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T E C H N I C A L M E M O R A N D U M

TO: Chris Wend – Washington State Department of Ecology (by mail and e-mail)

cc: Merv Wark – Yakima Steel Fabricators (by e-mail)
Clark Davis – Davis Law Office, PLLC (by e-mail)

FROM: Eric Buer, L.G., L.H.G., Associate Hydrogeologist
Jeff Kaspar, L.G., L.H.G., Principal Geologist

DATE: July 17, 2017

RE: **WETLAND EVALUATION TECHNICAL MEMORANDUM**
AGRI-TECH AND YAKIMA STEEL FABRICATORS SITE
YAKIMA, WASHINGTON
AGREED ORDER NO. DE 6091
FARALLON PN: 765-001

Farallon Consulting, L.L.C. (Farallon) has prepared this technical memorandum to provide the Washington State Department of Ecology (Ecology) with a summary of the previous soil and sediment investigations and the results of a sediment cleanup site evaluation performed for the approximately 0.45-acre wetland on the southern portion of 6 and 10½ East Washington Avenue in Yakima, Washington (herein referred to as the Site) (Figure 1). This information is provided to support a determination of whether further evaluation of the wetland is needed as part of the Feasibility Study for the Site. Farallon has prepared this memorandum on behalf of Yakima Steel Fabricators, Inc. (YSF) for the YSF and Agri-Tech, Inc. (Agri-Tech) properties that comprise the Site.

The work described in this technical memorandum was performed to meet the requirements of Agreed Order No. DE 6091 dated October 27, 2008, entered into by Ecology and YSF pursuant to the authority of the Washington State Model Toxics Control Act Cleanup Regulation (MTCA); and the First Amendment to Agreed Order No. DE 6091 dated October 17, 2016. Documents used in the preparation of this technical memorandum are provided in Attachment A.

BACKGROUND

The Site consists of Yakima County Tax Parcel Nos. 19133141009 and 19133141409 (Figure 2). Two structures currently are present at the Site: one single-story building currently used for steel fabrication and business offices on the YSF property (YSF building); and one single-story warehouse building on the Agri-Tech property (Agri-Tech building). Currently, the Agri-Tech building is leased by the operator of YSF for use in its steel fabrication operations. The wetland area is present on the southernmost portion of Yakima County Parcel No. 19133141009.

From 2011 through 2014, Farallon conducted a supplemental remedial investigation (RI) of soil and sediment quality to characterize the source, nature, and extent of the chemicals of potential concern (COPCs), including petroleum hydrocarbons, metals, chlorinated pesticides, carcinogenic polycyclic aromatic hydrocarbons (cPAHs), and volatile organic compounds (VOCs), in soil and groundwater on the southern parcel (Yakima County Parcel No. 19133141009) of the Site. The original work scope for completion of the supplemental RI was approved by Ecology and established in the *Feasibility Study Work Plan, Agri-Tech and Yakima Steel Fabricators, 6 and 10½ East Washington Avenue, Yakima, Washington* dated May 3, 2011, prepared by Farallon (FS Work Plan). This memorandum focuses on the area of the wetland in the southernmost portion of the Site, which can be evaluated as a separate sediment management unit under the Sediment Management Standards (SMS), Chapter 173-204 of the Washington Administrative Code (WAC 173-204).

Pertinent information regarding current and historical uses in this area of the Site and surrounding properties and a summary of previous sampling conducted in the wetlands area is presented below. More detailed descriptions of the Site features, ownership and operation, historical Site use, use of surrounding properties, and previous work conducted at the Site are provided in the FS Work Plan and the *Revised Remedial Investigation Report, Agri-Tech & Yakima Steel Fabricators, 6 and 10½ East Washington Avenue, Yakima, Washington* dated June 10, 2004, prepared by Farallon (RI Report).

SITE USAGE AND AREAS OF INVESTIGATION

Based on the historical Site uses, three areas of investigation have been established (Figure 2):

- Area 1 – Area 1, north of the Site wetland, includes the former Yakima Farmer Supply lime and sulfur processing plant, and the area of the plant's former waste pit.
- Area 2 – Area 2, north of the Site wetland, is present on the central and eastern portions of the YSF property between the YSF building and the east-adjacent automobile recycling facility, and is suspected to have included stockpiles of bulk lime and sulfur.
- Area 3 – Area 3 is southwest of the YSF building where a small release of petroleum hydrocarbons was suspected by Ecology proximate to the YSF building and north of the Site wetland. Ecology also identified Area 3 as a potential area of metals contamination due to historical activities at the west-adjacent Bay Chemical Company property, described

in further detail below. Area 3 also currently includes a former pond and the current wetland area.

The wetland was once part of a larger pond where the northern portions were filled during the early years of YSF's acquisition to accommodate steel storage. Since the 1980s the footprint of the pond has continued to shrink to its current size, resulting in the current estimated 0.45-acre wetland. The shrinking condition appears to be largely due to changes in surrounding land use, which changed from rural farming to commercial/industrial. Because of the change in land use, seasonal irrigation channels are no longer introducing water that formerly sustained the pond. The areal photographs presented in Figure 3 depicted the evolution of the pond area to its current wetland status between 1979 to 2016. No buildings have been located, and no activities other than bulk steel storage have reportedly been conducted on the southern portion of the Site. No prior anthropomorphic uses have been documented within the extent of the existing wetland or former pond area.

Historical uses of the Site, including operation of a steel fabrication facility (1980 to present), operation of a fruit packing supply and equipment company (1982 through 1989), and construction and operation of a lime and sulfur formulating plant (1960 through approximately 1978), occurred in Areas 1 and 2, north of Area 3, and in the filled portion of the wetland.

The west-adjacent property is owned by BNSF Railroad Company and historically leased to Bay Chemical Company (Bay Chemical property). A former sludge settling pond area was present on the Bay Chemical property immediately adjacent to the wetland. The sludge settling pond was used for disposal of waste sludge generated during production of liquid zinc sulfate by reacting steel mill flue dust with sulfuric acid on the northern portion of the Bay Chemical property. The sludge settling pond previously was identified as one of two sources of metals contamination to the Site in the technical memorandum regarding Metals Source Evaluation, Agri-Tech and Yakima Steel Fabricators Site, Yakima Steel Fabricators, Yakima, Washington dated October 4, 2016, from Eric Buer and Jeff Kaspar of Farallon to Chris Wend of Ecology (Metals Source Evaluation). According to the Metals Source Evaluation, sampling station WetSed-1 is closest to the Bay Chemical property sludge settling pond from which flue dust and associated metals were likely transported onto the Site by wind and surface water flow.

The Site wetland is bordered by drainage ditches to the south and east that join near the southeastern corner of the Site. No records are available to identify over what period the ditches received dredging and maintenance or when maintenance ceased. As of 2008, the ditches sloped generally to the east/southeast. Based on review of aerial photographs taken in 1979, 1992, 1996, 2003, 2004, 2009, and 2016, the drainage ditches and areas south and east of the Site wetland have remained vegetated and undeveloped since 1979. Site soil to the west and south of the wetland was excavated as part of an Ecology-approved cleanup action that was performed by BNSF between July 30 and October 5, 2007. The cleanup action did not include the wetland area. The excavation extended to a maximum depth of approximately 6 feet below ground surface (bgs) proximate to the drainage ditch south of the wetland. Following the cleanup action, the area was backfilled to the approximate grade currently observed on the Site.

Because the wetland is topographically distinct (3 to 5 feet below the surrounding Site topography); has unique environmental conditions, including seasonal standing water and saturated surface soil; and is subject to sediment criteria that do not apply to other portions of the Site (see below), Farallon recommends that the Site wetland be evaluated as its own area of the Site, Area 4, under the SMS. Wetland buffer areas would remain part of Area 3 as described above.

WETLAND ASSESSMENT AND SEDIMENT EVALUATION

This section presents a description of the Site wetland based on the letter regarding Yakima Steel Fabricators Wetland Assessment Report dated September 13, 2016, from Chris Wend of Ecology to Jeff Kaspar of Farallon (Ecology assessment) (Attachment B). Results of wetland sediment sampling and analysis and sediment bioassay results are also presented.

WETLAND DESCRIPTION AND ECOLOGY ASSESSMENT

A pond has been present on the Site since at least 1979. The present wetland area originally was part of the larger pond. Since the late 1990s, the pond portion of the wetland has transitioned from perennial open water to intermittent standing water with increased growth of reeds and grasses in soft, saturated soil. The footprint of the wetland, including the intermittent pond, was surveyed as part of the RI Report in 1997 and estimated to be approximately 0.4 acre. A wetland delineation performed by Ecology on August 25, 2016 revised the wetland extent to the south and east, and increased the total area to approximately 0.45 acre.

The wetland delineation performed by Ecology was documented in the Ecology assessment provided in Attachment B. The Ecology assessment determined the extent of the wetland based on visual inspection and excavation of an observation pit proximate to the wetland's eastern boundary to confirm the presence of hydric soil.

The Ecology assessment identified the wetland as the area that is "much lower" than the surrounding ground surface, generally within approximately 3 to 5 vertical feet of the pond surface. Because the pond portion of the wetland is sustained by groundwater, approximately 0.3 acre of the 0.45-acre wetland footprint was classified as "emergent" (Figure 3). Per the Ecology assessment, trees and shrubs growing in the area surrounding the wetland and proximate to the ditch to the east, above the area identified to be within 3 to 5 vertical feet of the pond surface area, are in the wetland buffer.

Based on the wetland's morphology, hydrology, and vegetation assemblage, Ecology assigned the wetland a Category III rating. Category III wetlands are identified as having moderate ecological function with some disturbance from their natural state. Category III wetlands are also more isolated from other natural resources in the surrounding landscape than Category II wetlands.

SOIL AND SEDIMENT SAMPLING

Following initial identification of the Site wetland and survey of the wetland boundary in 1997, Ecology requested that soil samples collected from locations with intermittent standing water or perennially saturated conditions be evaluated against SMS criteria as detailed in the letter regarding Feasibility Work Plan Additional Requirements for Wetlands/Pond Area of the Yakima Steel Site Under Agreed Order DE 6091 dated February 16, 2011, from Norman D. Peck of Ecology to Jeff Kaspar of Farallon. SMS criteria include both sediment cleanup objectives (SCOs) and cleanup screening levels (CSLs). Farallon sampled Site wetland soil and sediment on May 23 and 26, 2011 at six locations (Figure 3). Sediment samples were analyzed for the following analytes:

- Metals by U.S. Environmental Protection Agency (EPA) Methods 6000/6010/7000;
- Total petroleum hydrocarbons as gasoline-, as diesel-, and as oil-range organics by Northwest Methods NWTPH-HCID and NWTPH-Dx;
- VOCs by EPA Method 8260B; and
- Pesticides by EPA Method 8081.

Sediment samples were collected from locations that were either intermittently submerged by standing water or were saturated throughout the year from a depth interval of 0 to 10 centimeters below ground surface. However, in the period between Farallon soil and sediment sampling and when the Ecology wetland delineation was performed, saturated conditions associated with the intermittent pond/emergent wetland have expanded to encompass stations previously identified for soil sampling. Thus, all six samples are evaluated as sediment samples in this section.

Analytical results for the wetland samples are provided in Tables 1 through 4. Concentrations of cadmium, lead, and zinc in sediment were elevated in the central portion of the emergent wetland (stations WetSed-1 through WetSed-3) compared to the concentrations observed at the outlying sampling stations (WetSoil-1 and WetSoil-2 to the south, and WetSoil-3 to the north). Cadmium was detected at concentrations exceeding the CSL of 5.4 milligrams per kilogram (mg/kg) in samples collected from the three central sampling stations. Cadmium was detected at concentrations exceeding the SCO of 2.1 mg/kg in sediment collected from sampling station WetSoil-1, south of the central WetSed station group, at a depth of 0 to 6 inches bgs. Other cadmium results for samples collected from stations WetSoil-1 through WetSoil-3 were less than the SCO.

Concentrations of lead and zinc in sediment reflected a similar spatial distribution to that for cadmium, with higher concentrations at stations WetSed-1 through WetSed-3 and slightly elevated concentrations at station WetSoil-1. However, none of the lead or zinc results for samples collected from the Site exceeded their respective SCOs. Concentrations of arsenic were somewhat elevated in samples collected from stations WetSed-2 and WetSed-3, but were less than SCOs. Concentrations of antimony, copper, and mercury did not appear to follow a spatial pattern and were less than SCOs.

Petroleum hydrocarbons, VOCs, and pesticides were either detected at low concentrations less than their respective SCOs or SCLs, or were reported non-detect at the laboratory practical quantitation limit (Tables 2 through 4).

In summary, cadmium concentrations exceeded the CSL in samples collected from three sampling stations and exceeded the SCO in samples collected from one sampling station; all other analytes were detected at concentrations less than their respective SCOs or were reported non-detect at the laboratory practical quantitation limit. Under the SMS, biological test results override chemistry results when determining whether sediments exhibit toxicity to biological organisms. Therefore, bioassays were conducted using the sediment samples collected from the wetlands that exceeded CSLs to further evaluate their toxicity and compliance with SMS biological criteria.

2011 SEDIMENT BIOASSAYS

Bioassay testing of samples collected from stations WetSed-1 through WetSed-3 was performed on May 23, 2011 by Nautilus Environmental (Nautilus) to evaluate the toxicity of the wetland sediments. The Nautilus sediment bioassays included:

- 10-day survival using the amphipod *Hyalella azteca (H. azteca)* (EPA method 100.1);
- 20-day growth and survival using the midge *Chironomus dilutus (C. dilutus)* (EPA method 100.5); and
- Luminescence readings of the marine bacterium *Vibrio fischeri* after 5 minutes and 15 minutes of exposure to sediment porewater (Microtox testing).

This testing suite meets the current sediment biological testing requirements of WAC 173-204-563(3)(d), requiring two different approved species; three endpoints, including one sublethal endpoint; and one chronic test. Because Microtox testing is no longer an approved method of assessment for freshwater species under the SMS, these results are not discussed further in this memorandum. A summary of bioassay results is provided in Table 5. Bioassay results and discussion are provided in Attachment C.[1]

Reductions in the rate of growth of *C. dilutus* were less than the SCO in sediment collected from all three sampling stations (Table 5). Mortality exceeded the CSL in sediment collected from sampling station WetSed-3 on the south-central portion of the emergent wetland in the 20-day survival bioassay using *C. dilutus*. Mortality also exceeded the SCO in sediment collected from sampling station WetSed-2, north of WetSed-3.

Results for the 10-day survival bioassay using *H. azteca* were spatially dissimilar to results for the 20-day survival bioassay using *C. dilutus*. 10-day survival of *H. azteca* at station WetSed-1 exceeded the CSL and exceeded the SCO at station WetSed-2. The CSL is considered to be exceeded if any one test (i.e., 10-day survival of *H. azteca*, 20-day survival of *C. dilutus*, or 20-

[1] The 2011 Nautilus study currently is only available in draft form.

day growth of *C. dilutus*) at a station exceeds the CSL or any two tests exceed the SCO. Therefore, all three stations exceeded the CSL in 2011, but only by the minimum number of test results.

Some quality control deviations from standard bioassay methodology that may have affected the bioassay results were noted by Nautilus, including decreased dissolved oxygen levels during the 20-day survival bioassay using *C. dilutus* and adding twice the recommended number of test animals but not increasing the food ration during the 10-day survival bioassay using *H. azteca*.

2013 SEDIMENT BIOASSAYS

Metals concentrations, including cadmium (the only analyte detected at concentrations exceeding the CSL), were relatively similar in all three samples that were evaluated in the Nautilus sediment bioassays (Table 1). To determine whether metals were associated with the observed toxicity in sediment samples collected from stations WetSed-1 through WetSed-3, Farallon contracted with Ramboll-Environ Inc. of Port Gamble, Washington (Environ) to perform a detailed evaluation of wetland sediment. The Environ study had three primary objectives:

- Verify the toxicity results of the Nautilus bioassay testing;
- Conduct a toxicity identification evaluation; and
- Determine, if toxicity was confirmed, whether a Site-specific cleanup level could be developed.

Environ collected sediment samples from stations WetSed-1 through WetSed-3 on December 3, 2013. No standing water was observed at the time sediment sampling was conducted, and water was encountered at approximately 6 inches bgs. The samples were analyzed for the parameters identified below:

- Metals by EPA method 6010C;
- Grain size and total organic carbon by Plumb (1981);
- Percent solids by SM2540G;
- Dissolved sulfides and ammonia by SM4500/NH_3F;
- Acid volatile sulfides and simultaneously extracted metals by EPA (1991);
- 10-day survival using the amphipod *H. azteca* (EPA method 100.1);
- 20-day growth and survival using the midge *C. dilutus* (EPA method 100.5); and
- Luminescence readings of the marine bacterium *Vibrio fischeri* after 5-minutes and 15-minutes of exposure to sediment porewater (Microtox testing).

This testing suite meets the current sediment biological testing requirements of WAC 173-204-563(3)(d), requiring two different approved species; three endpoints, including one sublethal endpoint; and one chronic test. Because Microtox testing is no longer an approved freshwater species under the SMS, these results are not discussed further in this memorandum. A summary

of bioassay results is provided in Table 5. Bioassay results and discussion are provided in Attachment D.[2]

Analytical results for metals were similar to those obtained by Farallon in 2011. Cadmium concentrations exceeded the CSL of 5.4 mg/kg in sediment collected from all three sampling stations. Zinc concentrations were similar in samples collected from all three sampling stations to concentrations reported in 2011, with the exception of an elevated concentration of 3,810 mg/kg in a sample collected from station WetSed-3, which exceeded the SCO. Concentrations of manganese and lead were similar to concentrations reported in 2011 and did not exceed applicable screening criteria.

Acute mortality exceeded the CSL in the sediment collected from station WetSed-1, proximate to the Bay Chemical property sludge settling pond, during the 10-day survival bioassay using *H. azteca*. Mortality exceeded the SCO in sediment collected from sampling stations WetSed-2 and Wetsed-3 on the central and south-central portions of the emergent wetland, respectively, during the 20-day survival bioassay using *C. dilutus*. Other bioassay results for 10-day survival of *H. azteca* and 20-day growth of *C. dilutus* were less than their respective SCOs.

In these results, only one station exceeded the CSL for 10-day survival of *H. azteca* and two stations exceeded the SCO for 20-day survival for *C. dilutus*, using the same bioassays as conducted in 2011. This difference may be due to natural recovery over time, sequestration of metals by wetland vegetation, or quality control issues in the 2011 bioassays that adversely affected the results.

