	6.06
	Tidal Cycle[3]	2/26/2014		3.89 - 4.45	7.48 - 8.04
MW-9	Round 1	1/4/2013	11.77	4.83	6.94
	Round 2	4/10/2013		5.52	6.25
	Round 3	7/16/2013		5.51	6.26
	Round 4	10/4/2013		5.81	5.96
	Tidal Cycle[3]	2/26/2014		3.85 - 5.65	6.12 - 7.92

Notes:

[1]Monitoring well locations are shown on Figure 2.

[2]Elevation is referenced to Mean Lower Low Water (MLLW). Elevation measurements were obtained from "ASBUILT MAP" provided by Van Aller Surveying to Anderson Environmental Contracting, LLC dated February 2013. Top of casing elevations were estimated by subtracting the distance between the top of the monument and the top of the casing at each well.

[3]Hourly groundwater level measurements are included in Table 3.

Table 2

Groundwater Chemical Analytical Data - Petroleum Hydrocarbons, cPAHs and Dissolved Metals[1]

Former Irondale Iron and Steel Plant Site

Irondale, Washington

Sample Location[2]	Quarterly Groundwater Monitoring Event	Sample Date	Petroleum Hydrocarbons[3]		Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)[4]									Dissolved Metals[5]	
			Diesel-Range	Heavy Oil-Range	Total or Dissolved cPAHs	Benzo[a]anthracene	Chrysene	Benzo[b]fluoranthene	Benzo[k]fluoranthene	Benzo[a]pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz[a,h]anthracene	Total cPAH - TEQ[4]	Copper	Nickel
Groundwater Samples															
MW-5	Round 1	1/4/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**1.3**	**5.6**
	Round 2	4/10/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**1.5**	**5.1**
	Round 3	7/16/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**0.9**	**4.6**
	Round 4	10/4/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**1.4**	**5**
MW-6	Round 1	1/4/2013	100 U	200 U	Total	0.010 U	**0.0066 J**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	**0.00757 J**	**0.8**	**5.8**
					Dissolved	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U		
	Round 2	4/10/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	0.5 U	**4.2**
	Round 3	7/16/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**0.6**	**4.9**
	Round 4	10/4/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**0.9**	**9.3**
MW-7	Round 1	1/4/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**0.8**	**4.4**
					Dissolved	0.010 U	**0.0072 J**	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	**0.00757 J**	--	--
	Round 2	4/10/2013	**160**	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**1.4**	**5.1**
	Round 3	7/16/2013	**200**	200 U	Total	**0.087**	**0.11**	**0.056**	**0.042**	**0.11**	**0.028**	**0.012**	**0.1336**	0.5 U	**2.7**
	Round 4	10/4/2013	**230**	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**0.6**	**3.6**
MW-8	Round 1	1/4/2013	100 U	200 U	Total	**0.0075 J**	**0.0094 J**	**0.0063 J**	0.010 U	**0.0078 J**	0.010 U	0.010 U	**0.0108 J**	0.5 U	**5**
	Round 1	1/4/2013	--	--	Dissolved	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	--	--
	Round 2	4/10/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**2.2**	**4.9**
	Round 3	7/16/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**0.9**	**4.4**
	Round 4	10/4/2013	100 U	200 U	Total	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.010 U	0.00755 U	**0.9**	**5.1**
MW-9[8]	Round 1	1/4/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**7**	**90**
	Round 2	4/10/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**7**	**10**
	Round 3	7/16/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**7**	**77**
	Round 4	10/4/2013	100 U	200 U	--	--	--	--	--	--	--	--	--	**5.00 NJ**	**30**
	Tidal Cycle	2/26/2014	--	--	--	--	--	--	--	--	--	--	--	**3 - 6**	**5 - 8**
Surface Water Samples															
SW-1	Round 3	7/16/2013	--	--	--	--	--	--	--	--	--	--	--	**1.4**	**4.8**
	Round 4	10/4/2013	--	--	--	--	--	--	--	--	--	--	--	**1.3**	**5.2**
SW-1A	Tidal Cycle	2/26/2014	--	--	--	--	--	--	--	--	--	--	--	4 U[7]	2 U[7]
SW-1B	Tidal Cycle	2/26/2014	--	--	--	--	--	--	--	--	--	--	--	4 U[7]	**4 J**
SW-2	Round 3	7/16/2013	--	--	--	--	--	--	--	--	--	--	--	**13**	**16**
	Round 4	10/4/2013	--	--	--	--	--	--	--	--	--	--	--	**30**	**8.5 NJ**
	Tidal Cycle	2/26/2014	--	--	--	--	--	--	--	--	--	--	--	4 U[7]	**4 J**
SW-3	Round 3	7/16/2013	--	--	--	--	--	--	--	--	--	--	--	**9**	**16**
	Round 4	10/4/2013	--	--	--	--	--	--	--	--	--	--	--	**13.5 NJ**	**9.0 NJ**
	Tidal Cycle	2/26/2014	--	--	--	--	--	--	--	--	--	--	--	**4 J**	2 U[7]
Site-Specific Groundwater Cleanup Level[6]			500	500	--	see TEQ	see TEQ	see TEQ	see TEQ	see TEQ	see TEQ	see TEQ	0.018	2.4	8.2

Notes:

[1]Reported results are in micrograms per liter (µg/L).

[2]Groundwater monitoring well locations and surface water sample locations are shown in Figure 2.

[3]Petroleum Hydrocarbons analyzed using NWTPH-Dx.

[4]cPAHs analyzed using EPA method 8270D-SIM. Total carcinogenic PAHs (cPAHs) calculated using toxic equivalent (TEQ) methodology relative to benzo(a)pyrene. cPAHs that were not detected were assigned a value of one half of the reporting limit for these calculations. Samples analyed for dissolved cPAHs were laboratory filtered using a 0.7 µm borosilicate glass, binder free filter.

[5]Dissolved Metals analyzed using EPA method 200.8 (field filtered).

[6]Site-specific groundwater cleanup level is referenced from Table 1 of the Final Enigneering Design Report (GeoEngineers, 2012).

[7]The copper and nickel reporting limits for the surface water samples were elevated because sample dilution was necessary to account for high chloride levels in the samples. Therefore, ARI reported the copper and nickel results for these samples down to the sample detection, rather than the reporting limit.

[8]Approximate surface water elevations and tide status (low, rising, or falling) when the MW-9 groundwater samples were collected is discussed on Page 3 of the attached report.

-- = not analyzed. Monitoring wells are located in the area remediated due to metals contamination.

J = Concentration is estimated.

NJ = Analyte is tentatively identified and the concentration is estimated.

U = Laboratory qualifier indicating analyte not detected at level above listed reporting limit (where noted values shown are detection limits).

Bold indicates analyte was detected.

Chemical analyses performed by Analytical Resources. Inc., in Tukwila, Washington.

Shaded values represent concentrations or detection limits greater than the Site-Specific cleanup level.

Table 3

Tidal Cycle Study Groundwater Level Measurements (February 26, 2014)

Former Irondale Iron and Steel Plant

Irondale, Washington

Time/Top of Casing Elevation (feet)	Tidal Cycle	Depth to Water from Top of Casing (feet)				
		MW-5[1]	MW-6[1]	MW-7[1]	MW-8[1]	MW-9[1]
		13.97	17.04	15.98	11.93	11.77
1100	Rising	4.9	2.8	4.88	4.1	4.4
1200	Rising	4.9	2.75	4.8	3.95	4
1300	High	4.53	2.7	4.9	3.91	3.85
1400	Falling	4.51	2.74	4.88	3.89	4.18
1500	Falling	4.55	2.76	4.9	3.98	4.78
1600	Falling	4.91	2.74	4.84	4.08	5.35
1700	Falling	4.93	2.74	4.9	4.2	5.45
1800	Falling	4.95	2.75	4.9	4.3	5.64
1900	Falling	4.97	2.8	4.9	4.36	5.64
2000	Low	4.97	2.55	4.92	4.42	5.65
2100	Rising	4.98	2.65	4.91	4.45	5.65

Time	Tidal Cycle	Groundwater Elevation (feet)[2]				
		MW-5[1]	MW-6[1]	MW-7[1]	MW-8[1]	MW-9[1]
1100	Rising	9.07	14.24	11.10	7.83	7.37
1200	Rising	9.07	14.29	11.18	7.98	7.77
1300	High	9.44	14.34	11.08	8.02	7.92
1400	Falling	9.46	14.30	11.10	8.04	7.59
1500	Falling	9.42	14.28	11.08	7.95	6.99
1600	Falling	9.06	14.30	11.14	7.85	6.42
1700	Falling	9.04	14.30	11.08	7.73	6.32
1800	Falling	9.02	14.29	11.08	7.63	6.13
1900	Falling	9.00	14.24	11.08	7.57	6.13
2000	Low	9.00	14.49	11.06	7.51	6.12
2100	Rising	8.99	14.39	11.07	7.48	6.12

Notes:

[1]Monitoring well locations are shown on Figure 2.

[2]Elevation is referenced to Mean Lower Low Water (MLLW). Elevation measurements were obtained from "ASBUILT MAP" provided by Van Aller Surveying to Anderson Environmental Contracting, LLC dated February 2013. Top of casing elevations (see Table 1) were estimated by subtracting the distance between the top of the monument and the top of the casing at each well.