Environ identified freely dissolved metals, particularly zinc and potentially manganese, as the primary source of toxicity in sediment. Both metals were present in sediment and dissolved in porewater (Table 15 in Attachment D). Environ concluded that "zinc is likely to be the primary driver in toxicity" in porewater at sampling station WetSed-1. However, a combination of metals likely contributed to toxicity at these stations. Organic analytes were not identified as a source of toxicity in sediments collected from any sampling station, consistent with the chemistry results.

SEDIMENT SITE EVALUATION

Identification of a sediment site under SMS (WAC 173-204-520) requires a cluster of at least three sampling stations where the following conditions are met:

- Concentrations of COPCs in sediments exceed the CSL for bioaccumulative chemicals based on protection of human health, wildlife, birds, or fish;
- Concentrations of COPCs in sediment exceed the CSL chemical criteria identified in Table VI in WAC 173-204-563(2); or
- Toxicity test results exceed biological standards identified in Table VII in WAC 173-204-563(3).

[2] The 2014 Environ study currently is only available in Agency Review Draft form.

No bioaccumulative COPCs have been identified in the wetland area. Cadmium is the only metal that has been detected at concentrations exceeding CSL chemical criteria in samples collected from the sampling stations. Bioassay results for sediment collected from the Site wetlands by Environ identified only a single station, WetSed-1, that exceeded biological CSL criteria.

Under the SMS, the results of biological testing override chemistry results. Therefore, based on WAC 173-204-520, the wetland area of the Site does not qualify for listing as a contaminated sediment site. Although this area has already been identified as part of a listed site, it can be evaluated separately as a sediment management unit to determine whether cleanup is required.

Because this area does not meet the site listing threshold under SMS, and because active cleanup of this area would require disturbance of the wetland, Farallon recommends that this area be formally separated into a sediment management unit and designated as requiring no further action.

SUMMARY AND CONCLUSIONS

A pond of variable size has been present on the Site since at least 1979. Over the past 20 years, the pond has transitioned to include progressively less open standing water and increased growth of reeds and grasses in soft, saturated soil. The City of Yakima first identified the combined open water and saturated soil area as a Type III wetland; this designation was carried forward in the RI Report. The extent of the wetland was surveyed in 1997 and had a total area of approximately 0.4 acre. A subsequent delineation and wetland evaluation was performed by Ecology in 2016. The Ecology assessment revised the wetland's total area to 0.45 acre, including 0.3 acre of emergent wetland. Ecology also assigned the wetland a Category III rating, which indicates some disturbance and isolation from the natural environment and a moderate level of ecological function.

Soil and sediment sampling performed by Farallon in 2011 identified cadmium at concentrations exceeding the CSL of 5.4 mg/kg. A bioassay evaluation was performed by Nautilus at six sampling stations within the wetland on the Site. The Nautilus sediment bioassay results identified minor acute and chronic toxicity in wetland sediment samples, but the results were considered inconclusive due to quality control issues.

Farallon contracted with Environ to perform a detailed evaluation of the Site wetland sediment to confirm sediment toxicity and, if confirmed, identify potential causes of toxicity. The Environ evaluation identified toxicity exceeding both chemical and biological CSLs in sediment collected from sampling station WetSed-1. Environ concluded that the toxicity of tested sediments was primarily associated with zinc in sediment porewater, but was unable to calculate a Site-specific cleanup standard.

Although chemical and biological toxicity results for sampling station WetSed-1 exceed sediment CSLs, the Site wetland does not qualify as a sediment site requiring cleanup under WAC 173-204-520 because there were fewer than three sampling stations that exceeded sediment CSLs.

Therefore, Farallon recommends that the 0.45-acre wetland area be separated as a sediment management unit that does not require further evaluation in the Feasibility Study.

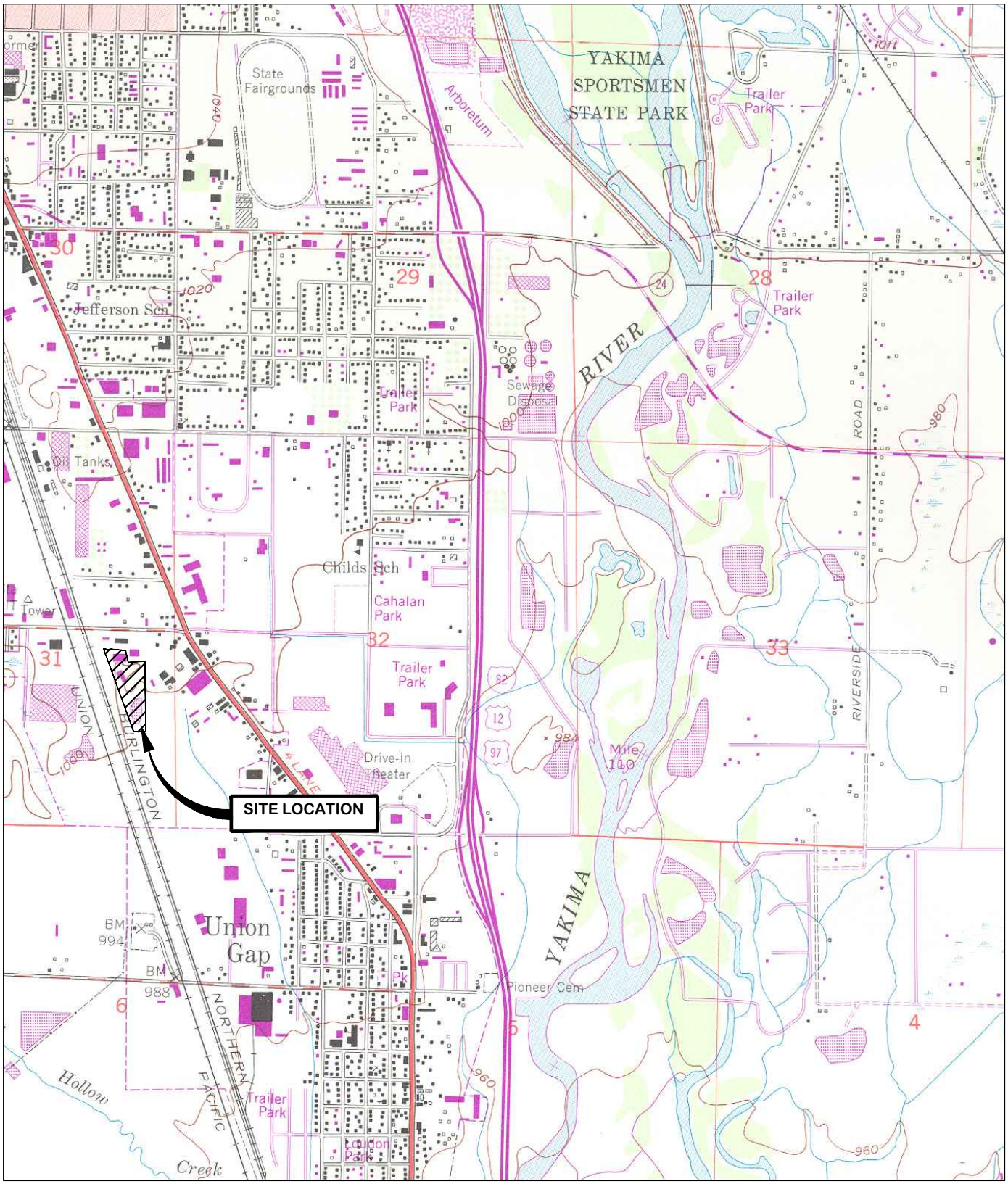
Attachments: Figure 1, *Site Vicinity Map*
Figure 2, *Site Plan and Tax Parcel Locations*
Figure 3, *Historical Wetland Extent*
Figure 4, *Wetland Boundaries*
Table 1, *Sediment Analytical Results for Metals*
Table 2, *Analytical Results for Petroleum Hydrocarbons*
Table 3, *Sediment Analytical Results for Volatile Organic Compounds*
Table 4, *Sediment Analytical Results for Pesticides*
Table 5, *Bioassay Results Summary*
Attachment A, References
Attachment B, Ecology Wetland Delineation Memorandum
Attachment C, Nautilus Bioassay Report
Attachment D, Environ Agri-Tech Yakima Steel Sediment Evaluation

EB:mm

FIGURES

WETLAND EVALUATION TECHNICAL MEMORANDUM
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Agreed Order No. DE 6091

Farallon PN: 765-001



REFERENCE: 7.5 MINUTE USGS QUADRANGLE YAKIMA SOUTH, WASHINGTON. DATED 1953 AND PHOTOREVISED 1981

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FIGURE 1

SITE VICINITY MAP
YSF/AGRI-TECH SITE
6 & 10 1/2 EAST WASHINGTON AVENUE
YAKIMA, WASHINGTON

FARALLON PN: 765-001

Drawn By: DEW | Checked By: HC | Date: 1/25/2016 | Disk Reference: 765001a

LEGEND

- SITE BOUNDARY
- TAX PARCEL BOUNDARY
- FENCE
- RAILROAD
- APPROXIMATE BOUNDARY OF FORMER YAKIMA FARMERS SUPPLY WASTE PIT
- AREA = 1 — FORMER YAKIMA FARMERS SUPPLY WASTE PIT LOCATION
- AREA = 2 — FORMER YAKIMA FARMER SUPPLY LIME AND SULFUR STOCKPILE LOCATIONS
- AREA = 3 — YAKIMA STEEEL STORAGE YARD AND WETLAND AREA

FORMER BAY CHEMICAL FLUE DUST STOCKPILE AREA

FORMER BAY CHEMICAL SLUDGE SETTLING POND AREA

PARCEL # 19133141010
BAY CHEMICAL SITE

PARCEL # 19133141408

- ASPHALT -

- AREA 1 -

AGRI-TECH BUILDING
(FORMER LIME SULFUR FORMULATING PLANT LOCATION)

PARCEL # 19133141409

BUILDING
(FORMER YAKIMA FARMERS SUPPLY MAIN WAREHOUSE)

EAST WASHINGTON AVENUE

OFFICES

YAKIMA STEEL FABRICATORS BUILDING

FABRICATION AREA

FABRICATION AND LOADING AREA

EDGE OF PAVEMENT

CONCRETE PAD

PARCEL # 19133141005

- GRAVEL -

(FORMER YAKIMA FARMERS SUPPLY LEASED WAREHOUSE)

PARCEL # 19133141011
BUILDING

- ASPHALT -

BNSF RAILROAD SPUR

PARCEL # 19133114003

- AREA 3 -

- ASPHALT -

MATERIALS STORAGE AREA

- GRAVEL -

PARCEL # 19133141009

- AREA 2 -

STEEL STORAGE AREA

- GRAVEL -

- GRAVEL -

UNPAVED ROAD

- DITCH -

OLD BARB WIRE FENCE

FORMER POND
CURRENT
WETLANDS AREA

- DITCH -

- DITCH -

PARCEL # 19133232408

PARCEL # 19133232433

CASCADE AUTO RECYCLING

PARCEL # 19133141406

PARCEL # 19133233009

0 N 100

APPROXIMATE SCALE IN FEET

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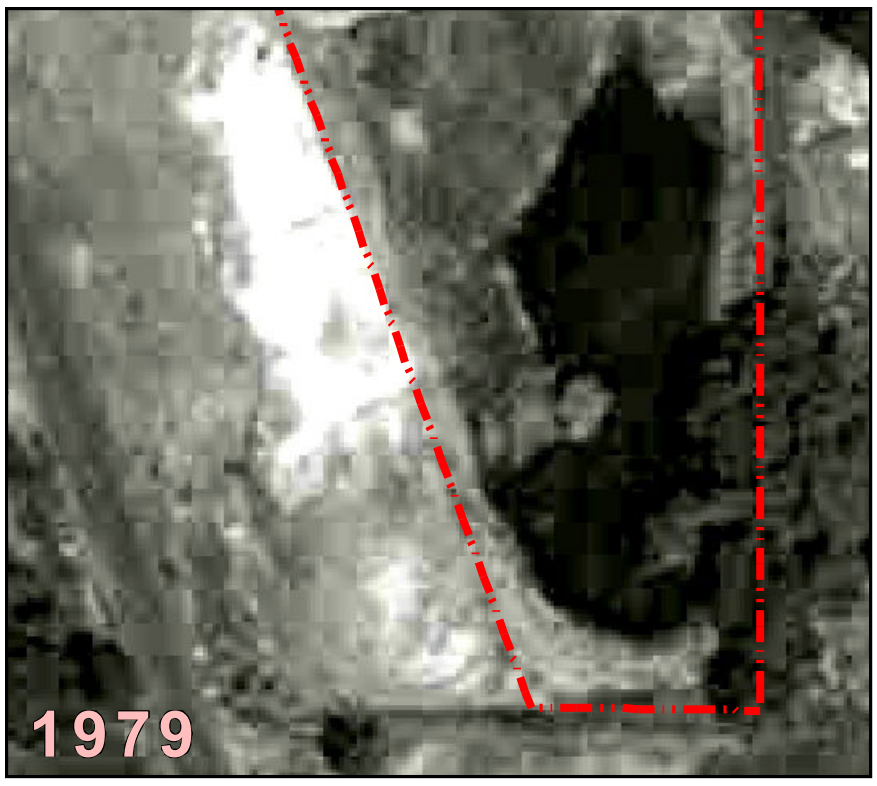
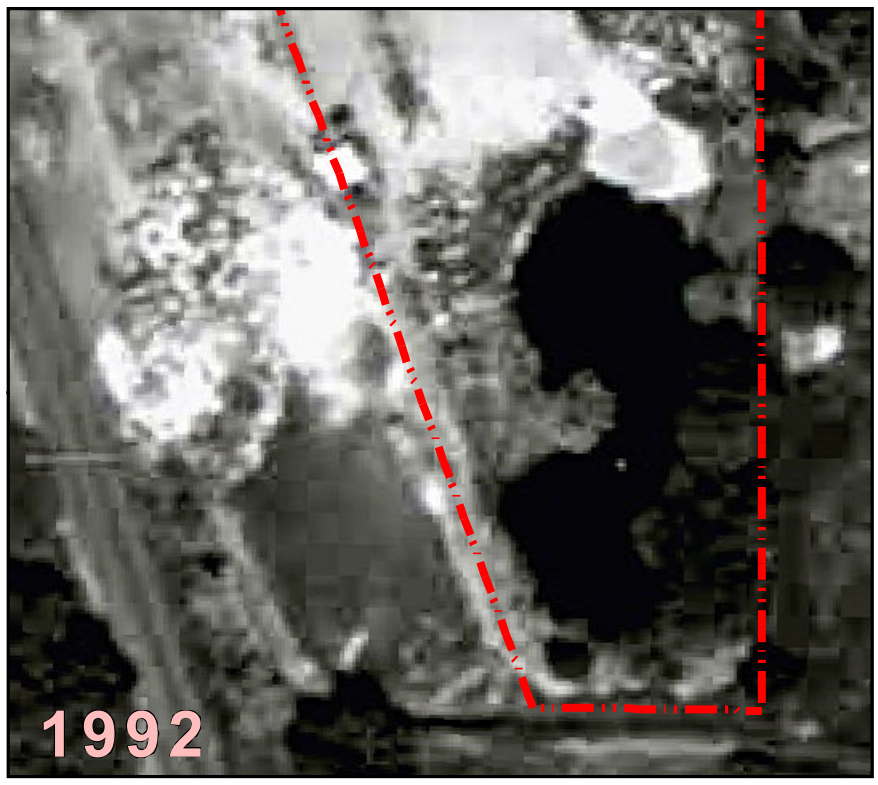
FIGURE 2

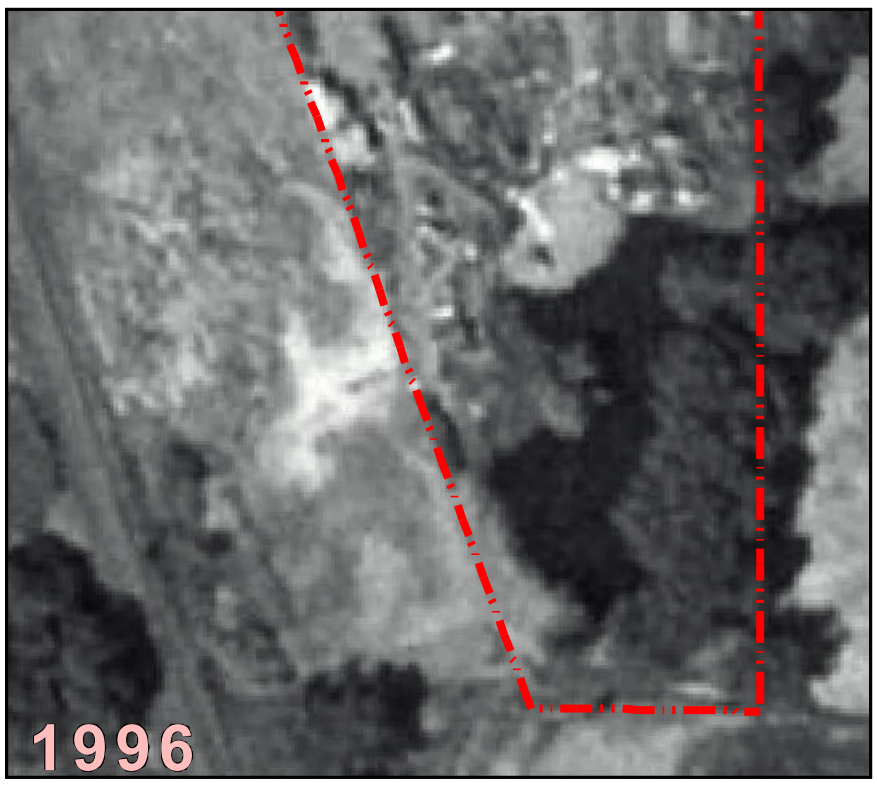
SITE PLAN AND TAX PARCEL LOCATIONS
YSF/AGRI-TECH SITE
6 & 10 1/2 EAST WASHINGTON AVENUE
YAKIMA, WASHINGTON

FARALLON PN: 765-001

Drawn By: DEW | Checked By: EB | Date: 1/5/2017 | Disk Reference: 765001a







LEGEND

SITE BOUNDARY

0 100

SCALE IN FEET

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FIGURE 3

HISTORICAL WETLAND EXTENT
YSF/AGRI-TECH SITE
6 & 10 1/2 EAST WASHINGTON AVENUE
YAKIMA, WASHINGTON

FARALLON PN: 765-001

Drawn By: ebuer | Checked By: JC | Date: 1/31/2017 | Disc Reference:

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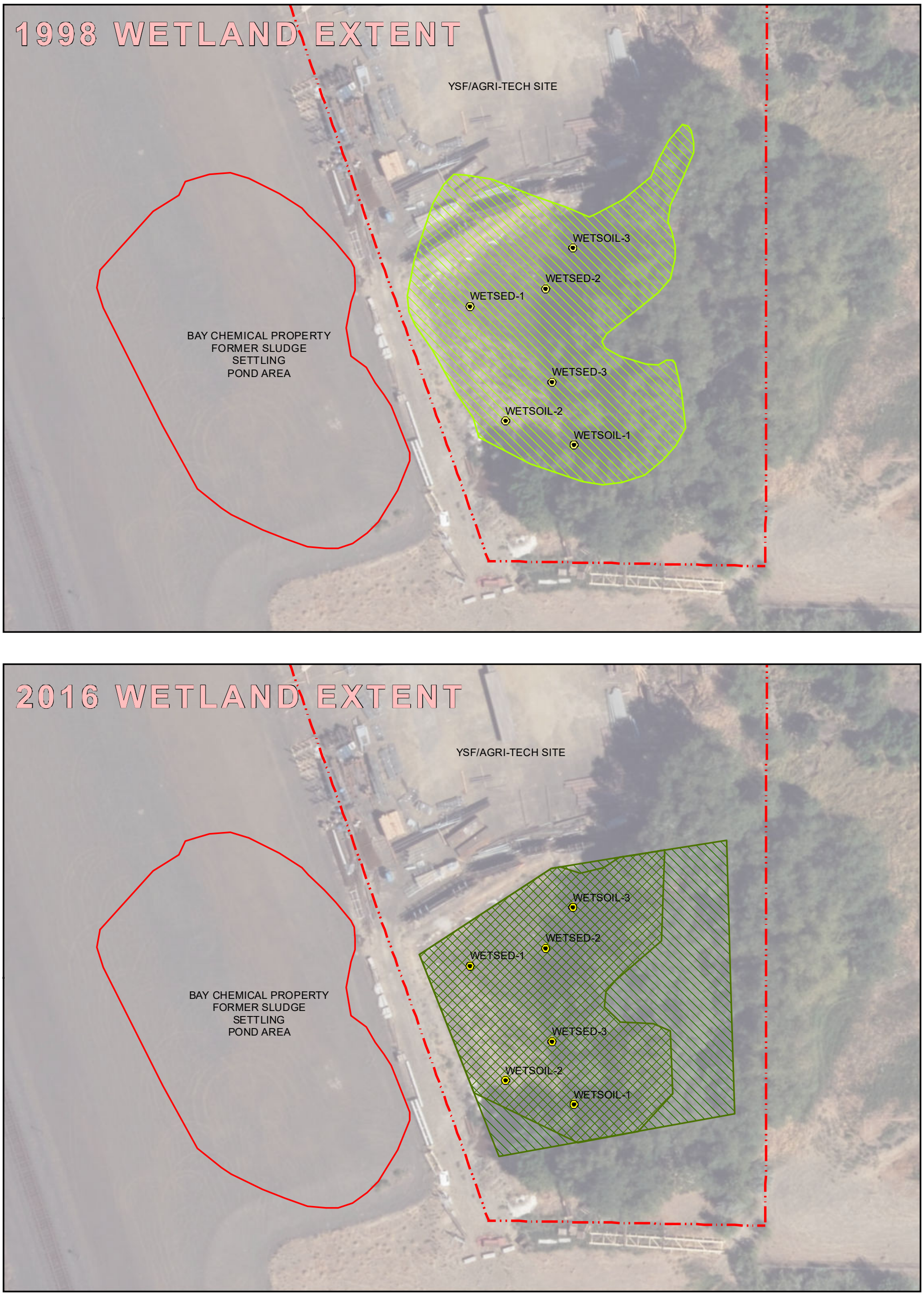

LEGEND

- SAMPLE LOCATION
- FORMER SLUDGE SETTLING POND AREA
- YSF/AGRI-TECH SITE
- 1998 WETLAND EXTENT
- 2016 EMERGENT WETLAND
- 2016 WETLAND EXTENT

0 50

SCALE IN FEET

N

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Portland | Bend | Baker City

California
Oakland | Sacramento | Irvine

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FIGURE 4

WETLAND BOUNDARIES
YSF/AGRI-TECH SITE
6 AND 10 1/2 EAST WASHINGTON AVENUE
YAKIMA, WASHINGTON

FARALLON PN: 555-001

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TABLES

WETLAND EVALUATION TECHNICAL MEMORANDUM
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Agreed Order No. DE 6091

Farallon PN: 765-001

Table 1
Analytical Results for Metals
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Farallon PN: 765-001

Grid	Test Pit	Sample Identification	Laboratory Report	Sample Date	Sample Depth (feet) [1]	Analytical Results (milligrams per kilogram)[2]							
						Antimony [3]	Arsenic [3]	Cadmium [4]	Copper [3]	Lead [3]	Manganese [3]	Mercury [4]	Zinc [3]
Wetland Samples													
E	WetSoil-1	E-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<5.1	<5.1	**3.7**	39	110	190	0.14	1,700
		E-wetsoil-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<2.4	<2.4	<0.40	17	4.2	160	0.043	310
	WetSoil-2	E-wetsoil-2-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<3.4	<3.4	1.6	19	19	250	0.071	670
		E-wetsoil-2-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<3.0	<3.0	1.8	20	4.4	270	0.059	870
	WetSed-1	E-wetsed-1-053111	580-26360-1	5/23/2011	0.5	<5.8	<5.8	**9.2**	36	190	210	–	2,700
	WetSed-2	E-wetsed-2-053111	580-26360-1	5/23/2011	0.5	<6.9	7.6	**6.8**	41	150	220	–	2,800
	WetSed-3	E-wetsed-3-053111	580-26360-1	5/23/2011	0.5	<6.1	8.5	**7.8**	52	180	270	–	2,700
G	WetSoil-3	G-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<2.4	<2.4	<0.40	16	3.5	210	0.044	41
		G-wetsoil-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<4.2	<4.2	1.5	40	80	470	0.14	510
Sediment Cleanup Objective[5]						**--**	**14**	**2.1**	**400**	**360**	**--**	**0.7**	**3,200**
Sediment Cleanup Screening Level[5]						**--**	**120**	**5.4**	**1,200**	**1,300**	**--**	**0.8**	**4,200**

NOTES:

Results in **bold** denote concentrations exceeding applicable cleanup levels.

Result exceeds the sediment cleanup objective.

Result exceeds the sediment cleanup screening level.

– = denotes sample not analyzed

< denotes analyte not detected at or exceeding the laboratory reporting limit listed.

COPC = constituent of potential concern

L = a negative instrument reading had an absolute value greater than the reporting limit

[1] Depth in feet below ground surface.

[2] Analyzed by U.S. Environmental Protection Agency Methods 6000/6010/7000 Series.

[3] Constituent was not retained as a COPC following completion of the *Revised Remedial Investigation Report, Agri-Tech & Yakima Steel* Fabricators, 6 and 10 1/2 East Washington Avenue, Yakima, Washington dated June 10, 2004, prepared by Farallon Consulting, L.L.C. (Revised RI Report).

[4] Identified and retained as COPC in the Revised RI Report.

[5] Table VI, *Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria* , of Section 563 of Chapter 173-204 of the Washington Administrative Code (WAC 173-204-563).

Table 2
Analytical Results for Petroleum Hydrocarbons
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Farallon PN: 765-001

Grid	Test Pit	Sample Identification	Lab Report	Sample Date	Sample Depth (feet)[1]	Analytical Results (milligrams per kilogram)						
						GRO[2]	DRO[3]	ORO[3]	Benzene[3]	Toluene[3]	Ethyl-benzene[3]	Xylenes[3]
Wetland Samples												
E	Wetsoil-1	E-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<36	<90	<180	<0.0019	<0.0038	<0.0019*	<0.0047*
		E-wetsoil-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<22	<54	<110	<0.0012[H]	<0.0024[H]	<0.0012[H]	<0.0036[H]
	Wetsoil-2	E-wetsoil-2-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<22	<55	<110	<0.00091[H]	<0.0018[H]	<0.00091[H]	<0.00271[H]
		E-wetsoil-2-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<23	<58	<120	<0.0013[H]	<0.0026[H]	<0.0013[H]	<0.0039[H]
	WetSed-1	E-wetsed-1-052311	580-26502-1	5/23/2011	0.5	--	–	–	<0.0027	<0.0054	<0.0027	<0.0081
	WetSed-2	E-wetsed-2-052311	580-26502-1	5/23/2011	0.5	--	–	–	<0.0026	<0.0052	<0.0026	<0.0078
	WetSed-3	E-wetsed-3-052311	580-26502-1	5/23/2011	0.5	--	–	–	<0.0033	<0.0066	<0.0033	<0.0099
G	Wetsoil-3	G-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<24	<60	<120	<0.0013[H]	<0.0025[H]	<0.0013[H]	<0.0038[H]
		G-wetsoil-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<30	<74	<150	<0.00094	<0.0019	<0.00094	<0.00284
Sediment Cleanup Objective[4]						--	**340**	**3,600**	--	--	--	--
Sediment Cleanup Screening Level[4]						--	**510**	**4,400**	--	--	--	--

NOTES:

Results in **bold** denote concentrations exceeding applicable cleanup levels.

< denotes analyte not detected at or exceeding the laboratory reporting limit listed.

[1] Depth in feet below ground surface.

[2] Analyzed by Northwest Method NWTPH-HCID.

[3] Analyzed by Northwest Method NWTPH-Dx.

[4] Table VI, *Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria* , of Section 563 of Chapter 173-204 of the Washington Administrative Code (WAC 173-204-563).

COPC = constituent of potential concern

DRO = total petroleum hydrocarbons (TPH) as diesel-range organics

ORO = TPH as oil-range organics

H = sample was prepared or analyzed beyond the specified holding time

Table 3
Analytical Results for Volatile Organic Compounds
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Farallon PN: 765-001

Grid	Test Pit	Sample Identification	Lab Report	Sample Date	Sample Depth (feet)[1]	Analytical Results (milligrams per kilogram)[2]												
						Benzene[3]	Ethyl-benzene[3]	m,p-Xylene[3]	o-Xylene[3]	Toluene[3]	Naphthalene[3]	n-Butylbenzene[3]	Sec-Butylbenzene[3]	Isopropylbenzene[3]	Methylene Chloride[3]	4-Methyl-2-Pentanone[3]	4-Isopropyltoluene[3]	n-Propylbenzene[3]
Wetland Samples																		
E	Wetsoil-1	E-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<0.0019	<0.0019*	<0.0038 *	<0.0019 *	<0.0038	<0.0094 *	<0.0038 *	<0.0038 *	<0.0038 *	<0.028	<0.0094	<0.0038 *	<0.0019 *
		E-wetsoil-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<0.0012 H	<0.0012 H	<0.0024 H	<0.0012 H	<0.0024 H	<0.0060 H	<0.0024 H	<0.0024 H	<0.0024 H	<0.018 H	<0.0060 H	<0.0024 H	<0.0012 H
	Wetsoil-2	E-wetsoil-2-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<0.00091 H	<0.00091 H	<0.0018 H	<0.00091 H	<0.0018 H	<0.0045 H	<0.0018 H	<0.0018 H	<0.0018 H	<0.014 H	<0.0045 H	<0.0018 H	<0.00091 H
		E-wetsoil-2-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<0.0013 H	<0.0013 H	<0.0026 H	<0.0013 H	<0.0026 H	<0.0065 H	<0.0026 H	<0.0026 H	<0.0026 H	<0.019 H	<0.0065 H	<0.0026 H	<0.0013 H
	WetSed-1	E-wetsed-1-053111	580-26502-1	5/23/2011	0.5	<0.0027	<0.0027	<0.0054	<0.0027	<0.0054	<0.014	<0.0054	<0.0054	<0.054	<0.041	<0.014	<0.0054	<0.0027
	WetSed-2	E-wetsed-2-053111	580-26502-1	5/23/2011	0.5	<0.0026	<0.0026	<0.0052	<0.0026	<0.0052	<0.013	<0.0052	<0.0052	<0.0052	<0.039	<0.013	<0.0052	<0.0026
	WetSed-3	E-wetsed-3-053111	580-26502-1	5/23/2011	0.5	<0.0033	<0.0033	<0.0066	<0.0033	<0.0066	<0.017	<0.0066	<0.0066	<0.0066	<0.050	<0.017	<0.0066	<0.0033
G	Wetsoil-3	G-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<0.0013 H	<0.0013 H	<0.0025 H	<0.0013 H	<0.0025 H	<0.0064 H	<0.0025 H	<0.0025 H	<0.0025 H	<0.019 H	<0.0064 H	<0.0025 H	<0.0013 H
		G-wetsoil-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<0.00094	<0.00094	<0.0019	<0.00094	<0.0019	<0.0047	<0.0019	<0.0019	<0.0019	<0.014	<0.0047	<0.0019	<0.00094
Sediment Cleanup Objective[5]						--	--	--	--	--	--	--	--	--	--	--	--	--
Sediment Cleanup Screening Level[5]						--	--	--	--	--	--	--	--	--	--	--	--	--

NOTES:

Results in **bold** denote concentrations exceeding applicable cleanup levels.

< denotes analyte not detected at or exceeding the reporting limit listed.

-- Denotes the initial calibration curve was outside acceptance criteria for Carbon Disulfide. As Carbon Disulfide was not a requested analyte at the time of sample analysis, it cannot be reported.

* Denotes Internal Standard response or retention time outside acceptable limits.

[1] Depth in feet below ground surface.

[2] Analyzed by U.S. Environmental Protection Agency Method 8260B.

[3] Compound was not retained as a COPC following completion of the *Revised Remedial Investigation Report, Agri-Tech & Yakima Steel Fabricators, 6 and 10 1/2 East Washington Avenue, Yakima, Washington* dated June 10, 2004, prepared by Farallon Consulting, L.L.C. (Revised RI Report).

[4] Identified and retained as a COPC in the Revised RI Report.

[5] Table VI, *Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria* , of Section 563 of Chapter 173-204 of the Washington Administrative Code (WAC 173-204-563).

COPC = constituent of potential concern

H = sample was prepared or analyzed beyond specified holding time

MEK = 2-butanone

NE = not established

PCE = tetrachloroethene

TCE = trichloroethene

VOCs = volatile organic compounds

Table 3
Analytical Results for Volatile Organic Compounds
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Farallon PN: 765-001

Grid	Test Pit	Sample Identification	Lab Report	Sample Date	Sample Depth (feet)[1]	Analytical Results (milligrams per kilogram)[2]											
						Acetone[3]	1,2,4-Trimethylbenzene[3]	1,3,5-Trimethylbenzene[3]	Carbon Disulfide[3]	1,2-Dichloropropane[4]	MEK[3]	Chloroform[3]	Tetrachloroethene[4]	Trichloroethene[4]	1,1-Dichloroethene[3]	(cis) 1,2-Dichloroethene[4]	tert-Butylbenzene[3]
Wetland Samples																	
E	Wetsoil-1	E-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	0.094	<0.0038 *	<0.0094 *	0.0064	<0.0019	0.010	<0.0019	<0.0019	<0.0019	**<0.0094**	<0.0019	<0.0038 *
		E-wetsoil-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	<0.018 H	<0.0024 H	<0.0060 H	<0.0012 H	<0.0012 H	<0.0060 H	<0.0012 H	<0.0012 H	<0.0012 H	**<0.0060 H**	<0.0012 H	<0.0024 H
	Wetsoil-2	E-wetsoil-2-052611-0.5-1.0	580-26451-1	5/26/2011	1.0	0.029 H	<0.0018 H	<0.0045 H	0.0010 H	<0.00091 H	<0.0045 H	<0.00091 H	<0.00091 H	<0.00091 H	**<0.0045 H**	<0.00091 H	<0.0018 H
		E-wetsoil-2-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	0.038 H	<0.0026 H	<0.0065 H	<0.0013 H	<0.0013 H	<0.0065 H	<0.0013 H	<0.0013 H	<0.0013 H	**<0.0065 H**	<0.0013 H	<0.0026 H
	WetSed-1	E-wetsed-1-053111	580-26502-1	5/23/2011	0.5	0.082	<0.0054	<0.014	<0.0027	<0.0027	<0.014	<0.0027	<0.0027	<0.0027	**<0.014**	<0.0027	<0.0054
	WetSed-2	E-wetsed-2-053111	580-26502-1	5/23/2011	0.5	<0.039	<0.0052	<0.013	0.0032	<0.0026	<0.013	<0.0026	<0.0026	<0.0026	**<0.013**	<0.0026	<0.0052
	WetSed-3	E-wetsed-3-053111	580-26502-1	5/23/2011	0.5	0.110	<0.0066	<0.017	<0.0033	**<0.0033**	0.025	<0.0033	<0.0033	<0.0033	**<0.017**	<0.0033	<0.0066
G	Wetsoil-3	G-wetsoil-052611-0.0-0.5	580-26451-1	5/26/2011	0.5	<0.019 H	<0.0025 H	<0.0013 H	<0.0013 H	<0.0013 H	<0.0064 H	<0.0013 H	<0.0013 H	<0.0013 H	**<0.0064 H**	<0.0013 H	<0.0025 H
		G-wetsoil-052611-1.0-2.0	580-26451-1	5/26/2011	2.0	<0.014	<0.0019	<0.0047	<0.00094	<0.00094	<0.0047	<0.00094	<0.00094	<0.00094	**<0.0047**	<0.00094	<0.0019
Sediment Cleanup Objective[5]						--	--	--	--	--	--	--	--	--	--	--	--
Sediment Cleanup Screening Level[5]						--	--	--	--	--	--	--	--	--	--	--	--

NOTES:

Results in **bold** denote concentrations exceeding applicable cleanup levels.

< denotes analyte not detected at or exceeding the reporting limit listed.

-- Denotes the initial calibration curve was outside acceptance criteria for Carbon Disulfide. As Carbon Disulfide was not a requested analyte at the time of sample analysis, it cannot be reported.

* Denotes Internal Standard response or retention time outside acceptable limits.

[1] Depth in feet below ground surface.

[2] Analyzed by U.S. Environmental Protection Agency Method 8260B.

[3] Compound was not retained as a COPC following completion of the *Revised Remedial Investigation Report, Agri-Tech & Yakima Steel Fabricators, 6 and 10 1/2 East Washington Avenue, Yakima, Washington* dated June 10, 2004, prepared by Farallon Consulting, L.L.C. (Revised RI Report).