Table 4

Tidal Cycle Study Groundwater Field Parameters for MW-9 (February 26, 2014)

Former Irondale Iron and Steel Plant

Irondale, Washington

Time	Tidal Cycle	pH	Conductivity (ms/cm)	Dissolved Oxygen (mg/L)	Temperature (C)	Salinity (ppt)	TDS (g/l)	ORP (mV)
1020	Rising	7.84	13.4	3.82	9.90	6.6	8.26	98
1025	Rising	7.89	12.3	2.96	10.00	6.9	7.64	76
1030	Rising	7.90	11.8	2.77	10.10	6.6	7.32	65
1035	Rising	7.92	11.3	2.59	10.10	6.3	7.03	51
1040	Rising	7.93	11.1	2.51	10.20	6.2	6.90	45
1045	Rising	7.94	10.9	2.46	10.20	6.1	6.78	39
1050	Rising	7.93	11.2	2.52	10.17	6.2	6.93	32
1055	Rising	7.91	11.5	2.64	10.14	6.5	7.15	32
1100	Rising	7.88	13.1	2.87	10.00	7.4	8.12	36
1115	Rising	7.87	13.6	2.92	10.04	7.7	8.40	36
1130	Rising	7.85	14.8	3.01	10.16	8.1	9.16	38
1200	Rising	7.84	15.5	3.15	10.13	8.9	9.59	39
1230	Rising	7.84	15.7	3.17	10.10	9.0	9.76	40
1245	Rising	7.83	16.2	3.20	10.10	9.3	10.10	41
1300	High	7.83	16.7	3.29	10.00	9.6	10.30	44
1315	Falling	7.82	17.5	4.86	9.59	10.1	10.80	52
1330	Falling	7.82	16.5	3.61	9.47	9.5	10.20	53
1345	Falling	7.79	17.2	4.80	9.56	11.1	11.80	64
1400	Falling	7.81	17.7	4.20	9.52	10.2	11.00	62
1430	Falling	7.82	16.4	4.80	9.32	9.4	10.20	65
1500	Falling	7.80	18.4	6.10	9.30	10.7	11.40	68
1515	Falling	7.84	16.9	7.40	9.36	9.7	10.50	72
1530	Falling	7.94	13.0	5.20	9.54	7.4	8.16	61
1600	Falling	8.05	8.93	5.51	9.86	4.9	5.63	49
1630	Falling	8.05	7.88	4.70	9.95	4.3	4.96	41
1700	Falling	8.18	5.05	3.93	9.89	2.7	3.18	13
1730	Falling	8.14	4.52	4.85	9.91	2.4	2.89	-2
1800	Falling	8.15	4.18	3.20	9.87	2.2	2.67	-12
1830	Falling	8.12	4.06	2.96	9.88	2.1	2.60	-19
1900	Falling	8.13	3.91	2.12	9.80	2.0	2.50	-20
1930	Falling	8.13	3.77	2.08	9.85	2.0	2.41	-27
1945	Falling	8.13	3.69	1.52	9.88	1.9	2.36	-36
2000	Low	8.14	3.62	1.39	9.88	1.8	2.32	-38
2030	Rising	8.10	3.66	1.20	9.82	1.9	2.34	-37
2100	Rising	8.13	3.62	1.10	9.80	1.9	2.32	-37

Notes:

C = celcius

g/l = grams per liter

mg/L = milligrams per liter

ms/cm = mhos per centimeter

mV = millivolts

ppt = parts per trillion

Table 5

Tidal Cycle Study Groundwater Analytical Data (February 26, 2014) - Dissolved Metals and Conductivity[1]

Former Irondale Iron and Steel Plant Site

Irondale, Washington

Sample Identification[2]	Sample Date	Sample Time	Tidal Cycle	Dissolved Metals[3] (ug/l)		Conductivity[4] (umhos/cm)
				Copper	Nickel	
MW9-1100	2/26/2014	11:00 AM	Rising	**6**	**8**	**39,900**
MW9-1200	2/26/2014	12:00 PM	Rising	**4**	**6**	**12,400**
MW9-1300[5]	2/26/2014	1:00 PM	High	**3.9 J**	**5**	**42,100**
MW9-1400	2/26/2014	2:00 PM	Falling	**5**	**6**	**14,600**
MW9-1500	2/26/2014	3:00 PM	Falling	**6**	**5**	**16,300**
MW9-1600	2/26/2014	4:00 PM	Falling	**4**	**6**	**8,230**
MW9-1700	2/26/2014	5:00 PM	Falling	**3**	**7**	**4,640**
MW9-1800	2/26/2014	6:00 PM	Falling	**3**	**7**	**3,850**
MW9-1900	2/26/2014	7:00 PM	Falling	**3**	**8**	**3,550**
MW9-2000	2/26/2014	8:00 PM	Low	**3**	**5**	**3,270**
MW9-2100	2/26/2014	9:00 PM	Rising	**3**	**5**	**3,340**
Surface Water Samples[6]						
SW-1A	2/26/2014	9:30 AM	Rising	4 U	2 U	**44,700**
SW-1B	2/26/2014	9:45 AM	Rising	4 U	**4 J**	**45,200**
SW-2[5]	2/26/2014	1:10 PM	High	4 U	**4 J**	**43,200**
SW-3	2/26/2014	10:15 AM	Rising	**4 J**	2 U	**45,300**
Site-Specific Groundwater Cleanup Level[7]				2.4	8.2	NE

Notes:

[1]Chemical analyses performed by Analytical Resources, Inc., in Tukwila, Washington.

[2]Sample locations are shown in Figure 2.

[3]Dissolved Metals analyzed using EPA method 200.8 (field filtered).

[4]Conducitivity analyzed using EPA method 120.1

[5]A field duplicate surface sample was obtained; higher of the two detected concentrations (parent and field duplicate) is reported for each of the analyte.

[6]The copper and nickel reporting limits for the surface water samples were elevated because sample dilution was necessary to account for high chloride levels in the samples. Therefore, ARI reported the copper and nickel results for these samples down to the sample detection, rather than the reporting limit.

[7]Site-specific groundwater cleanup level is referenced from Table 1 of the Final Enigneering Design Report (GeoEngineers, 2012).

J = Analyte is tentatively identified and the concentration is estimated.

NE = Not established

U = Laboratory qualifier indicating analyte not detected at level above listed detection limit.

µg/L = Micrograms per liter.

umhos/cm = Micro mhos per centimeter.

Bold indicates analyte was detected.

Shaded values represent concentrations or detection limits greater than the Site-Specific cleanup level.

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. can not guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Data Sources: ESRI Data & Maps, Street Maps 2005

Transverse Mercator, Zone 10 N North, North American Datum 1983
North arrow oriented to grid north

Vicinity Map

Irondale Iron and Steel Plant
Irondale, Washington

GeoEngineers

Figure 1

Map Revised: May 24, 2007

Path: P:\0504042\00\GIS\0504042 00_FIG-1.mxd

Office: SEA

P:\0\050404\02\CAD\GW Monitoring Report - April 2014\Site Plan - Groundwater and Surface water Sample Locations Fig 2.dwg\TAB:Fig 2 modified by tmichaud on Apr 24, 2014 - 13:01

Legend

- Site Boundary
- Ordinary High Water (Estimated at Elevation 10.5 feet)
- Metals Area - Excavation
- Metals Area - Cap
- TPH Area - Excavation
- Slag Outcrop - Removal
- MW-1 — Monitoring Well Location
- SW-2 — Surface Water Monitoring Location
- Assumed Groundwater Flow Direction

Notes

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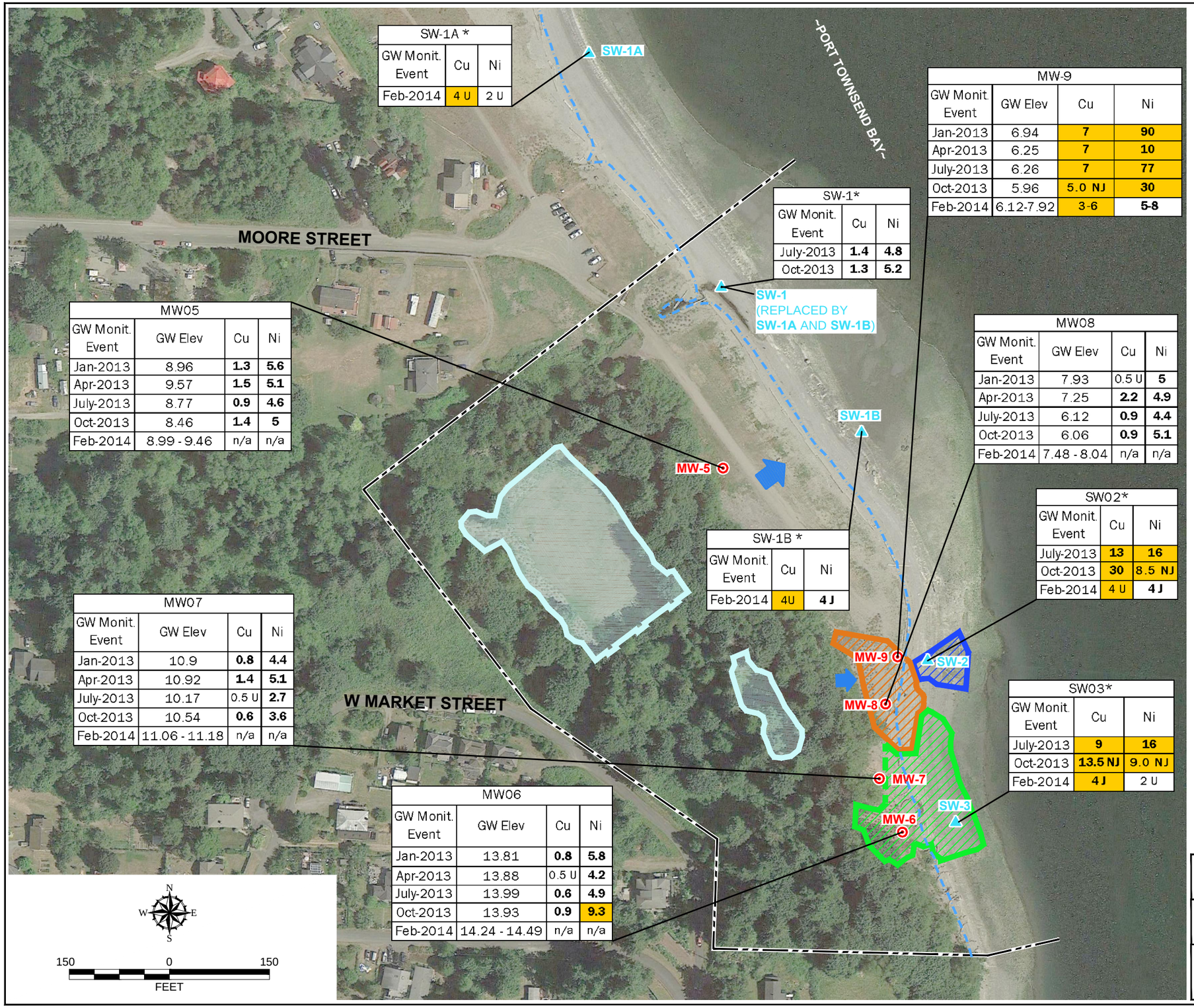
Reference: Aerial photo (July 2013) from Google Earth Pro.