[4] Identified and retained as a COPC in the Revised RI Report.

[5] Table VI, *Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria* , of Section 563 of Chapter 173-204 of the Washington Administrative Code (WAC 173-204-563).

COPC = constituent of potential concern

H = sample was prepared or analyzed beyond specified holding time

MEK = 2-butanone

NE = not established

PCE = tetrachloroethene

TCE = trichloroethene

VOCs = volatile organic compounds

Table 4
Analytical Results for Pesticides
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Farallon PN: 765-001

Grid	Test Pit	Lab Report	Sample Identification	Sample Date	Sample Depth (feet) [1]	Analytical Results (milligrams per kilogram)[2]												
						Aldrin [3]	Alpha Chlordane [4]	4,4'-DDD [4]	4,4'-DDE [4]	4,4'-DDT [3]	Dieldrin [4]	Endosulfan Sulfate [3]	Endrin [4]	Heptachlor Epoxide [4]	Endrin Aldehyde [3]	Gamma Chlordane [3]	Heptachlor [3]	Endosulfan II
Wetland Samples																		
E	WetSoil-1	580-26451-1	E-wetsoil-052611-0.0-0.5	5/26/2011	0.5	<0.0019	<0.0019	<0.0038	<0.0038	<0.0038	**<0.0038**	<0.0038	<0.0038	<0.0019	<0.0038	<0.0019	<0.0019	<0.0038
			E-wetsoil-052611-0.5-1.0	5/26/2011	1.0	<0.0011	<0.0011	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0022	<0.0011	<0.0022	<0.0011	<0.0011	<0.0022
	WetSoil-2	580-26451-1	E-wetsoil-2-052611-0.5-1.0	5/26/2011	1.0	<0.0011	<0.0011	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0011	<0.0023	<0.0011	<0.0011	<0.0023
			E-wetsoil-2-052611-1.0-2.0	5/26/2011	2.0	<0.0011	<0.0011	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0023	<0.0011	<0.0023	<0.0011	<0.0011	<0.0023
	WetSed-1	580-26360-1	E-wetsed-1-053111	5/23/2011	0.5	<0.0021 H	<0.0021 H	<0.0042 H	<0.0042 H	<0.0042 H	**<0.0042 H**	<0.0042 H	<0.0042 H	<0.0021 H*	<0.0042 H	<0.0021 H	<0.0021 H	<0.0042 H
	WetSed-2	580-26360-1	E-wetsed-2-053111	5/23/2011	0.5	<0.0022 H	<0.0022 H	<0.0044 H	<0.0044 H	<0.0044 H	**<0.0044 H**	<0.0044 H	<0.0044 H	<0.0022 H*	<0.0044 H	<0.0022 H	<0.0022 H	<0.0044 H
	WetSed-3	580-26360-1	E-wetsed-3-053111	5/23/2011	0.5	<0.0023 H	<0.0023 H	<0.0047 H	<0.0047 H	<0.0047 H	**<0.0047 H**	<0.0047 H	<0.0047 H	<0.0023 H*	<0.0047 H	<0.0023 H	<0.0023 H	<0.0047 H
G	WetSoil-3	580-26451-1	G-wetsoil-052611-0.0-0.5	5/26/2011	0.5	<0.0012	<0.0012	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0024	<0.0012	<0.0024	<0.0012	<0.0012	<0.0024
			G-wetsoil-052611-1.0-2.0	5/26/2011	2.0	<0.0016	<0.0016	<0.0031	<0.0031	<0.0031	**<0.0031**	<0.0031	<0.0031	<0.0016	<0.0031	<0.0016	<0.0016	<0.0031
Sediment Cleanup Objective[5]						--	--	**0.31**	**0.31**	**0.10**	**4.9**	--	--	--	--	--	--	--
Sediment Cleanup Screening Level[5]						--	--	**0.86**	**0.9**	**8.1**	**9.3**	--	--	--	--	--	--	--

NOTES:

Results in **bold** denote concentrations at or exceeding the Preliminary Screening Level indicated.

< denotes analyte not detected at or above the reporting limit listed.

[1] Depth in feet below ground surface.

[2] Analyzed by U.S. Environmental Protection Agency Method 8081.

[3] Constituent was not retained as a COPC following completion of the *Revised Remedial Investigation Report, Agri-Tech & Yakima Steel Fabricators, 6 and 10 1/2 East Washington Avenue, Yakima, Washington* dated June 10, 2004, prepared by Farallon Consulting, L.L.C. (Revised RI Report).

[4] Identified and retained as a COPC in the Revised RI Report.

[5] Table VI, *Freshwater Sediment Cleanup Objectives and Cleanup Screening Levels Chemical Criteria* , of Section 563 of Chapter 173-204 of the Washington Administrative Code (WAC 173-204-563).

* = Response or retention time outside acceptable limits.

COPC = constituent of potential concern

H = sample was prepared or analyzed beyond the specified holding time

NE = not established

Table 5
Bioassay Results Summary
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Farallon PN: 765-001

Bioassay Evaluation	Screening Criteria		WETSED-1		WETSED-2		WETSED-3	
	SCO	CSL	Nautilus	Environ	Nautilus	Environ	Nautilus	Environ
10-day *H. azteca* Mortality (M_T-M_C)	>15%	>25%	100%	91%	14%	-4%	4%	-4%
20-day *C. dilutus* Mortality (M_T-M_C)	>15%	>25%	15%	14%	18%	17%	58%	20%
20-day *C. dilutus* Growth (MIG_C-MIG_T)/MIG_C	>0.25	>0.40	-0.22	0.12	0.04	-0.31	0.34	-0.01

Table based on Attachment C, Table 24, Summary of Sediment Chemistry and Test Results, Agri-Tech/YSF, 2011 and 2013.

NOTES:

Result exceeds sediment cleanup objective.

Result exceeds sediment cleanup screening level.

CSL = Cleanup Screening Level
Environ = Ramboll-Environ Corporation
M_C = Control group mortality
MIG_C = Control group mean individual growth
MIG_T = Test group mean individual growth
M_T = Test group mortality
Nautilus = Nautilus Environmental
SCO = Sediment Cleanup Objective

ATTACHMENT A
REFERENCES

WETLAND EVALUATION TECHNICAL MEMORANDUM
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Agreed Order No. DE 6091

Farallon PN: 765-001

REFERENCES

Farallon Consulting, L.L.C. (Farallon). 2004. *Revised Remedial Investigation Report, Agri-Tech & Yakima Steel Fabricators, 6 and 10 ½ East Washington Avenue, Yakima, Washington.* Prepared for Yakima Steel Fabricators. June 10.

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ATTACHMENT B
ECOLOGY WETLAND DELINEATION MEMORANDUM

WETLAND EVALUATION TECHNICAL MEMORANDUM
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Agreed Order No. DE 6091

Farallon PN: 765-001

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
1250 W Alder St • Union Gap, WA 98903-0009 • (509) 575-2490

September 13, 2016

Mr. Jeff Kaspar
Farallon Consulting
975 5th Avenue Northwest
Issaquah, WA 98027

RE: Yakima Steel Fabricators Wetland assessment report

Site Name:	Agri Tech Yakima Steel Fabricators
Site Address:	6 & 10 ½ E Washington, Yakima
Facility/Site ID No.:	479
Cleanup Site ID No.:	3639

Dear Mr. Kasper,

Please find enclosed with this letter a full copy of the wetland evaluation report performed by Ecology at the Yakima Steel Fabricators site on August 25, 2016. We now have a designation of the area as a Category III wetland.

Please feel free to include this report as part of the Wetland Appendix in the feasibility study.

Respectfully,

Chris Wend, PhD, PE
Cleanup Project Manager
Toxics Cleanup Program, CRO

DEPARTMENT OF ECOLOGY

Shorelands and Environmental Assistance Program

DATE: September 6, 2016

TO: Chris Wend

FROM: Catherine Reed, PWS, SEA Program

SUBJECT: Yakima Steel Fabricators site (parcel # 19133141009) wetland reconnaissance project SIC code JJ222

On August 25, 2016, we walked around a low-lying "pond" area on the above-referenced parcel in order to answer several questions. Was a wetland present on the site? If so, what is the extent of the wetland area, and what buffers would be required to protect the functional values of the wetland?

The general extent of the wetland was determined by visual observation of wetland conditions in the pond area and by digging one observation hole in a low-lying ditch remnant to the east of the wetland to confirm hydric soil conditions in that moist area. The water source of the pond and ditch appears to be primarily groundwater, and the wetland type is "emergent" based on the kind of vegetation (rushes and cattails) present.

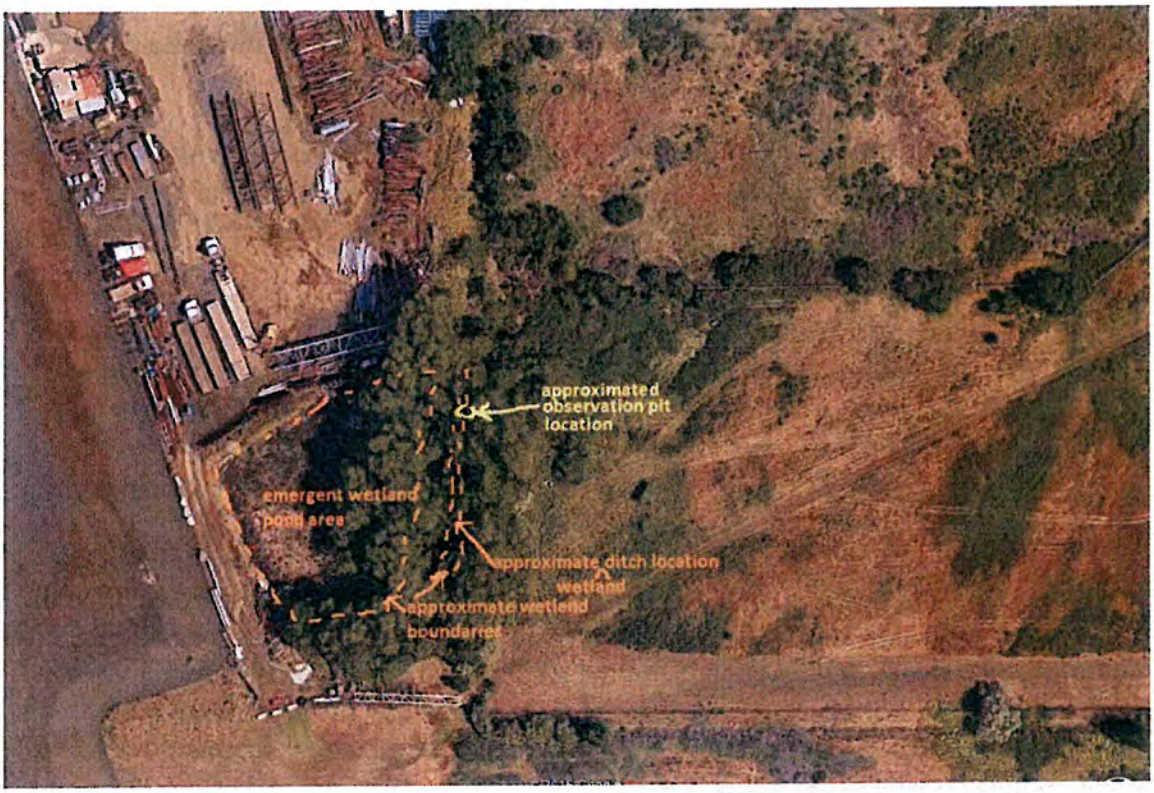
The pond area/wetland is located at the extreme south of the parcel and is primarily confined to an area that is much lower (3 to 5 vertical feet to the pond surface) than the surrounding land elevation. Trees and shrubs that grow adjacent to the pond and the ditch are growing in the buffer, just outside of the wetland. There are berms around the pond wetland, probably composed of fill material from excavation of the wetland sometime in the past. There was also a narrow wetland ditch remnant on the northeast corner of the pond on the east side of the berm as well.

Based on old aerial photos of the site and its vegetation, there is evidence that the wetland area of today is a portion of a much larger historic wetland area, which was either filled or drained over time to accommodate development. The current pond area was likely excavated into an existing wetland area. Therefore, even though this wetland has been altered over time, it is still a "jurisdictional" wetland. This is an important fact when determining how much wetland mitigation may be required for future activities that could impact the wetland.

Since the amount of any mitigation required is based on the wetland's functional values, I completed a wetland rating form for the wetland using Ecology's "Washington State Wetland Rating System for Eastern Washington (2014) methodology. The wetland was rated as a Category III wetland. Ecology would generally recommend 75 to 80 foot buffers to protect wetland functional values based on the wetland being located in a

high-intensity development area, but because the habitat scores of the wetland are so low, if stormwater inputs into the wetland were controlled, then smaller buffers can be considered to protect the functional values. If this wetland were to be filled and wetland mitigation was done, replacement ratios for re-establishment or creation of the wetland would be 2:1 (for every one acre of wetland lost, 2 acres of replacement wetlands would need to be provided).

I hope this information will assist you in working with your client to resolve some of the issues on the site.



Wetland name or number:_____

RATING SUMMARY – Eastern Washington

Name of wetland (or ID #): Agri-Tech / Bay Chemical Date of site visit: 8/25/16

Rated by Catherine Reed (ECY) Trained by Ecology? Yes (No___ Date of training_____

HGM Class Used for Rating Depressional Unit has multiple HGM classes?___Y X (N)

NOTE: Form is not complete without the figures requested (*figures can be combined*).

Source of base aerial photo/map Google Maps

OVERALL WETLAND CATEGORY III

1. Category of wetland based on FUNCTIONS

_____**Category I** - Total score = 22 – 27

_____**Category II** - Total score = 19 - 21

X **Category III** - Total score = 16 - 18

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat
	Circle the appropriate ratings		
Site Potential	H (M) L	(H) M L	H M (L)
Landscape Potential	(H) M L	(H) M L	H M (L)
Value	H (M) L	H M (L)	H M (L)
Score Based on Ratings	7	7	3

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY *Circle the appropriate category*
Vernal Pools	II III
Alakali	I
Wetland with high conservation value	I
Bog	I
Old Growth or Mature Forest – slow growing	I
Aspen Forest	I
Old Growth or Mature Forest – fast growing	II
Floodplain forest	II
None of the above	

Wetland name or number_____

Maps and figures required to answer questions correctly (Eastern Washington)

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2, H1.3	
Location of outlet *(can be added to map of hydroperiods)*	D 1.1, D1.4	
Boundary of 150 ft buffer *(can be added to another figure)*	D 2.2, D 5.2	
Polygon of area 1km from wetland edge - Including polygons for accessible habitat and undisturbed habitat	H 2.1, H2.2	
Screen capture of map of 303d listed waters in basin (from Ecology web site)	D 3.1, D 3.2	
Screen capture of list of TMDL's for WRIA in which unit is found (from web)	D 3.3	
Area of open water *(can be added to map of hydroperiods)*	H1.3.1	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.4	
Hydroperiods	H 1.2, H1.3	
Ponded depressions	R 1.1	
Boundary of 150 ft buffer *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Polygon of area 1km from wetland edge -Including polygons for accessible habitat and undisturbed habitat	H 2.1, H2.2	
Screen capture of map of 303d listed waters in basin (from Ecology web site)	R 3.1	
Screen capture of list of TMDL's for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake-fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of 150 ft buffer *(can be added to another figure)*	L 2.2	
Polygon of area 1km from wetland edge (Including polygons for accessible habitat and undisturbed habitat)	H 2.1, H2.2	
Screen capture of map of 303d listed waters in basin (from Ecology web site)	L 3.1	
Screen capture of list of TMDL's for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes and classes of emergents	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants *(can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
Polygon of area 1km from wetland edge (Including polygons for accessible habitat and undisturbed habitat)	H 2.1, H2.2	
Screen capture of map of 303d listed waters in basin (from Ecology web site)	S 3.1, S 3.2	
Screen capture of list of TMDL's for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number_____

DEPRESSIONAL WETLANDS **Water Quality Functions** - Indicators that the site functions to improve water quality.	Points (only 1 score per box)
D 1.0 Does the wetland unit have the potential to improve water quality?	
D 1.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet - points = 5 Wetland has an intermittently flowing outlet points = 3 Wetland has a highly constricted permanently flowing outlet points = 3 Wetland has a permanently flowing surface outlet points = 1	5
D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions of soils)* YES points = 3 NO points = 0	0
D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) Wetland has persistent, ungrazed, vegetation for > 2/3 of area points = 5 Wetland has persistent, ungrazed, vegetation from 1/3 to 2/3 of area points = 3 Wetland has persistent, ungrazed vegetation from 1/10 to < 1/3 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0	5
D 1.4 Characteristics of seasonal ponding or inundation.) *This is the area of ponding that fluctuates every year. Do not count the area that is permanently ponded.* Area seasonally ponded is > ½ total area of wetland points = 3 Area seasonally ponded is ¼ - ½ total area of wetland points = 1 Area seasonally ponded is < ¼ total area of wetland points = 0	0
Total for D 1 Add the points in the boxes above	10

Rating of Site Potential If score is: 12 – 16 = H 6 – 11 = (M) 0 – 5 = L
Record the rating on the first page

D 2.0 Does the landscape have the potential to support the water quality function at the site?	
D2.1 Does the Wetland unit receive stormwater discharges? Yes = 1 No = 0	1
D 2.2 Is > 10% of the buffer within 150 ft of wetland unit in land uses that generate pollutants Yes = 1 No = 0	1
D2.3 Are there are septic systems within 250 ft of the wetland unit? Yes = 1 No = 0	?
D2.4 Are there are other sources of pollutants coming into the wetland that are not listed in questions D2.1 – D2.3? Source groundwater Cadmium etc. Yes = 1 No = 0	1
Total for D 2 Add the points in the boxes above	

Rating of Landscape Potential If score is: 3 or 4 = (H) 1 or 2 = M 0 = L
Record the rating on the first page

D 3.0 Is the water quality improvement provided by the site valuable to society?	
D3.1 Does the unit discharge directly (within 1 mile) to a stream, river, or lake that is on the 303dlist? Yes = 1 No = 0	0
D 3.2 Is the unit in a basin or sub-basin where water quality is an issue in some aquatic resource (303d list, eutrophic lakes, problems with nuisance and toxic algae)? groundwater contamination Yes = (1) No = 0	1
D 3.3 Has the site been identified in a watershed or local plan as important for maintaining water quality? (*answer YES if there is a TMDL for the drainage or basin in which unit is found*) Yes = 2 No = 0	0
Total for D 3 Add the points in the boxes above	1