Site Plan - Groundwater and Surface Water Monitoring Locations

Former Irondale Iron and Steel Plant
Irondale, Washington

GeoEngineers

Figure 2



SW-1A *		
GW Monit. Event	Cu	Ni
Feb-2014	4 U	2 U

SW-1*		
GW Monit. Event	Cu	Ni
July-2013	**1.4**	**4.8**
Oct-2013	**1.3**	**5.2**

MW-9			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	6.94	**7**	**90**
Apr-2013	6.25	**7**	**10**
July-2013	6.26	**7**	**77**
Oct-2013	5.96	**5.0 NJ**	**30**
Feb-2014	6.12-7.92	**3-6**	**5-8**

MW05			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	8.96	**1.3**	**5.6**
Apr-2013	9.57	**1.5**	**5.1**
July-2013	8.77	**0.9**	**4.6**
Oct-2013	8.46	**1.4**	**5**
Feb-2014	8.99 - 9.46	n/a	n/a

MW08			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	7.93	0.5 U	**5**
Apr-2013	7.25	**2.2**	**4.9**
July-2013	6.12	**0.9**	**4.4**
Oct-2013	6.06	**0.9**	**5.1**
Feb-2014	7.48 - 8.04	n/a	n/a

SW-1B *		
GW Monit. Event	Cu	Ni
Feb-2014	4U	**4 J**

SW02*		
GW Monit. Event	Cu	Ni
July-2013	**13**	**16**
Oct-2013	**30**	**8.5 NJ**
Feb-2014	4 U	**4 J**

MW07			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	10.9	**0.8**	**4.4**
Apr-2013	10.92	**1.4**	**5.1**
July-2013	10.17	0.5 U	**2.7**
Oct-2013	10.54	**0.6**	**3.6**
Feb-2014	11.06 - 11.18	n/a	n/a

SW03*		
GW Monit. Event	Cu	Ni
July-2013	**9**	**16**
Oct-2013	**13.5 NJ**	**9.0 NJ**
Feb-2014	**4 J**	2 U

MW06			
GW Monit. Event	GW Elev	Cu	Ni
Jan-2013	13.81	**0.8**	**5.8**
Apr-2013	13.88	0.5 U	**4.2**
July-2013	13.99	**0.6**	**4.9**
Oct-2013	13.93	**0.9**	**9.3**
Feb-2014	14.24 - 14.49	n/a	n/a

Legend

- Site Boundary
- Ordinary High Water (Estimated at Elevation 10.5 feet)
- Metals Area - Excavation
- Metals Area - Cap
- TPH Area - Excavation
- Slag Outcrop - Removal
- MW-1 — Monitoring Well Location
- SW-2 — Surface Water Monitoring Location
- Assumed Groundwater Flow Direction

Data Box Explanation:

GW Monit. = Groundwater Monitoring

GW Elev = Groundwater Elevation in feet

Cu = Dissolved Copper

Ni = Dissolved Nickel

Exceedance of site-specific groundwater cleanup level and surface water criteria (Cu = 2.4 µg/L; Ni = 8.2 µg/L)

J = Concentration is estimated

n/a = Not analyzed

NJ = Analyte is tentatively identified; concentration is estimated

U = Analyte not detected above method reporting limit

Groundwater results in micrograms per liter (µg/L)

*Surface water samples were collected only during the listed events.

Notes

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. February 2014 tidal cycle results in Table 3 (groundwater elevation) and Table 5 (copper and nickel concentrations).
4. February 2014 groundwater results are presented as range detected/measured over tidal cycle.

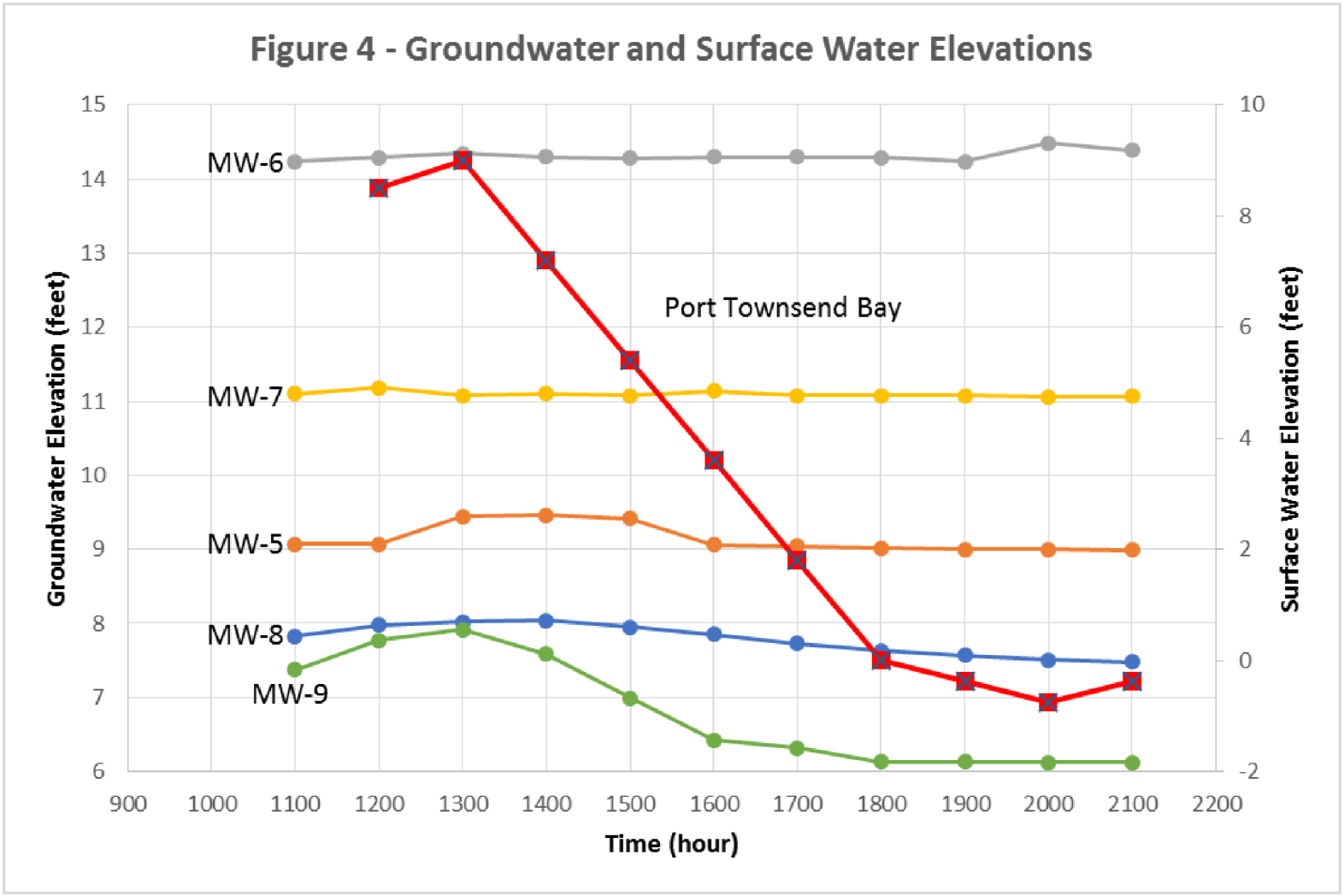
Reference: Aerial photo (July 2013) from Google Earth Pro.