Rating of Value If score is: 2-4 = H 1 = (M) 0 = L
Record the rating on the first page

Wetland name or number_____

DEPRESSIONAL WETLANDS **Hydrologic Functions** - Indicators that the site functions to reduce flooding and stream erosion.	Points (only 1 score per box)
D 4. 0 Does the wetland unit have the potential to reduce flooding and erosion?	
D 4.1 Characteristics of surface water flows out of the wetland unit: Wetland has no surface water outlet — points = 8 Wetland has an intermittently flowing outlet — points = 4 Wetland has a highly constricted permanently flowing outlet — points = 4 Wetland has a permanently flowing surface outlet — points = 0 *(If outlet is a ditch and not permanently flowing treat unit as "intermittently flowing")*	8
D 4.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Seasonal ponding: => 3 ft above the lowest point in unit or the surface of permanent ponding — points = 8 Seasonal ponding: 2 ft - < 3 ft above the lowest point in unit or the surface of permanent ponding — points = 6 The wetland is a "headwater" wetland" — points = 4 Seasonal ponding: 1 ft - < 2 ft — points = 4 Seasonal ponding: 6 in - < 1 ft — points = 2 Seasonal ponding: <6 in orr unit has only saturated soils — points = 0	4
Total for D 4 — Add the points in the boxes above	12

Rating of Site Potential If score is: 12 - 16 = H (circled) 6 - 11 = M (X) 0 - 5 = L

Record the rating on the first page

D 5.0 Does the landscape have the potential to support hydrologic functions at the site?	
D5.1 Does the unit receive any stormwater discharges? Yes = 1 No = 0	1
D5. Is >10% of the land use within 150 ft of the wetland in a land uses that generates runoff? Yes = 1 No = 0	1
D 5.3 Is more than 25% of the contributing basin of the wetland unit covered with intensive human land uses? Yes = 1 No = 0	1
Total for D 5 — Add the points in the boxes above	3

Rating of Landscape Potential If score is: 3 = H (circled) 1,2 = M 0 = L

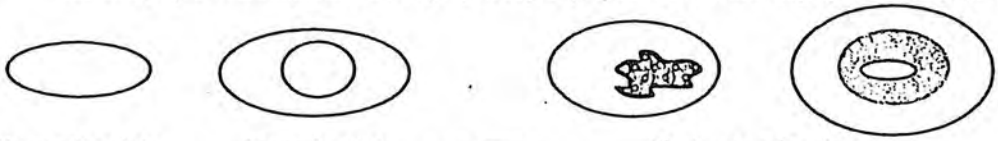
Record the rating on the first page

D 6.0 Are the hydrologic functions provided by the site valuable to society?	
D 6.1 Is the unit is in a landscape that has flooding problems? Choose the description that best matches conditions around the wetland unit being rated. *Do not add points.* *Choose the highest score if more than one condition is met.* ☐ The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g. salmon redds), AND o Damage occurs in sub-basin that is immediately downgradient of unit — points=2 o Damage occurs in a sub-basin further down-gradient — points = 1 ☒ The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* really small wetland stormwater system within city — points = 0 ☐ There are no problems with flooding downstream of the unit. — points = 0	0
D 6.2 Has the site has been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 — Add the points in the boxes above	

Rating of Value If score is: 2 -4 = H 1 = M 0 = L (circled)

Record the rating on the first page

Wetland name or number_____

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	(only 1 score per box)
H 1. Does the wetland unit have the <u>potential</u> to provide habitat for many species?	
H 1.1 Categories of vegetation structure *Check the Cowardin vegetation classes present and categories of emergent plants. Size threshold for each category is >= ¼ acre or >= 10% of the unit if unit is < 2.5 acres* ____Emergent plants 0-12 in. (0 – 30 cm) high are the highest layer and have > 30% cover _X_Emergent plants >12 – 40 in.(>30 – 100cm) high are the highest layer with >30% cover rcg _X_Emergent plants > 40 in.(> 100cm) high are the highest layer with >30% cover ~~rcg~~ rushes ____Scrub/shrub (areas where shrubs have >30% cover) 4-6 checks points = 3 ____Forested (areas where trees have >30% cover) 3 checks points = 2 2 checks points = 1 1 check points = 0	1
H 1.2. Is one of the vegetation types "aquatic bed?" YES = 1 point (NO) = 0 points	0
H 1.3. <u>Surface Water</u> H 1.3.1 Does the unit have areas of "open" water (without herbaceous or shrub plants) over at least ¼ acre **OR** 10% of its area during the March to early June **OR** in August to the end of September? *Note: answer YES for Lake-fringe wetlands* YES = 3 points & **go to H 1.4** (NO) = go to H 1.3.2 H 1.3.2 Does the unit have an intermittent or permanent, and unvegetate,d stream within its boundaries, or along one side, over at least ¼ acre or 10% of its area, (*answer yes only if H 1.3.1 is NO*)? YES = 3 points (NO) = 0 points	0
H 1.4. <u>Richness of Plant Species</u> Count the number of plant species in the wetland that cover at least 10 ft^2. (*different patches of the same species can be combined to meet the size threshold) You do not have to name the species.* *Do not include Eurasean Milfoil, reed canarygrass, purple loosestrife, Russian Olive, Phragmites, Canadian Thistle, Yellow-flag Iris, and Salt Cedar (Tamarisk)* # of species ____ Scoring: > 9 species = 2 points 4-9 species = 1 point < 4 species = 0 points	1
H 1.5. Interspersion of habitats Decide from the diagrams below whether interspersion between types of plant structures (described in H 1.1), and unvegetated areas (open water or mudflats) is high, medium, low, or none. *Use map of Cowardin plant classes prepared for questions H1.1 and map of open water from H1.3*  **None** = 0 points **Low** = 1 point **Moderate** = 2 points  **High** = 3 points **High** = 3 points riparian braided channels with 2 classes = High NOTE: If you have four or more classes or three plants classes and open water the rating is always "high".	Figure__ 1

Wetland name or number_____

H 1.6. Special Habitat Features: *Check the habitat features that are present in the wetland unit. The number of checks is the score.* ____Loose rocks larger than 4" or large, downed, woody debris (>4in. diameter) within the area of surface ponding or in stream. __X__Cattails or bulrushes are present within the unit. ____Standing snags (diameter at the bottom > 4 inches) in the wetland unit or within 30 m (100ft) of the edge. ____Emergent or shrub vegetation in areas that are permanently inundated/ponded. ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (>45 degree slope) OR signs of recent beaver activity __X__Invasive species cover less than 20% in each stratum of vegetation *(canopy, sub-canopy, shrubs, herbaceous, moss/ground cover)* *Maximum score possible = 6*	2
H 1. TOTAL Score - Add the check marks in the box above	5

Rating of Site Potential **If score is:** **12 – 16 = H** **6 - 11 = M** **0 - 5 = L**
Record the rating on the first page

H 2.0 . Does the landscape have the potential to support habitat at the site?	
H 2.1 Accessible habitat (only area of habitat abutting wetland unit). *Calculate:* % undisturbed habitat 4 + [(% moderate and low intensity land uses)/2] 25/2 = 20.5% If total accessible habitat is: > 1/3 (33.3%) of 1km circle (~100 hectares) points = 3 20 - 33% of 1km circle points = 2 10- 19% of 1km circle points = 1 <10% of 1km circle points = 0	2
H2.2 Undisturbed habitat in 1km circle around unit. If: Undisturbed habitat > 50% of circle points = 3 Undisturbed habitat 10 - 50% and in 1-3 patches points = 2 Undisturbed habitat 10 - 50% and > 3 patches points = 1 Undisturbed habitat < 10% of circle points = 0	0
H2.3 Land use intensity in 1 km circle. If: > 50% of circle is high intensity land use points = (- 2) Does not meet criterion above points = 0	-2
H 2.4 ☐ The wetland unit is in an area where annual rainfall is less than 12 inches, and its water regime is not influenced by irrigation practices, dams, or water control structures. *(Generally, this means outside boundaries of reclamation areas, irrigation district, or reservoirs)* points = 3	0
Total for H 2 Add the points in the boxes above	0

Rating of Landscape Potential **If score is:** **4- 6 = H** **1-3 = M** **< 1 = L**
Record the rating on the first page

H 3.0 Is the Habitat provided by the site valuable to society?	
H3.1Does the site provides habitat for species valued in laws, regulations or policies? *(choose the highest score)* Site meets ANY of the following criteria: points = 2 __It provides habitat for Threatened or Endangered species (any plant or animal on state or federal lists) __It is a "priority area" for an individual WDFW species __It is a Wetland With a High Conservation Value as determined by the Department of Natural Resources __It has 3 or more priority habitats within 100m (see Appendix B) __It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan Site has 1 or 2 priority habitats within 100m (see Appendix B) points = 1 Site does not meet any of the criteria above points = 0	0

Rating of Value **If score is:** **2 = H** **1 = M** **0 = L**
Record the rating on the first page

Wetland name or number_____

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland unit meets the attributes described below and circle the appropriate Category. NOTE: A wetland may meet the criteria for more than one set of special characteristics. Record all those that apply. NOTE: All units should also be characterized based on their functions.

Wetland Type *Check off any criteria that apply to the wetland. Circle the Category when the appropriate criteria are met.*	Category
SC 1.0 Vernal pools Is the wetland unit **less than 4000 ft^2**, and does it meet at least **two** of the following criteria? — Its only source of water is rainfall or snowmelt from a small contributing basin and has no groundwater input — Wetland plants are typically present only in the spring; the summer vegetation is typically upland annuals. *NOTE: If you find perennial, "obligate", wetland plants the wetland is probably NOT a vernal pool* — The soil in the wetland are shallow (<1ft deep (30 cm)) and is underlain by an impermeable layer such as basalt or clay. — Surface water is present for less than 120 days during the "wet" season. YES = Go to SC 1.1 NO - *not a vernal pool* SC 1.1 Is the vernal pool relatively undisturbed in February and March? YES = Go to SC 1.2 NO – *not a vernal pool with special characteristics*	
SC 1.2 Is the vernal pool in an area where there are at least 3 separate aquatic resources within 0.5 miles (other wetlands, rivers, lakes etc.)? YES = Category II NO = Category III	**Cat. II** **Cat. III**
SC 2.0 Alkali wetlands Does the wetland unit meets **one** of the following two criteria? — The wetland has a conductivity > 3.0 mS/cm. — The wetland has a conductivity between 2.0 - 3.0 mS, and more than 50% of the plant cover in the wetland can be classified as "alkali" species (see Table 4 for list of plants found in alkali systems). — If the wetland is dry at the time of your field visit, the central part of the area is covered with a layer of salt. **OR** does the wetland unit meets two of the following three sub-criteria? — Salt encrustations around more than 80% of the edge of the wetland — More than ¾ of the plant cover consists of species listed on Table 4 — A pH above 9.0. All alkali wetlands have a high pH, but please note that some freshwater wetlands may also have a high pH. Thus, pH alone is not a good indicator of alkali wetlands. **YES = Category I** NO – *not an alkali wetland*	**Cat. I**

Wetland name or number_____

SC 3.0 Wetlands with High Conservation Value (WHCV) SC 2.1 Has the Department of Natural Resources updated their web site to include the list of Wetlands with High Conservation Value? YES - Go to SC 2.2 NO – Go to SC 2.3 SC 2.2 Is the wetland unit you are rating listed on the DNR database as having a High Conservation Value? YES = Category I NO = not a WHCV SC 2.3 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf YES____ – contact WNHP/DNR and go to SC 2.4 NO = not a WHCV SC 2.4 Has DNR identified the wetland within the S/T/R as a wetland with High Conservation value and is listed on their web site? YES = Category I NO ____not an WHCV	**Cat. I**
SC 4.0 Bogs and Calcareous Fens Does the wetland unit (or any part of the wetland unit) meet both the criteria for soils and vegetation in bogs or calcareous fens. *Use the key below to identify if the wetland is a bog or calcareous fen. If you answer yes you will still need to rate the wetland based on its functions.* SC 4.1. Does an area within the wetland unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix C for a field key to identify organic soils)? Yes - go to SC 4.3 No - go to SC 4.2 SC 4.2. Does an area within the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond?? Yes - go to SC 4.3 No - *Is not a bog for rating* SC 4.3. Does an area within the unit have more than 70% cover of mosses at ground level AND at least 30% of the total plant cover consists of species in Table 5? Yes – Category I bog No - go to SC 4.4 *NOTE: If you are uncertain about the extent of mosses in the understory you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16" deep. If the pH is less than 5.0 and the plant species in Table 5 are present, the wetland is a bog.* SC 4.4 Is an area with peats or mucks forested (> 30% cover) with subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, AND any of the species (or combination of species) listed in Table 5 provide more than 30% of the cover under the canopy **Yes – Category I bog** NO – go to question SC 4.5 5. Do the species listed in Table 6 comprise at least 20% of the total plant cover within an area of peats and mucks? Yes – Is a Calcareous Fen for purpose of rating No - go to Question 6 6. Do the species listed in Table 6 comprise at least 10% of the total plant cover an area of peats and mucks, AND one of the two following conditions is met: • Marl deposits (calcium carbonate ($CaCO_3$) precipitate) occur on the soil surface or plant stems • The pH of free water ≥ 6.8 AND electrical conductivity ≥ 200 uS/cm at multiple locations within the wetland **Yes – Is a Category I calcareous fen** No - Is not a calcareous fen	**Cat. I** **Cat. I**

Wetland name or number_____

SC 5.0 Forested Wetlands Does the wetland unit have an area of forest rooted within its boundary that meets **at least one** of the following three criteria? (*Continue only if you have identified a forested class is present in question H 1.1*) • The wetland is within the "100 year" floodplain of a river or stream • aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species — There is at least ¼ acre of trees (even in wetlands smaller than 2.5 acres) that are "mature" or "old-growth" according to the definitions for these priority habitats developed by WDFW *(see definitions in question H3.1)* YES = go to SC 5.1 NO –*not a forested wetland with special characteristics*	
SC 5.1 Does the wetland unit have a forest canopy where more than 50% of the tree species (by cover) are slow growing native trees (*see Table 7*) YES = Category I NO = go to SC 5.2	**Cat. I**
SC 5.2 Does the unit have areas where aspen (*Populus tremuloides*) represents at least 20% of the total cover of woody species. YES = Category I NO = go to SC 5.3	**Cat. I**
SC 5.3 Does the wetland unit have areas with a forest canopy where more than 50% of the tree species (by cover) are fast growing species. (*see Table 7*) YES = Category II NO = go to SC 5.5	**Cat. II**
SC 5.4 Is the forested component of the wetland within the "100 year floodplain" of a river or stream? YES = Category II	**Cat. II**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories.* If you answered NO for all types enter "Not Applicable" on p.1	

Wetland name or number_____

Appendix B: WDFW Priority Habitats in Eastern Washington

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf)

Count how many of the following priority habitats are within 330 ft (100m) of the wetland unit? *NOTE: This question is independent of the land use between the wetland unit and the priority habitat.*

___**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre).

___**Biodiversity Areas and Corridors:** Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report p. 152*).

___**Old-growth/Mature forests:** Old-growth east of Cascade crest: Stands are highly variable in tree species composition and structural characteristics due to the influence of fire, climate, and soils. In general, stands will be >150 years of age, with 25 trees/ha (10 trees/acre) that are > 53 cm (21 in) dbh, and 2.5-7.5 snags/ha (1 – 3 snags/acre) that are > 30-35 cm (12-14 in) diameter. Downed logs may vary from abundant to absent. Canopies may be single or multi-layered. Evidence of human-caused alterations to the stand will be absent or so slight as to not affect the ecosystem's essential structures and functions. Mature forests: Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80 - 200 years old west and 80 - 160 years old east of the Cascade crest.

___**Oregon white Oak:** Woodlands Stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

___**Riparian:** The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

___**Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

___**Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

___**Cliffs:** Greater than 7.6 m (25 ft) high and occurring below 5000 ft.

___**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

___**Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long.

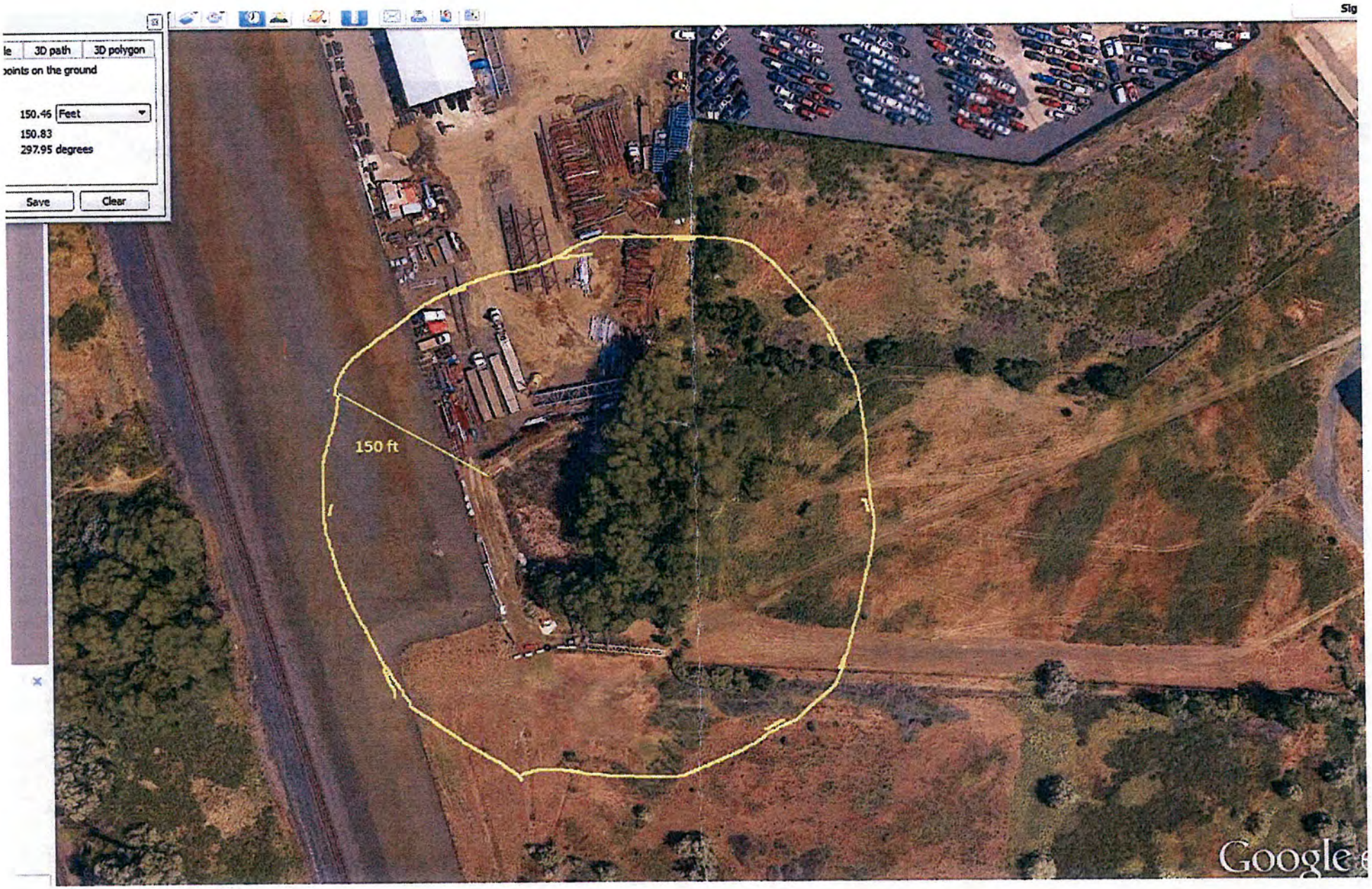
___**Shrub-steppe:** A nonforested vegetation type consisting of one or more layers of perennial bunchgrasses and a conspicuous but discontinuous layer of shrubs (see Eastside Steppe for sites with little or no shrub cover).