Groundwater and Surface Water Monitoring Results - Dissolved Metals

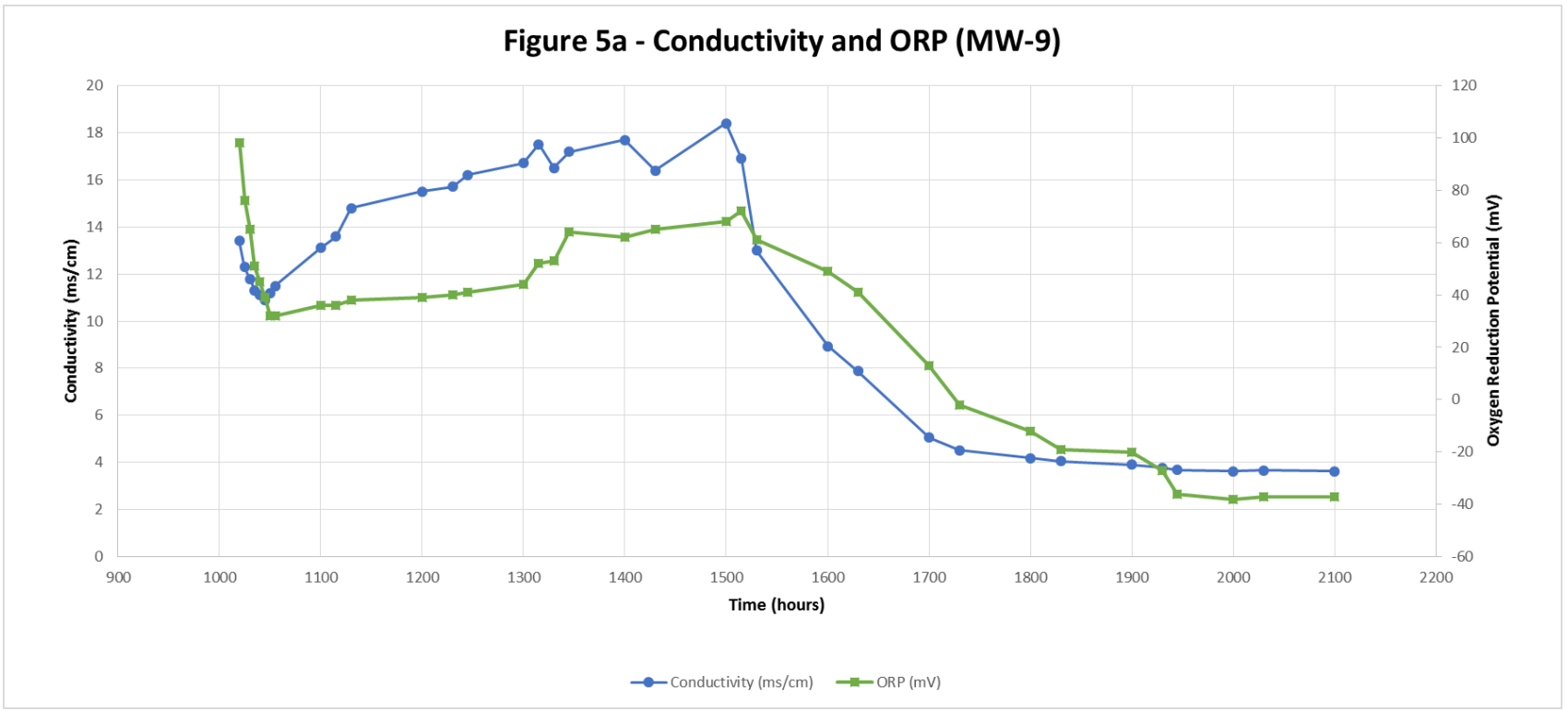
Former Irondale Iron and Steel Plant
Irondale, Washington