___**Eastside Steppe:** Nonforested vegetation type dominated by broadleaf herbaceous flora (i.e., forbs), perennial bunchgrasses, or a combination of both. Bluebunch Wheatgrass (Pseudoroegneria spicata) is often the prevailing cover component along with Idaho Fescue (Festuca idahoensis), Sandberg Bluegrass (Poa secunda), Rough Fescue (F. campestris), or needlegrass (Achnatherum spp.).

___ **Juniper Savannah:** All juniper woodlands.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.


South Broadway
Union Gap
© 2015 Google
Google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oints on the ground
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297.95 degrees
Save
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WETLAND DETERMINATION DATA FORM – Arid West Region

Project/Site: Agritech / Bay Chemical City/County: Yakima (City) Sampling Date: 3/25/16

Applicant/Owner: State: WA Sampling Point: Hole 1 ditch area

Investigator(s): Catherine Reed Section, Township, Range:

Landform (hillslope, terrace, etc.): ancient floodplain terrace Local relief (concave, convex, none): concave Slope (%):

Subregion (LRR): Lat: Long: Datum:

Soil Map Unit Name: NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation, Soil, or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X No	Is the Sampled Area within a Wetland? Yes X No
Hydric Soil Present?	Yes X No	
Wetland Hydrology Present?	Yes X No	

Remarks:
Whole area subject to unknown underground drains. Surface ditches located on this site and to the south/east end of the property. Installation of railroad grade and clean-up berm to west

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size:)			
1.			
2.			
3.			
4.			
= Total Cover			
Sapling/Shrub Stratum (Plot size:)			
1.			
2.			
3.			
4.			
5.			
= Total Cover			
Herb Stratum (Plot size:)			
1. reed canary grass	70		
2.			
3.			
4.			
5.			
6.			
7.			
8.			
= Total Cover			
Woody Vine Stratum (Plot size:)			
1.			
2.			
= Total Cover			

% Bare Ground in Herb Stratum % Cover of Biotic Crust

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: (A)

Total Number of Dominant Species Across All Strata: (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- Dominance Test is >50%
- Prevalence Index is ≤3.0[1]
- Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes No

Remarks:
Willows and Russian olive in adjacent buffer areas. Tree and shrub canopies influence micro-climate of area to cool it down. Also sumac and roses in buffer. No holes dug in pond area, dominated by rushes, cattails. Water surface visible Duckweed in pond, too.

SOIL

Sampling Point: _____

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	2.5Y 3/1		10YR 4/6	12	Distinct		Loam	sample taken at this location because pond itself known soil to contain heavy metal contamination

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5) **(LRR C)**
- ___ 1 cm Muck (A9) **(LRR D)**
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Vernal Pools (F9)

Indicators for Problematic Hydric Soils[3]:

- ___ 1 cm Muck (A9) **(LRR C)**
- ___ 2 cm Muck (A10) **(LRR B)**
- ___ Reduced Vertic (F18)
- ___ Red Parent Material (TF2)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:
Soil in this location could have been fill, but if so, probably more than 40 plus years

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1) **(Nonriverine)**
- ___ Sediment Deposits (B2) **(Nonriverine)**
- ___ Drift Deposits (B3) **(Nonriverine)**
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Water-Stained Leaves (B9)
- ___ Salt Crust (B11)
- ___ Biotic Crust (B12)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- X Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water Marks (B1) **(Riverine)**
- ___ Sediment Deposits (B2) **(Riverine)**
- ___ Drift Deposits (B3) **(Riverine)**
- X Drainage Patterns (B10) man-made ditches
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No X Depth (inches): _____ visible in adjacent pond

Water Table Present? Yes X No ____ Depth (inches): ↓

Saturation Present? (includes capillary fringe) Yes X No ____ Depth (inches): to surface

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Saturated to surface Obvious redox in spite of altered situation

Wetland visit Yakima Steel Fabricators 25AUG2016 1200 - 1300

Chris Wend Cally Reed.

Location

South 1) duckweed on water surface estimated high water mark ≃ 2' above current level

2) (weed canary) grass unknown?

russian olive above wetland

3) Cat tails

4) rushes

willows on buffer so far

East side 5) unknown plantain sumac on highland

rose on highland

Northeast corner - ditch some surface water saturated to surface

willow & russian olive

Munsell - soil color chart 2.5Y 3/1 Matrix @ 8" east side of ditch

redox is 10yr 4/6 12%

Northwest side 6) nightshade

point of shovel ≃ 1 ft above water estimated extent of saturation picture taken

ATTACHMENT C
NAUTILIS BIOASSAY RESULTS

WETLAND EVALUATION TECHNICAL MEMORANDUM
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Agreed Order No. DE 6091

Farallon PN: 765-001

Nautilus Environmental

Test America
Sediment Characterization – Toxicological Results

Draft Report

Report date: July 12, 2011

Submitted to:

TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424

Washington Laboratory
5009 Pacific Hwy East
Suite 2
Tacoma, WA 98424

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SIGNATURE PAGE

Cat Curran, M.S.
Washington Laboratory Manager

This report has been prepared based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party.

1.0 INTRODUCTION

On May 23rd, 2011 Test America collected freshwater sediments for biological testing. Test America contracted with Nautilus Environmental to provide toxicity-testing services for the project. The three sediment samples selected for testing included samples E-WetSed-1-052311 (WETSED-1), E-WetSed-2-052311 (WETSED-2), and E-WetSed-3-052311 (WETSED-3). No reference sample was collected in conjunction with this project. The freshwater sediment samples were tested for toxicity using the *Chironomus dilutus* (aka *tentans*) 20-day survival and growth bioassay (USEPA 2000 and ASTM 2000), the *Hyalella azteca* 10-day survival bioassay (USEPA 2000 and ASTM 2000), and the 15-minute 100 percent porewater Microtox® bacteria bioluminescence test. All tests met negative and positive control criteria.

Results were evaluated by comparing test data to the criteria in the Sediment Evaluation Framework for the Pacific Northwest (RSET 2009) guidance document. *C. dilutus*, *H. azteca*, and Microtox results were compared to control results, and examined for statistically significant effects ($\alpha = 0.05$). Acceptability criteria from the literature are summarized in Table 1.

Table 1 Acceptability criteria for bioassays

Test Type	***C. dilutus* 20-Day**	***H. azteca* 10-Day**	**Microtox**
Endpoint	Survival and Growth	Survival	Luminescence
Source	RSET 2009	RSET 2009	RSET 2009
Test Criteria	One-hit failure is mortality > control mortality + 25% and/or biomass <60% of control biomass and significant difference Two-hit failure is mortality > control mortality + 15% and/or biomass <75% of control biomass and significant difference	One-hit failure is mortality > control mortality + 25% and significant difference Two-hit failure is mortality > control mortality + 10% and significant difference	One-hit failure is Luminescence <75% of control luminescence and significant difference Two-hit failure is Luminescence <85% of control luminescence and significant difference
Control Criteria	Negative control ≤32% mortality and growth ≥0.48 mg/ind. ash-free dry weight	Negative control ≤20% mortality	Negative control final light output > 72% of initial output

2.0 SAMPLES

Upon receipt of samples from Test America, samples were matched with the chain-of-custody form and inspected. Samples were stored at 4 ± 2°C in the dark prior to test initiation. Toxicity tests were initiated within 2 weeks of collection (Table 2). Total ammonia levels in the porewater ranged from <1.0 to 2.7 milligrams per liter (mg/L). Both overlying ammonia and sulfides were also measured during testing, and the results are reported in the QA/QC sections for each test.

Table 2 Summary of sample collection and test initiation dates

Sample ID	Collection Date	Microtox Test Initiation Date	*H. azteca* Test Initiation Date	*C. dilutus* Test Initiation Date
E-WetSed-1-052311	May 23, 2011	June 6, 2011	June 7, 2011	June 9, 2011
E-WetSed-2-052311				
E-WetSed-3-052311				

3.0 *CHIRONOMUS DILUTUS* TEST

3.1 Methods

C. dilutus were exposed to test sediments for 20 days to determine the effects of site sediment on survival and growth. These tests were conducted according to methods presented in USEPA (2000) and ASTM (2000), and are summarized in Table 3.

C. dilutus egg cases were obtained from Aquatic BioSystems (Fort Collins, Colorado) and arrived at the laboratory on June 8, 2011. The egg cases were transported in insulated containers in oxygen-saturated water contained in 500-mL plastic bottles. Upon arrival at the laboratory, water quality parameters were measured and observations of organism condition were made. The egg cases were 20°C at receipt, and were cultured at 23°C. The organisms emerged from the egg cases on June 9th and tests were initiated the same day.

One day prior to test initiation (Day –1), the sediment samples were homogenized, 100-ml of sediment was distributed to each of eight labeled test chambers for each of the samples, and

175-ml diluted mineral water (prepared by diluting two parts Perrier® into eight parts deionized water) was added to each container. Control sediment consisted of clean, rinsed silica sand (50/50 mix of #30 and #70) mixed with peat moss (1/2 Tbsp) that was rinsed overnight in diluted mineral water. Eight test chambers were also prepared for the control sediment. An additional replicate was included for each sediment sample and the control sediment as a sacrificial test chamber for routine water quality measurements.

The test chambers were randomized and the sediments were left to settle overnight. On Day 0, overlying ammonia, sulfide, hardness, alkalinity, dissolved oxygen (DO), pH, conductivity, and temperature were measured. Twelve organisms were directly added to each test chamber, in random order.

Each test chamber was provided 1.5 mL of food daily (after the second renewal) starting on Day -1. The food consisted of a mixture of 4 g ground Tetrafin® flakes mixed with 1 L diluted mineral water. The feeding regime was reduced if the presence of excess food was observed on the sediment surface in several test chambers, which occurred on Day 8 only. Abnormal conditions or unusual animal behavior, if observed, were noted daily.

Temperature, DO, pH, and conductivity were monitored daily in the water quality replicate for each sample, while alkalinity, hardness, ammonia and sulfides were measured on Days 5, 10, and 15. Water was renewed twice daily.

At test termination, subsamples of overlying water were collected from each water quality replicate for ammonia, hardness, alkalinity, and sulfide analyses. The contents of each test chamber were gently mixed to suspend the sediment and poured through a 0.5-mm Nitex screen. The sediment was rinsed through the screen using dechlorinated tap water. Animals were removed from the screen and the number of survivors counted and recorded. Presence of pupae, flies, or exuviae (molts) were noted. The larvae were rinsed with deionized water and placed into pre-ashed, pre-weighed weigh boats. The weigh boats were placed in an oven at 60°C for at least 24-hours, then placed in a dessicator until dry weight could be measured. The weigh boats were then placed in a muffle furnace at 550°C for two hours, placed in a dessicator to cool, then weighed again to determine the ash weight. The ash weight was subtracted from the dry weight to determine the ash-free dry weight (AFDW). The number and AFDW of surviving chironomids were evaluated statistically by one-tailed t-test, or one-tailed Mann-Whitney U-test, as appropriate, to determine whether the samples exhibited a significant

decrease in survival or growth relative to the control ($p<0.05$). Survival data were arcsine transformed, while growth data was either square root or log transformed as needed to stabilize the variances and improve normality of the data prior to performing the t-test. Data that failed to meet parametric assumptions even after transformations were analyzed with the non-parametric Mann-Whitney U-test. Site performance was evaluated against the sediment acceptability criteria outlined in RSET 2009 (Table 1). The criteria for acceptable test performance were an average of ≤32 percent mortality of control organisms, and an average of at least 0.48 mg/individual AFDW per surviving control organism.

A 96-hour reference toxicant test using copper chloride ($CuCl_2$) was conducted concurrently with the tests on the sediments to determine whether the sensitivity of the test organisms was appropriate. This test was run with four replicates, ten animals per replicate, in diluted mineral water at 23°C, with a small amount of clean control sand as a substrate. Tetrafin® slurry (1.25 mL of 4 g/L Tetrafin) was added to each chamber on days 0 and 2.

Table 3 Summary of methods for the 20-day test with *Chironomus dilutus*

Test initiation date	June 9, 2011
Test termination date	June 29, 2011
Test organism source	Aquatic BioSystems; Fort Collins, Colorado
Organism age at test initiation	< 4 hours post-emergence from egg case
Feeding	1.5 mL of 4.0 g/L Tetrafin mixture every day; frequency reduced if excess food observed
Test chamber	475-mL glass beaker
Test sediment volume	100 mL
Dilution water type & volume	175 mL diluted mineral water
Water renewal	Twice daily
Control sediment	Sand mixed with peat (1/2 Tbsp)
Number of organisms/replicate	12
Number of replicates/sample	8 plus water quality surrogates
Test temperature	23± 1°C
Illumination	16 hours light : 8 hours dark
Aeration	Started on Day 13
Reference toxicant	Copper chloride
Acceptability Criteria	≤32% mortality, 0.48 mg/individual AFDW

3.2 Results

The results of toxicity tests conducted using *C. dilutus* are provided in Table 4. Statistics were conducted using Biostat software, which follows the flowchart recommended by RSET. Comparisons are shown to the control. A detailed summary of results is provided in Appendix A. Summary and detailed statistical analyses for endpoint measurements are provided in Appendix B. Summaries of water quality data are provided in Appendix C. Benchsheets are provided in Appendix D.

Table 4 Results of *Chironomus dilutus* tests. Samples with statistically reduced survival or growth are underlined, and values failing two-hit RSET criteria are shaded gray, while samples failing one-hit RSET criteria are bold.[1, 2]

Sample	Percent Mortality (Mean ± SD)	Mortality Percent Difference From	Ash-Free Dry Weight per Org (mg)	Ash-Free Dry Weight Percent of Control
Control	6.3 ± 7.4	--	0.91 ± 0.11	--
WETSED-1	20.8 ± 21.4	14.6	1.11 ± 0.46	123
WETSED-2	24.0 ± 12.9	17.7	0.87 ± 0.22	96
WETSED-3	**63.5 ± 31.2**	**57.3**	0.60 ± 0.57	66

[1]Criteria for one-hit failure is significant decrease in mortality ($p<0.05$), **and** mortality greater than 25% of control (RSET 2009), [2]Criteria for two-hit failure is significant decrease in mortality ($p<0.05$), **and** mortality greater than 15% of control (RSET 2009)

3.3 QA/QC

The *C. dilutus* were received in good condition for the June 9, 2011 test. All water quality parameters remained within acceptable ranges throughout the tests. A summary of the water quality parameters is presented in Table 5. Dissolved oxygen levels were decreased to a level on concern on day 13, and all replicates were aerated from that point forward. There were no deviations from the protocols. The toxicity test for mortality with this species met the control acceptability criterion (<32 percent mortality; >0.48 mg/ind AFDW).

Table 5 Summary of water quality parameters for *C. dilutus* tests (means and ranges). Required values are shown in brackets.

Analyte	Control	WETSED-1	WETSED-2	WETSED-3
	Mean (Min-Max)			
Temp. (°C) [23 ± 1°C]	22.0 (21.7-22.2)	22.0 (21.8-22.2)	21.9 (21.7-22.1)	21.9 (21.7-22.1)
DO (mg/L) [>2.5 mg/L]	6.7 (3.3-9.0)	6.7 (3.5-9.0)	7.1 (5.2-9.1)	7.0 (5.2-9.0)
pH [6-9]	7.34 (6.58-7.99)	7.18 (6.43-7.89)	7.13 (6.46-7.80)	7.35 (6.80-7.99)
Cond. (µS/cm) [NA]	208 (127-296)	180 (149-227)	249 (158-413)	251 (192-382)
Alkalinity (mg/L $CaCO_3$) [<50% variable]	58 (48-72)	65 (60-68)	69 (64-72)	85 (80-88)
Hardness (mg/L $CaCO_3$) [<50% variable]	83 (80-88)	98 (80-108)	195 (84-228)	122 (100-140)
Total Overlying NH3 (mg/L) [<50% variable]	1.6 (1.1-1.7)	1.2[a] (<1.0-1.3)	1.3[a] (<1.0-1.3)	<1.0 (<1.0-<1.0)
Total Overlying Sulfides (mg/L) [NA]	0.035[a] (<0.010-0.058)	0.028[a] (<0.010-0.054)	0.044[a] (<0.010-0.044)	0.020[a] (<0.010-0.021)

[a] estimated value

The result of the reference toxicant test conducted in conjunction with this testing program is provided in Table 6. Bench sheets and control charts are provided in Appendix E. This test was run with the same batch of organisms used in the testing program. The result of this test fell within the range of mean ± two standard deviations of historical results, indicating that the sensitivity of the test organisms was appropriate.

Table 6 *C. dilutus* reference toxicant test results.

Species	Test date	Toxicant	LC50	Acceptable Range	CV (%)
Chironomus dilutus	June 23, 2011	Cu	571 µg/L	401 – 1070 µg/L	22.7

3.4 Discussion

Mortality in the samples ranged from 20.8 to 63.5 percent, compared with 6.3 percent in the control. Sediment samples WETSED-2 and WETSED-3 were significantly different from control and were more than 15 percent higher than the control, failing the two-hit criterion for survival. WETSED-3 was also more than 25 percent higher than the control, failing the one-hit criterion for survival. Survival in WETSED-1 was not significantly different from the control, due to high

variability in the sample. Growth in the samples ranged from 0.60 to 1.11 mg/individual AFDW, compared with 0.91 mg/individual AFDW in the control. Growth in sample WETSED-1 was greater than the control. Growth in WETSED-2 and WETSED-3 was not significantly different from the control. Therefore none of the sites fail either the one- or two-hit failure requirements.

The total ammonia level reached 1.3 mg/L in the test sediments, which was well below the reported 4-day lethal concentration for 50% of test organisms (LC_{50}) range for *C. dilutus* of 82 to 370 mg/L (USEPA 2000). While sulfide toxicity thresholds are not available for this species, they were measured as part of the Ecology reference site study (Nautilus 2008), and samples with porewater sulfide values similar (0.226 to >0.600 mg/L) to the values found in the current study (0.010 to 0.054 mg/L) did not result in measurable effects. Therefore, it is unlikely that ammonia or sulfide levels caused the observed increases in mortality in the test sediments.

4.0 *HYALELLA AZTECA* TEST

4.1 Methods

H. azteca were exposed to test sediments for 10 days to determine the effects of site sediments on survival. These tests were conducted according to methods presented in USEPA (2000) and ASTM (2000), and are summarized in Table 7.

H. azteca were obtained from Aquatic Indicators (St. Augustine, Florida) and arrived at the laboratory on June 2, 2011. The organisms were transported in insulated boxes in oxygen-saturated water contained in plastic bags with fine screens as a substrate. Upon arrival at the laboratory, water quality parameters were measured and observations of animal condition were made. The organisms were acclimated to test conditions prior to test initiation over a 96-hour time period. During the acclimation period, the animals were observed for any indication of stress or significant mortality and any observations were recorded.

One day prior to test initiation (Day –1), the sediment samples were homogenized, 100-ml sediment was distributed to each of eight labeled test chambers for each of the samples, and 175-ml diluted mineral water (prepared by diluting two parts Perrier® into eight parts deionized water) was added to each container. Control sediment consisted of clean, rinsed silica sand (50/50 mix of #30 and #70) mixed with peat moss (1/2 Tbsp) that was rinsed

overnight in diluted mineral water. Eight test chambers were also prepared for the control sediment. An additional replicate was included for each sediment sample and the control sediment as a sacrificial test chamber for routine water quality measurements.

The test chambers were randomized and the sediments were left to settle overnight. On Day 0, overlying ammonia, sulfide, hardness, alkalinity, dissolved oxygen (DO), pH, conductivity, and temperature were measured. Organisms were carefully separated into groups of 10 amphipods in 30 mL cups containing diluted mineral water. The number of organisms was then recounted and any animals exhibiting signs of stress were replaced. The organisms were then gently added to the test chambers, two cups for each test chamber for a total of 20 organisms per chamber.

Temperature, DO, pH, and conductivity were monitored daily in the water quality replicate for each sample, while overlying ammonia, sulfide, hardness, and alkalinity were monitored on Day 5. Water was renewed twice daily in all chambers. Abnormal conditions or unusual animal behavior, if observed, were also noted daily. Each test chamber was fed 1 ml of Yeast Trout Chow (YTC) daily after the second renewal.

At test termination, subsamples of overlying water were collected for ammonia, hardness, alkalinity, and sulfides analyses, from each water quality replicate. The contents of each test chamber were gently mixed to suspend the sediment and poured through a 0.5-mm Nitex screen. The sediment was rinsed through the screen using dechlorinated tap water. The screen was then placed in diluted mineral water and the number of survivors counted and recorded. The number of surviving amphipods was evaluated statistically by one-tailed t-test, or one-tailed Mann-Whitey U-test, as appropriate, to determine whether the samples exhibited a significant decrease in survival relative to the control ($p<0.05$). Survival data was arcsin transformed as needed to stabilize the variances and improve normality of the data. Site performance was evaluated against sediment acceptability criteria outlined by the Northwest Regional Sediment Evaluation Framework (RSET 2009), as presented in Table 1.

A 96-hour reference toxicant test using copper chloride ($CuCl_2$) was conducted concurrently with the sediment tests to determine whether the sensitivity of the test organisms was within the range typically observed. The test was run with four replicates, ten animals per replicate, in diluted mineral water with a square of nitex screen as a substrate.

Table 7 Summary of methods for the 10-day test with *Hyalella azteca*.

Test initiation date	June 7, 2011
Test termination date	June 17, 2011
Test organism source	Aquatic Indicators, St. Augustine, Florida
Organism age at test initiation	8 days
Feeding	1 ml of YTC daily
Test chamber	475-ml glass beaker
Test sediment volume	100 ml
Dilution water type & volume	175 ml diluted mineral water
Water renewal	Twice daily
Control sediment	Sand mixed with peat (1/2 Tbsp)
Number of organisms/replicate	10
Number of replicates/sample	8 plus water quality surrogate
Test temperature	23 ± 1°C
Illumination	16 hours light: 8 hours dark
Aeration	None
Reference toxicant	Copper chloride
Acceptability criterion for control	≥80% survival

4.2 Results

The results of toxicity tests conducted using *H. azteca* are provided in Table 8. Statistics were conducted using Biostat software, which follows the flowchart recommended by RSET. Comparisons are shown to the control. A detailed summary of results is provided in Appendix A. Summary and detailed statistical analyses for endpoint measurements are provided in Appendix B. Summaries of water quality data are provided in Appendix C. Benchsheets are provided in Appendix D.

Table 8 Results of *Hyalella azteca* tests. Samples with statistically reduced survival or are underlined, and values failing two-hit RSET criteria are shaded gray, while samples failing one-hit RSET criteria are bold.[1, 2]

Sample	Percent Mortality (Mean ± SD)	Mortality Percent Difference from Control
Control	1.3 ± 2.3	--
WETSED-1	**100 ± 0.0**	98.7
WETSED-2	13.8 ± 11.6	12.5
WETSED-3	3.8 ± 4.4	2.5

[1]Criteria for one-hit failure is significant decrease in mortality (p<0.05), **and** mortality greater than 25% of control (RSET 2009), [2]Criteria for two-hit failure is significant decrease in mortality (p<0.05), **and** mortality greater than 10% of control (RSET 2009)

4.3 QA/QC

The *H. azteca* were received in good condition and the toxicity tests with this species met the control acceptability criterion (<20 percent mortality). A summary of the water quality parameters is provided in Table 10. All water quality parameters remained within acceptable ranges throughout the tests. Instead of the 10 animals per replicate required by the protocol, 20 animals were added to each replicate. As the controls still met acceptability criteria and water quality stayed within ranges for the test, this deviation is not expected to have affected the results. There were no other deviations from the protocol.

Table 9 Summary of water quality parameters for *H. azteca* analyses (means and ranges). Required values are shown in brackets.

Analyte	Control	WETSED-1	WETSED-2	WETSED-3
		Mean (Min-Max)		
Temp. (°C)	22.3	22.2	22.2	22.2
[23 ± 1°C]	(21.9-23.4)	(21.9-23.3)	(21.9-23.3)	(21.8-23.2)
DO (mg/L)	7.0	6.3	6.4	6.5
[>2.5 mg/L]	(5.8-8.4)	(5.4-7.3)	(5.4-7.2)	(5.6-7.3)
pH	7.26	6.83	6.83	7.01
[6-9]	(6.50-7.79)	(6.22-7.20)	(6.35-7.18)	(6.63-7.37)
Cond. (µS/cm)	172	188	283	223
[NA]	(145-189)	(164-262)	(190-418)	(159-343)
Alkalinity (mg/L $CaCO_3$)	52	67	75	72
[<50% variable]	(44-60)	(60-72)	(64-80)	(68-76)
Hardness (mg/L $CaCO_3$)	69	129	199	180
[<50% variable]	(60-76)	(124-132)	(192-204)	(172-188)
Total Overlying NH3	1.0[a]	1.0[a]	1.0[a]	1.0[a]
(mg/L) [<50% variable]	(<1.0-<1.0)	(<1.0-1.0)	(<1.0-<1.0)	(<1.0-<1.0)
Total Overlying Sulfides	0.091[a]	0.114	0.058	0.091[a]
(mg/L) [<50% variable]	(<0.010-0.125)	(0.014-0.293)	(0.012-0.126)	(<0.010-0.107)

[a]estimated value

The result of the reference toxicant test conducted in conjunction with this testing program is provided in Table 10. Bench sheets and control charts are provided in Appendix E. This test was run with the same batch of organisms used in the testing program. The result of this test fell within the range of mean ± two standard deviations of historical results, indicating that the sensitivity of the test organisms was appropriate.

Table 10 H. Azteca reference toxicant test results.

Species	Test date	Toxicant	LC50	Acceptable Range	CV (%)
Hyalella azteca	June 2, 2011	Cu	188 µg/L	0 – 1360 µg/L	74.6

4.4 Discussion

Mortality in the samples ranged from 3.8 to 100 percent, compared with 1.3 percent in the control. Sediment samples WETSED-1 and WETSED-2 were significantly different from control and were more than 10 percent higher than the control, failing the two-hit criterion for survival. WETSED-1 was more than 25 percent higher than the control, failing the one-hit criterion for survival.

5.0 MICROTOX® TEST

5.1 Methods

The luminescent marine bacterium *Vibrio fischeri* was used as the test organism for the Microtox test. The bacteria were exposed to porewater extracted from sediment samples and light readings were measured after 5 and 15 minutes of exposure. Test equipment included the Microtox Model 500 Analyzer, which measures light output and is equipped with a 15°C chamber to maintain test temperature in the samples and a 4°C chamber to keep the rehydrated bacteria chilled.

Vials of freeze-dried bacteria (Microtox® Acute Reagent Lot #s 10K1032, expiration date 10/2012) were obtained from Strategic Diagnostics, Inc. and stored at -20°C until use. On the day of the test, a vial was rehydrated with 1.0 ml of Microtox Reconstitution Solution, mixed thoroughly, and allowed to equilibrate for 30 minutes at 4°C. The bacteria were used within 2 hours of rehydration.

The tests were conducted in accordance with Ecology (2008) test protocol; these methods are summarized in Table 11. Approximately 50 ml of porewater was extracted from each sample by centrifuging for 30 minutes at 4500 G. Each porewater extract was adjusted to a salinity of 20 parts per thousand (ppt) with Crystal Sea Marine Mix artificial seasalt. The DO ranged from 7.2 to 8.2 mg/L in the adjusted samples. Since the DO in each sample was between 50 and 100 percent saturation (5.0 to 10.2 mg/L), the samples did not require aeration. The pH was adjusted to 7.8 to 8.2 using NaOH or HCl. None of the porewater samples were diluted below 90 percent. The control was deionized water adjusted to 20 ppt with artificial seasalt. Each porewater was tested within 3 hours of extraction.

Tests were conducted using five replicates. Disposable glass cuvettes were placed in the Microtox test wells and 1 ml of salinity-adjusted porewater was added. The rehydrated bacteria (reagent) were thoroughly mixed and 10 µl was added to each test cuvette, with mixing after each addition. After an initial incubation period of 5 minutes, the control cuvette was placed in the read chamber of the Microtox Analyzer to set the instrument. Initial light readings (I_0) were then taken by placing each cuvette in the read chamber of the Microtox Analyzer and measurements were recorded on a data sheet. Light output was measured at 5 minutes (I_5) and 15 minutes (I_{15}) of exposure after the initial light reading (I_0).

Test acceptability criteria were final mean control light output greater than or equal to 72 percent of initial control mean output, and test mean output not greater than 110 percent of control mean output. The data were evaluated statistically by conducting one-tailed t-tests or Mann-Whitney U-tests on the change in output over time for test sediment porewaters compared to the control porewater (where light output was lower than the control). Sediment performance was evaluated against sediment acceptability criteria outlined by the Northwest Regional Sediment Evaluation Framework (RSET 2009), as presented in Table 1.

A reference toxicant test using phenol was conducted in conjunction with the sediment tests to ensure that the sensitivity of the test was within the acceptable range of historical values determined in this laboratory.

Table 11 Summary of methods for the Microtox test.

Test dates	June 6, 2011
Test organism source	Strategic Diagnostics
Batch number and expiration date	Lot#10K1032, Expiration 10/2012
Control	Saltwater (20 ppt) prepared with Crystal Sea artificial seasalt
Sample preparation	Centrifugation at 4500 G for 30 minutes; salinity adjustment to 20 ppt using Crystal Sea salt; pH adjustment to 7.8-8.2 ppt; DO 5.0 to 10.2 mg/L
Test chamber	Glass cuvette
Test volume	1 mL
Volume of inoculum/replicate	10 µL
Number of replicates/sample	5
Test temperature	15 ± 1°C
Aeration	None
Reference toxicant	Phenol
Acceptability criteria	Final control light output ≥72% initial; test output ≤110% control

5.2 Results

The results of toxicity tests conducted using Microtox are provided in Table 12. Statistics were conducted using Biostat software, which follows the flowchart recommended by RSET. Comparisons are shown to the control. A detailed summary of results is provided in Appendix A. Summary and detailed statistical analyses for endpoint measurements are provided in Appendix B. Summaries of water quality data are provided in Appendix C. Benchsheets are provided in Appendix D.

Table 12 Results of Microtox tests. Samples with statistically reduced luminescence are underlined, and values failing two-hit RSET criteria are shaded gray, while samples failing one-hit RSET criteria are bold.[1, 2]

Sample	5 minute reading		15 minute reading	
	Mean % of initial light output	Significantly different relative to the control	Mean % of initial light output	Significantly different relative to the control
Control	96 ± 3	--	84 ± 3	--
WETSED-1	**68 ± 4**	Yes	**17 ± 1**	Yes
WETSED-2	**72 ± 1**	Yes	**25 ± 1**	Yes
WETSED-3	81 ± 1	Yes	**35 ± 2**	Yes

[1]Criteria for one-hit failure is luminescence less than 75% of control luminescence **and** significant difference (RSET 2009); [2]Criteria for two-hit failure is luminescence less than 85% of control luminescence **and** significant difference (RSET 2009)

5.3 QA/QC

A summary of the water quality parameters for the Microtox tests is provided in Table 13. The Microtox tests met control acceptance criteria and there were no deviations from protocol.

Table 13 Summary of sites water quality parameters for Microtox analyses

Analyte	Mean (st.dev)	Minimum	Maximum	Number of Readings	Met Requirements
Initial Salinity (ppt)	1.1 (0.3)	0.8	1.3	3	N/A
Final Salinity (ppt)	19.9 (0.4)	19.5	20.2	3	Y
Initial DO (mg/L)	7.3 (0.2)	7.2	7.5	3	N/A
Final DO (mg/L)	7.3 (0.2)	7.2	7.5	3	Y
Initial pH	7.5 (0.4)	7.2	7.9	3	N/A
Final pH	7.9 (0.02)	7.9	7.9	3	Y
Final Concentration (%)	99.9 (0.0)	99.0	100	3	Y
Total NH3 (mg/L)	2.0 (1.0)[1]	<1.0	2.7	3	N/A

[1]estimated value

Results of the reference toxicant test conducted in conjunction with this testing program are provided in Table 14. Bench sheets and control charts are provided in Appendix E. The test was run with the same batch of organisms used in the testing program. The results of this test fell within the range of mean ± two standard deviations of historical results, indicating that the sensitivity of the test organisms was appropriate.

Table 14 Microtox reference toxicant test results.

Species	Test date	Toxicant	EC50	Acceptable Range (mean ± 2 S.D.)	CV (%)
Microtox	June 6, 2011	Phenol	5 min: 19.6 mg/L 15 min: 40.9 mg/L	5 min: 24.2 – 55.1 15 min: 31.0 – 92.2	19.5 24.8

5.4 Discussion

Change in light output in the samples at 15 minutes ranged from 17 to 35 percent, compared with 84 percent in the controls. Samples WETSED1, WETSED2, and WETSED3 were all significantly different from the controls and had luminescence less than 75% of controls, failing the one-hit criteria for luminescence.

6.0 CONCLUSIONS

WETSED-1 failed the one-hit criterion for *H. azteca* survival and the one-hit criterion for Microtox luminescence, but did not have a hit in the *C. dilutus* survival or growth criterion (RSET 2009). WETSED-2 failed the two-hit criterion for *C. dilutus* and *H. azteca* survival, and failed the one-hit criterion for Microtox luminescence (RSET 2009). WETSED-3 failed the one-hit criterion for *C. dilutus* survival and Microtox luminescence (RSET 2009).