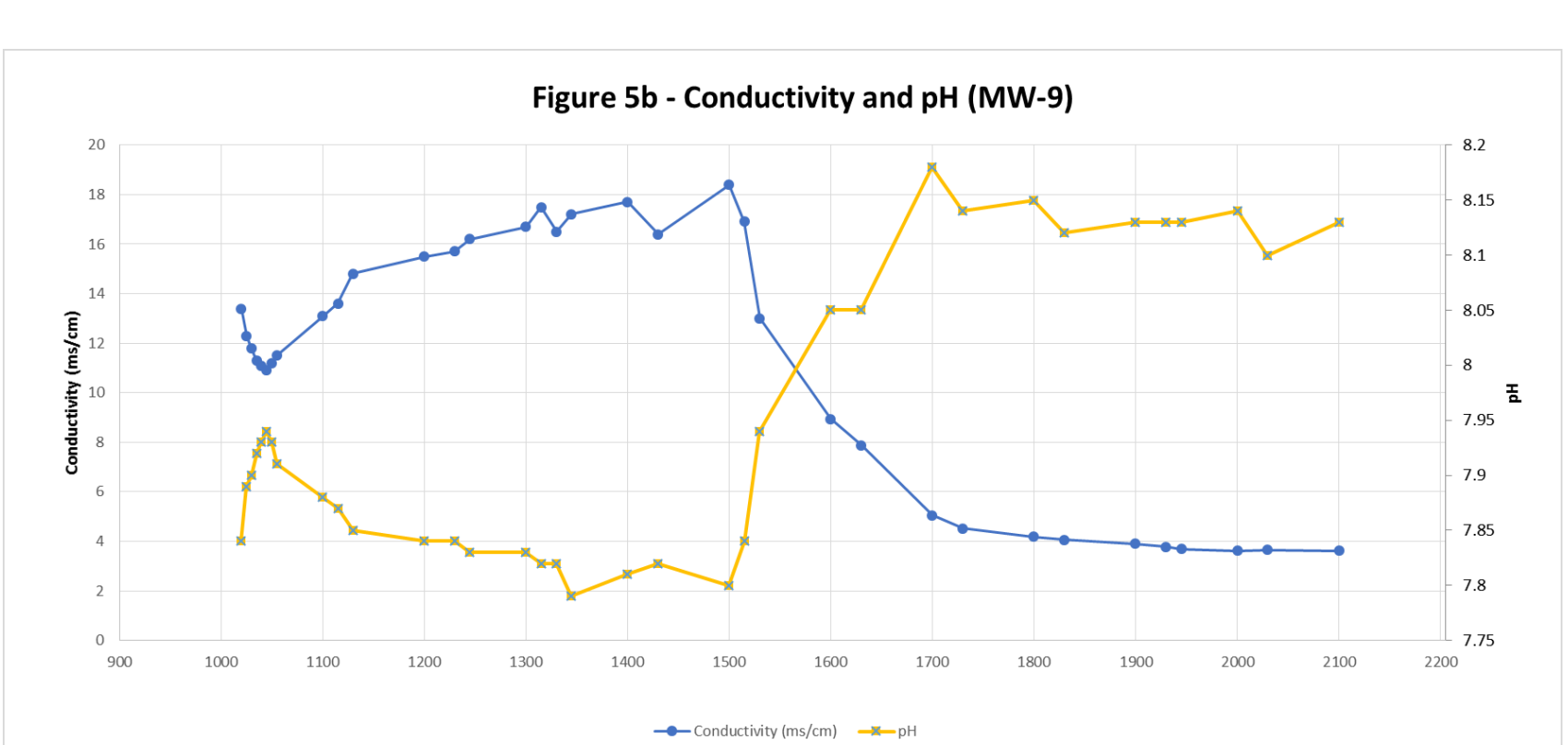
GeoEngineers

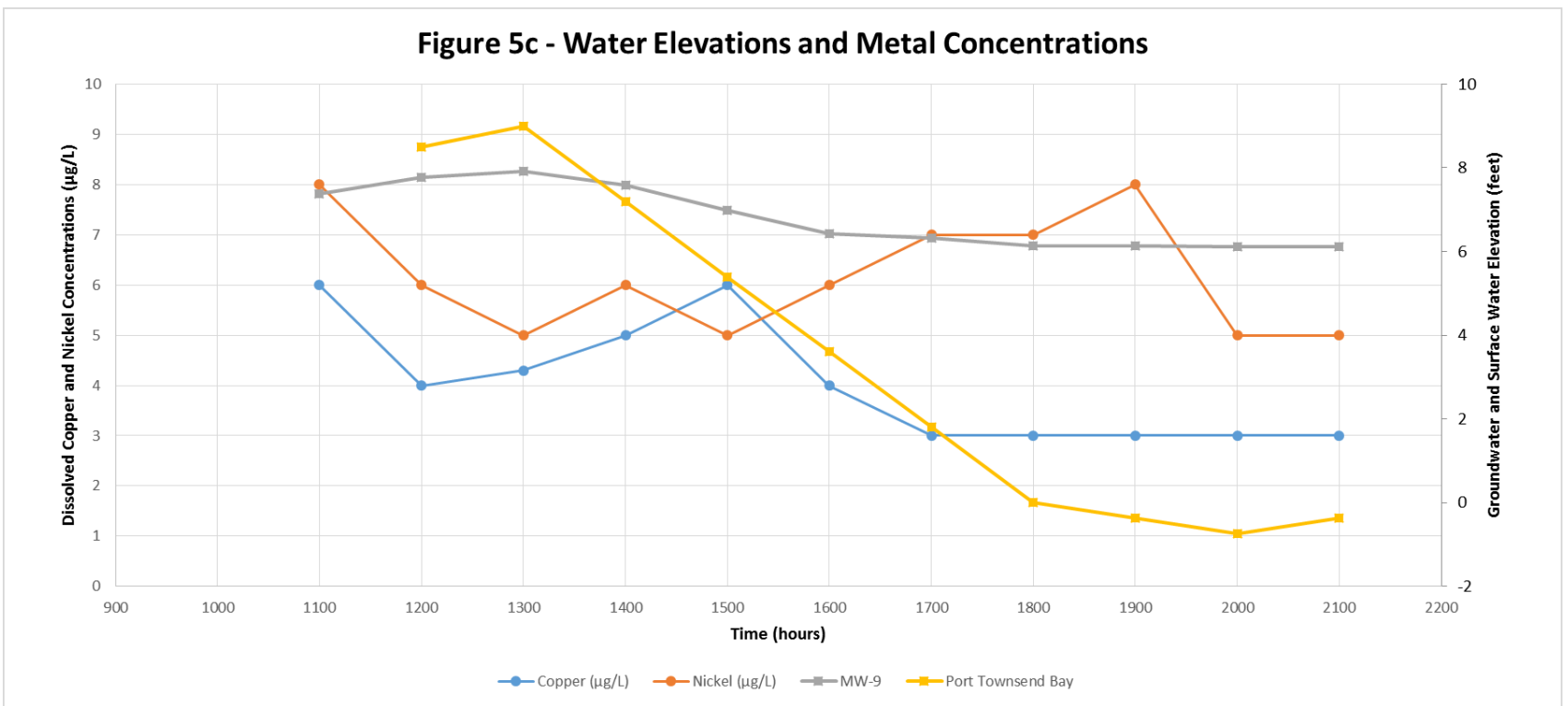
Figure 3



Groundwater and Surface Elevations	
Former Irondale Iron and Steel Plant Irondale, Washington	
GeoEngineers	Figure 4







MW-9 Groundwater Data and Field Parameters

Former Irondale Iron and Steel Plant
Irondale, Washington

GeoEngineers

Figure 5

ATTACHMENT 1
Data Validation Memorandum and Chemical Analytical Results

GeoEngineers

Plaza 600 Building, 600 Stewart Street, Suite 1700, Seattle, WA 98101, Telephone: 206.728.2674, Fax: 206.728.2732 www.geoengineers.com

Data Validation Report

Project:	Irondale Remedial Cleanup Action
	February 2014 Groundwater/Surface Water
GEI File No:	00504-042-02
Date:	March 28, 2014

This report documents the results of a United States Environmental Protection Agency (USEPA)-defined Stage 2B data validation (USEPA Document 540-R-08-005; USEPA, 2009) of analytical data from the analyses of twelve groundwater and five surface water samples collected as part of the February 2014 sampling event, and the associated laboratory and field quality control (QC) samples. The samples were obtained from the former Irondale Iron and Steel Plant Site located in Irondale, Washington.

Objective and Quality Control Elements

GeoEngineers, Inc. (GeoEngineers) completed the data validation consistent with the USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review (USEPA 2010) (National Functional Guidelines) to determine if the laboratory analytical results meet the project objectives and are usable for their intended purpose. Data usability was assessed by determining if:

- The samples were analyzed using well-defined and acceptable methods that provide reporting limits below applicable regulatory criteria;
- The precision and accuracy of the data are well-defined and sufficient to provide defensible data; and
- The quality assurance/quality control (QA/QC) procedures utilized by the laboratory meet acceptable industry practices and standards.

In accordance with the Quality Assurance Project Plan (QAPP), Appendix G of the Final Engineering Design Report (GeoEngineers, 2012), the data validation included review of the following QC elements:

- Data Package Completeness
- Chain-of-Custody Documentation
- Holding Times and Sample Preservation
- Method Blanks
- Matrix Spikes
- Laboratory Control Samples
- Laboratory/Field Duplicates
- Initial Calibrations (ICALs)
- Continuing Calibrations (CCALs)
- Internal Standards
- Instrument Tunes

Validated Sample Delivery Groups

This data validation included review of the sample delivery group (SDG) listed below in Table 1.

Table 1: Summary of Validated Sample Delivery Groups

Laboratory SDG	Samples Validated
YA74	MW9-1100, MW9-1200, MW9-1300, MW9-1300-Dup, MW9-1400, MW9-1500, MW9-1600, MW9-1700, MW9-1800, MW9-1900, MW9-2000, MW9-2100, SW-1A, SW-1B, SW-2, SW-2-Dup, SW-3

Chemical Analysis Performed

Analytical Resources, Incorporated (ARI), located in Tukwila, Washington, performed laboratory analysis on the groundwater and surface water samples using the following methods:

- Dissolved Metals by Method EPA200.8; and
- Conductivity by Method EPA120.1

Data Validation Summary

The results for each of the QC elements are summarized below.

Data Package Completeness

ARI provided all required deliverables for the data validation according to the National Functional Guidelines. The laboratory followed adequate corrective action processes and all identified anomalies were discussed in the relevant laboratory case narrative.

Chain-of-Custody Documentation

Chain-of-custody (COC) forms were provided with the laboratory analytical reports. The COCs were accurate and complete when submitted to the lab with the exception listed below.

SDG YA74: The laboratory noted that Sample MW9-2000 was labeled as MW-2000 on the COC and MW9-2000 on the sample labels. Additionally, Sample MW9-2100 was labeled as MW-2100 on the COC and MW9-2100 on the sample labels. In both cases, the sample ID on the labels were used. The sample IDs on the COC were written in error.

Holding Times and Sample Preservation

The sample holding time is defined as the time that elapses between sample collection and sample analysis. Maximum holding time criteria exist for each analysis to help ensure that the analyte concentrations found at the time of analysis reflect the concentration present at the time of sample collection. Established holding times were met for all analyses. The sample cooler arrived at the laboratory below the appropriate temperatures of between two and six degrees Celsius. The out-of-compliance temperature is detailed below.

SDG YA74: The sample cooler temperature recorded at the laboratory was 1.7 degrees Celsius. It was determined through professional judgment that since the samples were received by the laboratory the same day they were collected, this temperature should not affect the sample analytical results.

Method Blanks

Method blanks are analyzed to ensure that laboratory procedures and reagents do not introduce measurable concentrations of the analytes of interest. A method blank was analyzed with each batch of samples, at a frequency of 1 per 20 samples. For all sample batches, method blanks for all applicable methods were analyzed at the required frequency. None of the analytes of interest were detected above the reporting limits in any of the method blanks.

Matrix Spikes

Since the actual analyte concentration in an environmental sample is not known, the accuracy of a particular analysis is usually inferred by performing a matrix spike analysis on one sample from the associated batch, known as the parent sample. One aliquot of the sample is analyzed in the normal manner and then a second aliquot of the sample is spiked with a known amount of analyte concentration and analyzed. From these analyses, a percent recovery is calculated.

The matrix spike is followed by a post-digestion spike sample if any element percent recoveries were outside the control limits in the matrix spike. The percent recovery control limits for matrix spikes are 75% to 125%.

One matrix spike analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the percent recovery values were within the proper control limits.

Laboratory Control Samples

A laboratory control sample (LCS) is a blank sample that is spiked with a known amount of analyte and then analyzed. An LCS is similar to a matrix spike, but without the possibility of matrix interference. Given that matrix interference is not an issue, the LCS control limits for accuracy and precision are usually more rigorous than for matrix spike analysis. Additionally, data qualification based on LCS analysis would apply to all samples in the associated batch, instead of just the parent sample. The percent recovery control limits for LCS analysis are 75% to 125%.

One LCS analysis should be performed for every analytical batch or every 20 field samples, whichever is more frequent. The frequency requirements were met for all analyses and the percent recovery values were within the proper control limits.

Laboratory Duplicates

Internal laboratory duplicate analyses are performed to monitor the precision of the analyses. Two separate aliquots of a sample are analyzed as distinct samples in the laboratory and the RPD between the two results is calculated. Duplicate analyses should be performed once per analytical batch. If one or more of the samples used has a concentration less than five times the reporting limit for that sample, the absolute difference is used instead of the RPD. The RPD control limit for water samples is 20 percent. Laboratory duplicates were analyzed at the proper frequency and the specified acceptance criteria were met.

Field Duplicates

In order to assess precision, field duplicate samples were collected and analyzed along with the reviewed sample batches. The duplicate samples were analyzed for the same parameters as the associated parent samples. Precision is determined by calculating the RPD between each pair of samples. If one or more of the sample analytes has a concentration greater than five times the reporting limit for that

sample, then the absolute difference is used instead of the RPD. The RPD control limit for water samples is 35 percent.

SDG YA74: Two field duplicate sample pairs, MW9-1300/MW9-1300-Dup and SW-2/SW-2-Dup, were submitted with this SDG. The precision criteria for all target analytes were met for these sample pairs, with the exception of conductivity in Samples MW9-1300 and MW9-1300-Dup. The positive results for this target analyte were qualified as estimated (J) in these samples.

Initial Calibrations (ICALs)

All initial calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. All percent recoveries were within the control limits of 90% and 110%.

Continuing Calibrations (CCALs)

All continuing calibrations were conducted according to the laboratory methods and consisted of the appropriate number of standards. All percent recoveries were within the control limits of 90% and 110%.

Internal Standards (Low Resolution Mass Spectrometry)

Like the surrogate, an internal standard is a compound that is chemically similar to the analytes of interest, but unlikely to be found in any environmental sample. Internal standards are used only for the mass spectrometry instrumentation and are usually added to the sample aliquot after extraction has taken place. The internal standard should be analyzed at the beginning of a 12 hour sample run. The control limits for internal standard recoveries are 60 percent to 125 percent of the calibration standard. All internal standard recoveries were within the control limits.

Overall Assessment

As was determined by this data validation, the laboratory followed the specified analytical methods. Accuracy was acceptable, as demonstrated by the LCS and MS percent recovery values. Precision was acceptable, as demonstrated by the laboratory and field duplicate RPD values.

All data are acceptable for the intended use, with the following qualifications listed below in Table 2.

TABLE 2: SUMMARY OF QUALIFIED SAMPLES

Sample ID	Analyte	Qualifier
MW9-1300	Conductivity	J
MW9-1300-Dup	Conductivity	J

References

U.S. Environmental Protection Agency (USEPA). "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use," EPA-540-R-08-005. January 2009.

U.S. Environmental Protection Agency (USEPA). "Contract Laboratory Program National Functional Guidelines for Inorganic Superfund Data Review," EPA-540-R-10-011. January 2010.

GeoEngineers, Inc. "Final Engineering Design Report", prepared for Washington State Department of Ecology. May 1, 2012.

Table of Contents: ARI Job YA74

Client: Geoengineers

Project: 0504-042-02 Former Irondale Iron & Steel Plant

bc

Signature

March-07-2014

Date

Analytical Resources, Incorporated
Analytical Chemists and Consultants

March 10, 2014

Neil Morton
GeoEngineers, Inc.
Plaza 600 Building
600 Stewart Street, Suite 1700
Seattle, WA 98101

RE: Client Project: Former Irondale Iron & Steel Plant, 0542-042-02
ARI Job No.: YA74

Dear Neil:

Please find enclosed the Chain of Custody records (COCs), sample receipt documentation, and the final data package for samples from the project referenced above.

Sample receipt and analytical details are discussed in the Case Narrative.

An electronic copy of this package will remain on file with ARI. Should you have any questions or problems, please feel free to contact me at your convenience.

Sincerely,

ANALYTICAL RESOURCES, INC.

Cheronne Oreiro
Project Manager
(206) 695-6214
cheronneo@arilabs.com
www.arilabs.com

cc: eFile: YA74

Enclosures

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

Chain of Custody Documentation

ARI Job ID: YA74

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: YA74	Turn-around Requested: STANDARD	Page: 1 of 2	
ARI Client Company: GEOENGINEERS	Phone: 206.728 2674	Date: 2/26/14	Ice Present? YES
Client Contact: NEIL MORTON		No. of Coolers: 1	Cooler Temps: 1.7
Client Project Name: FORMER IRONDALE IRON & STEEL PLANT			
Client Project #: ~~0504-042-01~~	Samplers: FASIH KHAN		

0504-042-02 Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: DISSOLVED Cu, Ni	Analysis Requested: CONDUCTIVITY	Notes/Comments
MW9-1100	2/26/14	1100	WATER	2	X	X	~~HOLD~~
MW9-1200		1200			X	X	~~ALL~~
MW9-1300		1300			X	X	~~SAMPLES~~
MW9-1300-DUP		1315			X	X	
MW9-1400		1400			X	X	
MW9-1500		1500			X	X	
MW9-1600		1600			X	X	
MW9-1700		1700			X	X	
MW9-1800		1800			X	X	
MW9-1900		1900			X	X	

Comments/Special Instructions	Relinquished by (Signature)	Received by (Signature)	Relinquished by (Signature)	Received by (Signature)
	Printed Name: FASIH KHAN	Printed Name: Rich Hudson	Printed Name:	Printed Name:
	Company: GEOENGINEERS	Company: ARI	Company:	Company:
	Date & Time: 2/27/14, 1140	Date & Time: 2/27/14 1140	Date & Time:	Date & Time:

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: YA74	Turn-around Requested: STANDARD	Page: 2 of 2	
ARI Client Company: GEOENGINEERS	Phone: 206.728.2674	Date: 2/26/14	Ice Present? Yes
Client Contact: NEIL MORTON		No. of Coolers: 1	Cooler Temps: 1.7
Client Project Name: FORMER IRONDALE IRON & STEEL PLANT			
Client Project #: ~~5402-042-01~~ 0504-042-02	Samplers: FASIH KHAN		

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Analytical Chemists and Consultants
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Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested: Dissolved Cu, Ni	Analysis Requested: Conductivity	Notes/Comments
MW-2000	2/26/14	2000	WATER	2	X	X	~~HOLD~~
MW-2100		2100			X	X	~~ALL~~
SW-1A		0930			X	X	~~SAMPLES~~
SW-1B		0945			X	X	
SW-2		1310			X	X	
SW-2-DUP		1325			X	X	
SW-3	↓	1015	↓	↓	X	X	

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: FASIH KHAN	Printed Name: Rich Mullen	Printed Name:	Printed Name:
	Company: GEOENGINEERS	Company: ARI	Company:	Company:
	Date & Time: 2/27/14, 1140	Date & Time: 2/27/14 1140	Date & Time:	Date & Time:

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client. GeoEngineers

COC No(s). _____ (NA)

Assigned ARI Job No. YA74

Project Name Former Irondale Iron + Steel Plant

Delivered by: Fed-Ex UPS (Courier) Hand Delivered Other. _____

Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES (NO)

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc) YES NO

Temperature of Cooler(s) (°C) (recommended 2 0-6.0 °C for chemistry) 1.7

Time: 1205

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90877952

Cooler Accepted by: _____ Date 2/27/14 Time: 1140

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES (NO)

What kind of packing material was used? Bubble Wrap (Wet Ice) Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA (YES) NO

Were all bottles sealed in individual plastic bags? YES (NO)

Did all bottles arrive in good condition (unbroken)? (YES) NO

Were all bottle labels complete and legible? (YES) NO

Did the number of containers listed on COC match with the number of containers received? (YES) NO

Did all bottle labels and tags agree with custody papers? (YES) JM NO

Were all bottles used correct for the requested analyses? (YES) NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs)... NA (YES) NO

Were all VOC vials free of air bubbles? (NA) YES NO

Was sufficient amount of sample sent in each bottle? (YES) NO

Date VOC Trip Blank was made at ARI (NA) _____

Was Sample Split by ARI (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JM Date: 2/27/14 Time: 1320

***** Notify Project Manager of discrepancies or concerns *****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC
MW9-2000	MW-2000		
MW9-2100	MW-2100		

Additional Notes, Discrepancies, & Resolutions:

Used ID from Containers.

By: JM Date: 2/27/14

Small Air Bubbles ~2mm	Peabubbles 2-4 mm	LARGE Air Bubbles > 4 mm
• •	• • •	● ● ●

Small → "sm" (< 2 mm)

Peabubbles → "pb" (2 to < 4 mm)

Large → "lg" (4 to < 6 mm)

Headspace → "hs" (> 6 mm)

PRESERVATION VERIFICATION 02/27/14
Page 1 of 2

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **YA74**

PC: Cheronne
VTSR: 02/27/14

Inquiry Number: NONE
Analysis Requested: 02/27/14
Contact: Morton, Neil
Client: Geoengineers
Logged by: JM
Sample Set Used: Yes-481
Validatable Package: No
Deliverables:

Project #: 0504-042-02
Project: Former Irondale Iron & Steel Plant
Sample Site:
SDG No:
Analytical Protocol: In-house

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
14-3248 **YA74A**	MW9-1100						P DIS									Y						
14-3249 **YA74B**	MW9-1200						P DIS									Y						
14-3250 **YA74C**	MW9-1300						P DIS									Y						
14-3251 **YA74D**	MW9-1300-Dup						P DIS									Y						
14-3252 **YA74E**	MW9-1400						P DIS									Y						
14-3253 **YA74F**	MW9-1500						P DIS									Y						
14-3254 **YA74G**	MW9-1600						P DIS									Y						
14-3255 **YA74H**	MW9-1700						P DIS									Y						
14-3256 **YA74I**	MW9-1800						P DIS									Y						
14-3257 **YA74J**	MW9-1900						P DIS									Y						
14-3258 **YA74K**	MW9-2000						P DIS									Y						
14-3259 **YA74L**	MW9-2100						P DIS									Y						
14-3260 **YA74M**	SW-1A						P DIS									Y						
14-3261 **YA74N**	SW-1B						P DIS									Y						

P = Pass

Checked By JM Date ~~2/25~~ 2/27/14

PRESERVATION VERIFICATION 02/27/14
Page 2 of 2

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **YA74**

Client: Geoengineers

Project #: 0504-042-02
Project: Former Irondale Iron & Steel Plant

LOGNUM ARI ID	CLIENT ID	CN >12	WAD >12	NH3 <2	COD <2	FOG <2	MET <2	PHEN <2	PHOS <2	TKN <2	NO23 <2	TOC <2	S2 >9	TPHD <2	Fe2+ <2	DMET FLT	DOC FLT	PARAMETER	ADJUSTED TO	LOT NUMBER	AMOUNT ADDED	DATE/BY
14-3262 **YA74O**	SW-2						DIS P									Y						
14-3263 **YA74P**	SW-2-Dup						DIS P									Y						
14-3264 **YA74Q**	SW-3						DIS P									Y						

Checked By JM Date 2/27/14

Case Narrative, Data Qualifiers, Control Limits

ARI Job ID: YA74

ANALYTICAL
RESOURCES
INCORPORATED

Case Narrative

Client: GeoEngineers, Inc.
Project: Former Irondale Iron & Steel Plant, 0542-042-02
ARI Job No.: YA74

Sample Receipt

Seventeen water samples were received on February 27, 2014 under ARI job YA74. The cooler temperature measured by IR thermometer following ARI SOP was 1.7°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

Dissolved Metals by Method 200.8

The samples and associated laboratory QC were digested and analyzed within recommended holding times.

Samples were analyzed using a UCT (Universal Cell Technology) ICP-MS instrument which includes the capability to run DRC (Dynamic Reaction Cell), KED (Kinetic Energy Discrimination), or standard ICP-MS mode.

The method blank was clean at the reporting limits. The LCS percent recoveries were within control limits.

The matrix spike percent recoveries and duplicate RPDs were within control limits.

General Chemistry Parameters (Conductivity)

The samples and associated laboratory QC were prepared and analyzed within recommended holding times.

The method blank was clean at the reporting limit. The SRM percent recovery was within control limits.

The replicate RPD was within the control limit.

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: YA74
Client: Geoengineers
Project Event: 0504-042-02
Project Name: Former Irondale Iron & Steel Plant

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	MW9-1100	YA74A	14-3248	Water	02/26/14 11:00	02/27/14 11:40
2.	MW9-1200	YA74B	14-3249	Water	02/26/14 12:00	02/27/14 11:40
3.	MW9-1300	YA74C	14-3250	Water	02/26/14 13:00	02/27/14 11:40
4.	MW9-1300-Dup	YA74D	14-3251	Water	02/26/14 13:15	02/27/14 11:40
5.	MW9-1400	YA74E	14-3252	Water	02/26/14 14:00	02/27/14 11:40
6.	MW9-1500	YA74F	14-3253	Water	02/26/14 15:00	02/27/14 11:40
7.	MW9-1600	YA74G	14-3254	Water	02/26/14 16:00	02/27/14 11:40
8.	MW9-1700	YA74H	14-3255	Water	02/26/14 17:00	02/27/14 11:40
9.	MW9-1800	YA74I	14-3256	Water	02/26/14 18:00	02/27/14 11:40
10.	MW9-1900	YA74J	14-3257	Water	02/26/14 19:00	02/27/14 11:40
11.	MW9-2000	YA74K	14-3258	Water	02/26/14 20:00	02/27/14 11:40
12.	MW9-2100	YA74L	14-3259	Water	02/26/14 21:00	02/27/14 11:40
13.	SW-1A	YA74M	14-3260	Water	02/26/14 09:30	02/27/14 11:40
14.	SW-1B	YA74N	14-3261	Water	02/26/14 09:45	02/27/14 11:40
15.	SW-2	YA74O	14-3262	Water	02/26/14 13:10	02/27/14 11:40
16.	SW-2-Dup	YA74P	14-3263	Water	02/26/14 13:25	02/27/14 11:40
17.	SW-3	YA74Q	14-3264	Water	02/26/14 10:15	02/27/14 11:40

Analytical Method Information

Met Diss 200.8 (EPA 200.8) in Water

Preservation: pH<2; HNO3, Cool <6°C
Container: HDPE NM, 500 mL
Amount Required: 500 mL
Hold Time: 180 days

Analyte	MDL	Reporting Limit	Surrogate %R	Duplicate RPD	Matrix Spike %R	Matrix Spike RPD	Blank Spike / LCS %R	Blank Spike / LCS RPD
Aluminum-27	0.00160	0.0200 mg/L		20	75 - 125	20	80 - 120	20
Antimony-121	0.0000100	.000200 mg/L		20	75 - 125	20	80 - 120	20
Antimony-123	0.0000110	.000200 mg/L		20	75 - 125	20	80 - 120	20
Arsenic-75a	0.0000480	.000200 mg/L		20	75 - 125	20	80 - 120	20
Arsenic-75b	0.0000480	.000200 mg/L		20	75 - 125	20	80 - 120	20
Barium-135	0.0000200	.000500 mg/L		20	75 - 125	20	80 - 120	20
Barium-137	0.0000190	.000500 mg/L		20	75 - 125	20	80 - 120	20
Beryllium-9	0.0000210	.000200 mg/L		20	75 - 125	20	80 - 120	20
Cadmium-111	0.000100	.000100 mg/L		20	75 - 125	20	80 - 120	20
Cadmium-114	0.00000500	.000100 mg/L		20	75 - 125	20	80 - 120	20
Calcium-43	0.00398	0.0500 mg/L		20	75 - 125	20	80 - 120	20
Chromium-52	0.0000450	.000500 mg/L		20	75 - 125	20	80 - 120	20
Chromium-53	0.000118	.000500 mg/L		20	75 - 125	20	80 - 120	20
Cobalt-59	0.0000110	.000200 mg/L		20	75 - 125	20	80 - 120	20
Copper-63	0.000158	.000500 mg/L		20	75 - 125	20	80 - 120	20
Copper-65	0.000236	.000500 mg/L		20	75 - 125	20	80 - 120	20
Iron-54	0.00575	0.0200 mg/L		20	75 - 125	20	80 - 120	20
Iron-57	0.00388	0.0200 mg/L		20	75 - 125	20	80 - 120	20
Lead-208	0.0000460	.000100 mg/L		20	75 - 125	20	80 - 120	20
Magnesium-24	0.000297	0.0200 mg/L		20	75 - 125	20	80 - 120	20
Manganese-55	0.0000220	.000500 mg/L		20	75 - 125	20	80 - 120	20
Molybdenum-98	0.0000130	.000200 mg/L		20	75 - 125	20	80 - 120	20
Nickel-60	0.0000790	.000500 mg/L		20	75 - 125	20	80 - 120	20
Nickel-62	0.0000890	.000500 mg/L		20	75 - 125	20	80 - 120	20
Potassium-39	0.00294	0.0200 mg/L		20	75 - 125	20	80 - 120	20
Selenium-82	0.000127	.000500 mg/L		20	75 - 125	20	80 - 120	20
Selenium-78	0.000324	0.00200 mg/L		20	75 - 125	20	80 - 120	20
Silver-107	0.00000800	.000200 mg/L		20	75 - 125	20	80 - 120	20
Sodium-23	0.00283	0.100 mg/L		20	75 - 125	20	80 - 120	20
Thorium-232	0.0000130	.000200 mg/L		20	75 - 125	20	80 - 120	20
Thallium-205	0.00000400	.000200 mg/L		20	75 - 125	20	80 - 120	20
Uranium-238	0.00000300	.000200 mg/L		20	75 - 125	20	80 - 120	20
Vanadium-51a	0.0000430	.000200 mg/L		20	75 - 125	20	80 - 120	20
Vanadium-51b	0.0000430	.000200 mg/L		20	75 - 125	20	80 - 120	20
Zinc-66	0.000497	0.00400 mg/L		20	75 - 125	20	80 - 120	20
Zinc-67	0.000531	0.00400 mg/L		20	75 - 125	20	80 - 120	20
Zinc-68	0.000524	0.00400 mg/L		20	75 - 125	20	80 - 120	20
Lithium								
Scandium								
Germanium								
Indium								
Terbium								

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Spike Recovery Control Limits for Conventional Wet Chemistry

Effective 5/1/09

Control limits are updated periodically. Assure that you have ARI's current control limits by downloading the files at the time of use. http://www.arilabs.com/portal/downloads/ARI-CLs.zip

	ARI's Control Limits	
Sample Matrix:	Water	Soil / Sediment
Matrix Spike Recoveries	% Recovery	% Recovery
Ammonia	75 - 125	75 - 125
Bromide	75 125	75 - 125
Chloride	75 125	75 - 125
Cyanide	75 - 125	75 - 125
Ferrous Iron	75 - 125	75 - 125
Fluoride	75 - 125	75 - 125
Formaldehyde	75 - 125	75 - 125
Hexane Extractable Material	-- - --	78 - 114
Hexavalent Chromium	75 - 125	75 - 125
Nitrate/Nitrite	75 - 125	75 - 125
Oil and Grease	75 - 125	75 - 125
Phenol	75 - 125	75 - 125
Phosphorous	75 - 125	75 - 125
Sulfate	75 - 125	75 - 125
Sulfide	75 - 125	75 - 125
Total Kjeldahl Nitrogen	75 - 125	75 - 125
Total Organic Carbon	75 - 125	75 - 125
Duplicate RPDs		
Acidity	±20%	±20%
Alkalinity	±20%	±20%
BOD	±20%	±20%
Cation Exchange	±20%	±20%
COD	±20%	±20%
Conductivity	±20%	±20%
Salinity	±20%	±20%
Solids	±20%	±20%
Turbidity	±20%	±20%

Metals Analysis
Report and Summary QC Forms

ARI Job ID: YA74

Cover Page

INORGANIC ANALYSIS DATA PACKAGE

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Geoengineers

PROJECT: Former Irondale Iron

SDG: YA74

CLIENT ID	ARI ID	ARI LIMS ID	REPREP
MW9-1100	YA74A	14-3248	
MW9-1100D	YA74ADUP	14-3248	
MW9-1100S	YA74ASPK	14-3248	
MW9-1200	YA74B	14-3249	
PBW	YA74MB1	14-3249	
LCSW	YA74MB1SPK	14-3249	
MW9-1300	YA74C	14-3250	
MW9-1300-Dup	YA74D	14-3251	
MW9-1400	YA74E	14-3252	
MW9-1500	YA74F	14-3253	
MW9-1600	YA74G	14-3254	
MW9-1700	YA74H	14-3255	
MW9-1800	YA74I	14-3256	
MW9-1900	YA74J	14-3257	
MW9-2000	YA74K	14-3258	
MW9-2100	YA74L	14-3259	
SW-1A	YA74M	14-3260	
SW-1B	YA74N	14-3261	
SW-2	YA74O	14-3262	
SW-2-Dup	YA74P	14-3263	
SW-3	YA74Q	14-3264	

Were ICP interelement corrections applied ?	Yes/No	YES
Were ICP background corrections applied ?	Yes/No	YES
If yes - were raw data generated before application of background corrections ?	Yes/No	NO

Comments: _____

THIS DATA PACKAGE HAS BEEN REVIEWED AND AUTHORIZED FOR RELEASE BY:

Signature: _____ Name: Jay Kuhn

Date: 3/6/14 Title: Inorganics Director

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW9-1100
SAMPLE

Lab Sample ID: YA74A
LIMS ID: 14-3248
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant
0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	1.6	5	**6**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.8	5	**8**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW9-1200
SAMPLE

Lab Sample ID: YA74B
LIMS ID: 14-3249
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.8	2	**4**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.4	2	**6**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1300
SAMPLE

Lab Sample ID: YA74C
LIMS ID: 14-3250
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	1.6	5.0	**3.9**	**J**
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.8	5	**5**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

YA74:00617

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1300-Dup
SAMPLE

Lab Sample ID: YA74D
LIMS ID: 14-3251
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	1.6	5.0	**4.7**	**J**
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.8	5	**5**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1400
SAMPLE

Lab Sample ID: YA74E
LIMS ID: 14-3252
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.8	2	**5**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.4	2	**6**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1500
SAMPLE

Lab Sample ID: YA74F
LIMS ID: 14-3253
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.8	2	**6**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.4	2	**5**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1600
SAMPLE

Lab Sample ID: YA74G
LIMS ID: 14-3254
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.4	1	**4**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.2	1	**6**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1700
SAMPLE

Lab Sample ID: YA74H
LIMS ID: 14-3255
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.4	1	**3**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.2	1	**7**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1800
SAMPLE

Lab Sample ID: YA74I
LIMS ID: 14-3256
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.4	1	**3**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.2	1	**7**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1900
SAMPLE

Lab Sample ID: YA74J
LIMS ID: 14-3257
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.4	1	**3**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.2	1	**8**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: MW9-2000
SAMPLE

Lab Sample ID: YA74K
LIMS ID: 14-3258
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.4	1	**3**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.2	1	**5**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-2100
SAMPLE

Lab Sample ID: YA74L
LIMS ID: 14-3259
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	0.4	1	**3**	
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	0.2	1	**5**	

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: SW-1A
SAMPLE

Lab Sample ID: YA74M
LIMS ID: 14-3260
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	7440-50-8	Copper	4	10	10	U
200.8	02/28/14	200.8	03/04/14	7440-02-0	Nickel	2	10	10	U

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: SW-1B
SAMPLE

Lab Sample ID: YA74N
LIMS ID: 14-3261
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	7440-50-8	Copper	4	10	10	U
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	2	12	**4**	**J**

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: SW-2
SAMPLE

Lab Sample ID: YA74O
LIMS ID: 14-3262
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant
0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	7440-50-8	Copper	4	10	10	U
200.8	02/28/14	200.8	03/04/14	**7440-02-0**	**Nickel**	2	12	**4**	**J**

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: SW-2-Dup
SAMPLE

Lab Sample ID: YA74P
LIMS ID: 14-3263
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	7440-50-8	Copper	4	10	10	U
200.8	02/28/14	200.8	03/04/14	7440-02-0	Nickel	2	10	10	U

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS
Page 1 of 1

Sample ID: SW-3
SAMPLE

Lab Sample ID: YA74Q
LIMS ID: 14-3264
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant
0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	**7440-50-8**	**Copper**	4	12	**4**	**J**
200.8	02/28/14	200.8	03/04/14	7440-02-0	Nickel	2	10	10	U

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1100
MATRIX SPIKE

Lab Sample ID: YA74A
LIMS ID: 14-3248
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Copper	200.8	6	29	25.0	92.0%	
Nickel	200.8	8	34	25.0	104%	

Reported in µg/L

N-Control Limit Not Met
H-% Recovery Not Applicable, Sample Concentration Too High
NA-Not Applicable, Analyte Not Spiked

Percent Recovery Limits: 75-125%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: MW9-1100
DUPLICATE

Lab Sample ID: YA74A
LIMS ID: 14-3248
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant
0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

MATRIX DUPLICATE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Duplicate	RPD	Control Limit	Q
Copper	200.8	6	6	0.0%	+/- 5	L
Nickel	200.8	8	8	0.0%	+/- 5	L

Reported in µg/L

*-Control Limit Not Met
L-RPD Invalid, Limit = Detection Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS

Sample ID: LAB CONTROL

Lab Sample ID: YA74LCS
LIMS ID: 14-3249
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Copper	200.8	25.6	25.0	102%	
Nickel	200.8	26.0	25.0	104%	

Reported in µg/L

N-Control limit not met
Control Limits: 80-120%

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
DISSOLVED METALS **Sample ID: METHOD BLANK**

Lab Sample ID: YA74MB
LIMS ID: 14-3249
Matrix: Water
Data Release Authorized:
Reported: 03/06/14

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant 0504-042-02
Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	DL	LOQ	µg/L	Q
200.8	02/28/14	200.8	03/04/14	7440-50-8	Copper	0.16	0.5	0.5	U
200.8	02/28/14	200.8	03/04/14	7440-02-0	Nickel	0.08	0.5	0.5	U

U-Analyte undetected at given DL
J-Analyte detected between DL and LOQ
DL-Detection Limit

Results reported below the LOQ are for statistical purposes only and have not been evaluated by either an analyst or data reviewer.

General Chemistry Analysis
Report and Summary QC Forms

ARI Job ID: YA74

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
Conductivity by Method EPA 120.1

Data Release Authorized:
Reported: 03/03/14
Date Received: 02/27/14
Page 1 of 1

QC Report No: YA74-Geoengineers
Project: Former Irondale Iron & Steel Plant
0504-042-02

Client/ ARI ID	Date Sampled	Matrix	Analysis Date & Batch	RL	Result
MW9-1100 YA74A 14-3248	02/26/14	Water	02/28/14 022814#1	1.00	39,900
MW9-1200 YA74B 14-3249	02/26/14	Water	02/28/14 022814#1	1.00	12,400
MW9-1300 YA74C 14-3250	02/26/14	Water	02/28/14 022814#1	1.00	15,600
MW9-1300-Dup YA74D 14-3251	02/26/14	Water	02/28/14 022814#1	1.00	42,100
MW9-1400 YA74E 14-3252	02/26/14	Water	02/28/14 022814#1	1.00	14,600
MW9-1500 YA74F 14-3253	02/26/14	Water	02/28/14 022814#1	1.00	16,300
MW9-1600 YA74G 14-3254	02/26/14	Water	02/28/14 022814#1	1.00	8,230
MW9-1700 YA74H 14-3255	02/26/14	Water	02/28/14 022814#1	1.00	4,640
MW9-1800 YA74I 14-3256	02/26/14	Water	02/28/14 022814#1	1.00	3,850
MW9-1900 YA74J 14-3257	02/26/14	Water	02/28/14 022814#1	1.00	3,550
MW9-2000 YA74K 14-3258	02/26/14	Water	02/28/14 022814#1	1.00	3,270
MW9-2100 YA74L 14-3259	02/26/14	Water	02/28/14 022814#1	1.00	3,340
SW-1A YA74M 14-3260	02/26/14	Water	02/28/14 022814#1	1.00	44,700
SW-1B YA74N 14-3261	02/26/14	Water	02/28/14 022814#1	1.00	45,200
SW-2 YA74O 14-3262	02/26/14	Water	02/28/14 022814#1	1.00	43,200
SW-2-Dup YA74P 14-3263	02/26/14	Water	02/28/14 022814#1	1.00	43,100
SW-3 YA74Q 14-3264	02/26/14	Water	02/28/14 022814#1	1.00	45,300

Reported in umhos/cm

RL-Analytical reporting limit
U-Undetected at reported detection limit
Report for YA74

REPLICATE RESULTS-CONVENTIONALS
YA74-Geoengineers

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/03/14

Project: Former Irondale Iron & Steel
Event: 0504-042-02
Date Sampled: 02/26/14
Date Received: 02/27/14

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: YA74A Client ID: MW9-1100					
Conductivity	02/28/14	umhos/cm	39,900	40,000	0.3%

METHOD BLANK RESULTS-CONVENTIONALS
YA74-Geoengineers

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/03/14

Project: Former Irondale Iron & Steel
Event: 0504-042-02
Date Sampled: NA
Date Received: NA

Analyte	Date/Time	Units	Blank
Conductivity	02/28/14 12:28	umhos/cm	< 1.00 U

STANDARD REFERENCE RESULTS-CONVENTIONALS
YA74-Geoengineers

ANALYTICAL RESOURCES INCORPORATED

Matrix: Water
Data Release Authorized:
Reported: 03/03/14

Project: Former Irondale Iron & Steel
Event: 0504-042-02
Date Sampled: NA
Date Received: NA

Analyte/SRM ID	Date/Time	Units	SRM	True Value	Recovery
Conductivity Ricca #4110724	02/28/14 12:28	umhos/cm	985	1,000	98.5%