Table 15 One-hit/Two-hit criteria summary results table

Site	*C. dilutus* Survival	*C. dilutus* Growth	*H. azteca* Survival	Microtox Luminescence
WETSED-1	None	None	One-hit	One-hit
WETSED-2	Two-hit	None	Two-hit	One-hit
WETSED-3	One-hit	None	None	One-hit

7.0 REFERENCES

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APPENDIX A – Results Summaries

Appendix A-1. 20-Day Solid Phase *Chironomous dilutus* Survival & Growth

Test America Sediment Characterization

Test Initiation: June 9, 2011

[a]Number of pupae and flies

[b]AFDW = Ash-Free Dry Weight. Weights are for larvae only, not pupated animals

[c] One-tailed t-test. Survival data arcsine square-root transformed prior to analysis. Growth data either square root or log transformed prior to analysis Alpha = 0.05

Shaded values fail RSET one-hit criteria (Test sediment mortality - Control sediment mortality >25% and significantly different; Test sediment Growth/Control sediment Growth <0.7 and significantly different)

Site	Replicate	Rnd. No.	# Alive	# Pupated[a]	% Mortality	Mean % Mortality	St Dev	AFDW per Org (mg)	Mean AFDW per Org (mg)	St Dev	Significant Decrease Compared to Control [c] Survival	Growth
Control	1	9	10	0	16.7	6.3	7.4	0.83	0.91	0.11	--	--
	2	6	12	0	0.0			0.87				
	3	15	11	0	8.3			0.86				
	4	11	12	0	0.0			0.93				
	5	5	10	0	16.7			1.02				
	6	16	12	0	0.0			1.00				
	7	14	12	0	0.0			1.04				
	8	3	11	0	8.3			0.72				
WETSED-1	1	1	12	0	0.0	20.8	21.4	1.00	1.11	0.46	No	No
	2	2	12	0	0.0			0.76				
	3	10	10	0	16.7			0.43				
	4	8	7	0	41.7			1.06				
	5	12	12	0	0.0			1.58				
	6	4	9	0	25.0			1.77				
	7	7	5	0	58.3			0.83				
	8	13	9	0	25.0			1.48				
WETSED-2	1	1	9	0	25.0	24.0	12.9	0.95	0.87	0.22	Yes	No
	2	2	10	0	16.7			0.66				
	3	10	9	0	25.0			1.10				
	4	8	10	0	16.7			0.66				
	5	12	8	0	33.3			1.26				
	6	4	12	0	0.0			0.78				
	7	7	7	0	41.7			0.74				
	8	13	8	0	33.3			0.81				
WETSED-3	1	1	4	0	66.7	63.5	31.2	1.63	0.60	0.57	Yes	No
	2	2	9	0	25.0			0.61				
	3	10	1	0	91.7			0.14				
	4	8	0	0	100.0			0.00				
	5	12	0	0	100.0			0.00				
	6	4	5	0	58.3			0.49				
	7	7	8	0	33.3			0.94				
	8	13	8	0	33.3			1.01				

Appendix Table A-2. *Hyalella azteca* 10-day Survival
Test America Sediment Characterization

Test Initiation: June 7, 2011

Site	Rep	# Alive	% Mortality	Mean % Mortality	St. Dev.	Significant Decrease Compared to Control[a]
Control	1	20	0	1.3	2.3	--
	2	20	0			
	3	20	0			
	4	19	5			
	5	20	0			
	6	20	0			
	7	19	5			
	8	20	0			
WETSED-1	1	0	100	**100.0**	**0.0**	**Yes**
	2	0	100			
	3	0	100			
	4	0	100			
	5	0	100			
	6	0	100			
	7	0	100			
	8	0	100			
WETSED-2	1	18	10	13.8	11.6	Yes
	2	19	5			
	3	19	5			
	4	16	20			
	5	14	30			
	6	14	30			
	7	20	0			
	8	18	10			
WETSED-3	1	20	0	3.8	4.4	No
	2	19	5			
	3	18	10			
	4	18	10			
	5	19	5			
	6	20	0			
	7	20	0			
	8	20	0			

[a] One-tailed t-test. Survival data arcsine square-root transformed prior to analysis. Alpha = 0.05
Shaded values fail RSET one-hit criteria (Test sediment mortality - Control sediment mortality >25% and significantly different)
Bold values fail RSET two-hit criteria (Test sediment mortality - Control sediment mortality >10% and significantly different)

Appendix Table A-3. Microtox 100 Percent Sediment Porewater Test
Test AmericaSediment Characterization
Client: Test America
Test Date: 6/6/2011

Site	Light Reading	Replicate							$T_{(mean)}$/ $C_{(mean)}$	Quality Control Steps	
	Reading	1	2	3	4	5	Mean	St.Dev.		Change in control light readings compared to initial control $F_{c(mean)}/I_{c(mean)}$	Evaluation of initial light output in site sediments $I_{(0)T(mean)}/I_{(0)C(mean)}$
CON	$I_{(0)}$	96	100	104	102	98	100	3.16			
	$I_{(5)}$	90	100	98	96	94	96	3.85		0.96	
	$I_{(15)}$	82	80	85	85	87	84	2.77		0.84	
	$C_{(5)}$	0.94	1.00	0.94	0.94	0.96	0.96	0.03			
	$C_{(15)}$	0.85	0.80	0.82	0.83	0.89	0.84	0.03			
WETSED-1	$I_{(0)}$	80	75	75	80	77	77	2.51			0.77
	$I_{(5)}$	58	49	54	51	53	53	3.39			
	$I_{(15)}$	13	13	12	13	14	13	0.71			
	$T_{(5)}$	0.73	0.65	0.72	0.64	0.69	0.68	0.04	0.72		
	$T_{(15)}$	0.16	0.17	0.16	0.16	0.18	0.17	0.01	0.20		
WETSED-2	$I_{(0)}$	81	84	74	78	79	79	3.70			0.79
	$I_{(5)}$	57	59	54	56	57	57	1.82			
	$I_{(15)}$	19	21	19	19	21	20	1.10			
	$T_{(5)}$	0.70	0.70	0.73	0.72	0.72	0.72	0.01	0.75		
	$T_{(15)}$	0.23	0.25	0.26	0.24	0.27	0.25	0.01	0.30		
WETSED-3	$I_{(0)}$	74	78	77	77	75	76	1.64			0.76
	$I_{(5)}$	59	64	63	63	60	62	2.17			
	$I_{(15)}$	25	26	29	29	26	27	1.87			
	$T_{(5)}$	0.80	0.82	0.82	0.82	0.80	0.81	0.01	0.85		
	$T_{(15)}$	0.34	0.33	0.38	0.38	0.35	0.35	0.02	0.42		

$I_{(0)}$ is the light reading after the initial five minute incubation period

$I_{(5)}$ is the light reading five minutes after $I_{(0)}$

$I_{(15)}$ is the light reading fifteen minutes after $I_{(0)}$

$C_{(t)}$, $R_{(t)}$, and $T_{(t)}$ are the changes in light readings from the intial reading in each sample container for the control, reference sediment

APPENDIX B – Statistical Analyses

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-1
Alias:	Chironomid Growth
Replicates:	8
Mean:	1.114
SD:	0.458
Tr Mean:	0.316
Trans SD:	0.096

Ref Samp:	x2
Ref ID:	Control
Alias:	Chironomid Growth
Replicates:	8
Mean:	0.909
SD:	0.11
Tr Mean:	0.28
Trans SD:	0.025

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.061
SS:	0.07
K:	8
b:	0.258
Alpha Level:	0.05
Calculated Value:	0.9586
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.075
Test Residual SD:	0.053
Ref. Residual Mean:	0.02
Ref. Residual SD:	0.013
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.8368
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Log10 (x + 1.0)

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	-1.0133
Critical Value:	>= 1.860
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1	0.301	0.83	0.262	0.015	0.018			-0.161
2	0.76	0.246	0.87	0.272	0.07	0.008			-0.07
3	0.43	0.155	0.86	0.27	0.161	0.011			-0.053
4	1.06	0.314	0.93	0.286	0.002	0.005			-0.045
5	1.58	0.412	1.02	0.305	0.096	0.025			-0.018
6	1.77	0.442	1	0.301	0.127	0.021			-0.015
7	0.83	0.262	1.04	0.31	0.053	0.03			-0.011
8	1.48	0.394	0.72	0.236	0.079	0.045			-0.008
9									-0.002
10									0.005
11									0.021
12									0.025
13									0.03
14									0.079
15									0.096
16									0.127

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-1
Alias:	Chironomid Mortality
Replicates:	8
Mean:	20.838
SD:	21.358
Tr Mean:	21.765
Trans SD:	19.595

Ref Samp:	x2
Ref ID:	Control
Alias:	Chironomid Mortality
Replicates:	8
Mean:	6.25
SD:	7.397
Tr Mean:	10.216
Trans SD:	11.272

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	13.721
SS:	3577.056
K:	8
b:	57.669
Alpha Level:	0.05
Calculated Value:	0.9297
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	16.324
Test Residual SD:	8.912
Ref. Residual Mean:	10.216
Ref. Residual SD:	2.788
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.85
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	11
Experimental Alpha Level:	0.05
Calculated Value:	1.445
Critical Value:	>= 1.796
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	0	16.7	24.12	21.765	13.904			-21.765
2	0	0	0	0	21.765	10.216			-21.765
3	16.7	24.12	8.3	16.744	2.355	6.528			-21.765
4	41.7	40.222	0	0	18.457	10.216			-10.216
5	0	0	16.7	24.12	21.765	13.904			-10.216
6	25	30	0	0	8.235	10.216			-10.216
7	58.3	49.778	0	0	28.013	10.216			-10.216
8	25	30	8.3	16.744	8.235	6.528			2.355
9									6.528
10									6.528
11									8.235
12									8.235
13									13.904
14									13.904
15									18.457
16									28.013

Project Name: Test America

Sample:	x1
Samp ID:	WETSED1
Alias:	Hyalella Mortality
Replicates:	8
Mean:	100
SD:	0
Tr Mean:	0.76
Trans SD:	0

Ref Samp:	x2
Ref ID:	Control
Alias:	Hyalella Mortality
Replicates:	8
Mean:	1.25
SD:	2.315
Tr Mean:	-0.76
Trans SD:	0.373

Shapiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	N/A
Calculated Value:	N/A
Critical Value:	N/A
Normally Distributed:	N/A
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0
Test Residual SD:	0
Ref. Residual Mean:	0.302
Ref. Residual SD:	0.187
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	4.5826
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Rankits
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	7
Experimental Alpha Level:	0.05
Calculated Value:	11.5223
Critical Value:	>= 1.895
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	100	0.76	0	-0.962	0	0.202		-0.962	
2	100	0.76	0	-0.962	0	0.202		-0.962	
3	100	0.76	0	-0.962	0	0.202		-0.962	
4	100	0.76	5	-0.156	0	0.605		-0.962	
5	100	0.76	0	-0.962	0	0.202		-0.962	
6	100	0.76	0	-0.962	0	0.202		-0.962	
7	100	0.76	5	-0.156	0	0.605		-0.156	
8	100	0.76	0	-0.962	0	0.202		-0.156	
9								0.76	
10								0.76	
11								0.76	
12								0.76	
13								0.76	
14								0.76	
15								0.76	
16								0.76	

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-1
Alias:	Luminescence
Replicates:	5
Mean:	0.686
SD:	0.04
Tr Mean:	4.749
Trans SD:	0.14

Ref Samp:	x2
Ref ID:	Control
Alias:	Luminescence
Replicates:	5
Mean:	0.956
SD:	0.026
Tr Mean:	5.611
Trans SD:	0.076

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.073
SS:	0.102
K:	5
b:	0.308
Alpha Level:	0.05
Calculated Value:	0.9312
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.114
Test Residual SD:	0.058
Ref. Residual Mean:	0.056
Ref. Residual SD:	0.043
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.7951
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	12.0584
Critical Value:	>= 1.860
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.73	4.901	0.94	5.564	0.152	0.047			-0.161
2	0.65	4.624	1	5.739	0.125	0.129			-0.125
3	0.72	4.868	0.94	5.564	0.118	0.047			-0.047
4	0.64	4.589	0.94	5.564	0.161	0.047			-0.047
5	0.69	4.765	0.96	5.623	0.016	0.012			-0.047
6									0.012
7									0.016
8									0.118
9									0.129
10									0.152

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-1
Alias:	Luminescence 15
Replicates:	5
Mean:	0.166
SD:	0.009
Tr Mean:	2.334
Trans SD:	0.062

Ref Samp:	x2
Ref ID:	Control
Alias:	Luminescence 15
Replicates:	5
Mean:	0.838
SD:	0.034
Tr Mean:	5.251
Trans SD:	0.107

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.057
SS:	0.061
K:	5
b:	0.239
Alpha Level:	0.05
Calculated Value:	0.9289
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.05
Test Residual SD:	0.027
Ref. Residual Mean:	0.08
Ref. Residual SD:	0.059
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.0345
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	52.6779
Critical Value:	>= 1.860
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.16	2.292	0.85	5.29	0.042	0.038			-0.12
2	0.17	2.363	0.8	5.132	0.029	0.12			-0.056
3	0.16	2.292	0.82	5.195	0.042	0.056			-0.042
4	0.16	2.292	0.83	5.227	0.042	0.024			-0.042
5	0.18	2.432	0.89	5.413	0.097	0.162			-0.042
6									-0.024
7									0.029
8									0.038
9									0.097
10									0.162

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-2
Alias:	Chironomid Growth
Replicates:	8
Mean:	0.87
SD:	0.217
Tr Mean:	0.269
Trans SD:	0.049

Ref Samp:	x2
Ref ID:	Control
Alias:	Chironomid Growth
Replicates:	8
Mean:	0.909
SD:	0.11
Tr Mean:	0.28
Trans SD:	0.025

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.033
SS:	0.021
K:	8
b:	0.141
Alpha Level:	0.05
Calculated Value:	0.9478
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.04
Test Residual SD:	0.024
Ref. Residual Mean:	0.02
Ref. Residual SD:	0.013
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.9909
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Log10 (x + 1.0)

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	11
Experimental Alpha Level:	0.05
Calculated Value:	0.5526
Critical Value:	>= 1.796
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.95	0.29	0.83	0.262	0.021	0.018			-0.049
2	0.66	0.22	0.87	0.272	0.049	0.008			-0.049
3	1.1	0.322	0.86	0.27	0.053	0.011			-0.045
4	0.66	0.22	0.93	0.286	0.049	0.005			-0.029
5	1.26	0.354	1.02	0.305	0.085	0.025			-0.019
6	0.78	0.25	1	0.301	0.019	0.021			-0.018
7	0.74	0.241	1.04	0.31	0.029	0.03			-0.012
8	0.81	0.258	0.72	0.236	0.012	0.045			-0.011
9									-0.008
10									0.005
11									0.021
12									0.021
13									0.025
14									0.03
15									0.053
16									0.085

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-2
Alias:	Chironomid Mortality
Replicates:	8
Mean:	23.963
SD:	12.933
Tr Mean:	27.369
Trans SD:	12.382

Ref Samp:	x2
Ref ID:	Control
Alias:	Chironomid Mortality
Replicates:	8
Mean:	6.25
SD:	7.397
Tr Mean:	10.216
Trans SD:	11.272

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	10.163
SS:	1962.613
K:	8
b:	42.307
Alpha Level:	0.05
Calculated Value:	0.912
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.466
Test Residual SD:	8.45
Ref. Residual Mean:	10.216
Ref. Residual SD:	2.788
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	0.5562
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	2.8974
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	25	30	16.7	24.12	2.631	13.904			-27.369
2	16.7	24.12	0	0	3.248	10.216			-10.216
3	25	30	8.3	16.744	2.631	6.528			-10.216
4	16.7	24.12	0	0	3.248	10.216			-10.216
5	33.3	35.244	16.7	24.12	7.875	13.904			-10.216
6	0	0	0	0	27.369	10.216			-3.248
7	41.7	40.222	0	0	12.853	10.216			-3.248
8	33.3	35.244	8.3	16.744	7.875	6.528			2.631
9									2.631
10									6.528
11									6.528
12									7.875
13									7.875
14									12.853
15									13.904
16									13.904

Project Name: Test America

Sample:	x1
Samp ID:	WETSED2
Alias:	Hyalella Mortality
Replicates:	8
Mean:	13.75
SD:	11.573
Tr Mean:	19.462
Trans SD:	11.307

Ref Samp:	x2
Ref ID:	Control
Alias:	Hyalella Mortality
Replicates:	8
Mean:	1.25
SD:	2.315
Tr Mean:	3.23
Trans SD:	5.981

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	7.764
SS:	1145.389
K:	8
b:	31.911
Alpha Level:	0.05
Calculated Value:	0.8891
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	8.65
Test Residual SD:	6.507
Ref. Residual Mean:	4.845
Ref. Residual SD:	2.991
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	1.5026
Critical Value:	>= 1.761
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	14
Experimental Alpha Level:	0.05
Calculated Value:	3.5891
Critical Value:	>= 1.761
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	10	18.435	0	0	1.027	3.23			-19.462
2	5	12.921	0	0	6.541	3.23			-6.541
3	5	12.921	0	0	6.541	3.23			-6.541
4	20	26.565	5	12.921	7.103	9.691			-3.23
5	30	33.211	0	0	13.749	3.23			-3.23
6	30	33.211	0	0	13.749	3.23			-3.23
7	0	0	5	12.921	19.462	9.691			-3.23
8	10	18.435	0	0	1.027	3.23			-3.23
9									-3.23
10									-1.027
11									-1.027
12									7.103
13									9.691
14									9.691
15									13.749
16									13.749

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-2
Alias:	Luminescence 5
Replicates:	5
Mean:	0.714
SD:	0.013
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	Luminescence 5
Replicates:	5
Mean:	0.956
SD:	0.026
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.041
SS:	0.032
K:	5
b:	0.16
Alpha Level:	0.05
Calculated Value:	0.8075
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0.038
Test Residual SD:	0.016
Ref. Residual Mean:	0.056
Ref. Residual SD:	0.043
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.8791
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	25
Critical Value:	>= 21.000
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.7	1.5	0.94	7	0.048	0.047	1.5		-0.048
2	0.7	1.5	1	10	0.048	0.129	1.5		-0.048
3	0.73	5	0.94	7	0.054	0.047	3.5		-0.047
4	0.72	3.5	0.94	7	0.021	0.047	3.5		-0.047
5	0.72	3.5	0.96	9	0.021	0.012	5		-0.047
6							7		0.012
7							7		0.021
8							7		0.021
9							9		0.054
10							10		0.129

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-2
Alias:	Luminescence 15
Replicates:	5
Mean:	0.25
SD:	0.016
Tr Mean:	2.865
Trans SD:	0.091

Ref Samp:	x2
Ref ID:	Control
Alias:	Luminescence 15
Replicates:	5
Mean:	0.838
SD:	0.034
Tr Mean:	5.251
Trans SD:	0.107

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.064
SS:	0.079
K:	5
b:	0.274
Alpha Level:	0.05
Calculated Value:	0.9565
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.069
Test Residual SD:	0.048
Ref. Residual Mean:	0.08
Ref. Residual SD:	0.059
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.326
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	38.0359
Critical Value:	>= 1.860
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.23	2.749	0.85	5.29	0.116	0.038			-0.12
2	0.25	2.866	0.8	5.132	0.001	0.12			-0.116
3	0.26	2.923	0.82	5.195	0.058	0.056			-0.057
4	0.24	2.808	0.83	5.227	0.057	0.024			-0.056
5	0.27	2.979	0.89	5.413	0.114	0.162			-0.024
6									0.001
7									0.038
8									0.058
9									0.114
10									0.162

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-3
Alias:	Chironomid Growth
Replicates:	8
Mean:	0.603
SD:	0.572
Tr Mean:	0.181
Trans SD:	0.154

Ref Samp:	x2
Ref ID:	Control
Alias:	Chironomid Growth
Replicates:	8
Mean:	0.909
SD:	0.11
Tr Mean:	0.28
Trans SD:	0.025

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.094
SS:	0.17
K:	8
b:	0.397
Alpha Level:	0.05
Calculated Value:	0.9275
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.123
Test Residual SD:	0.079
Ref. Residual Mean:	0.02
Ref. Residual SD:	0.013
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	3.668
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Log10 (x + 1.0)

Experimental Hypothesis

Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	7
Experimental Alpha Level:	0.05
Calculated Value:	1.8016
Critical Value:	>= 1.895
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	1.63	0.42	0.83	0.262	0.239	0.018			-0.181
2	0.61	0.207	0.87	0.272	0.026	0.008			-0.181
3	0.14	0.057	0.86	0.27	0.124	0.011			-0.124
4	0	0	0.93	0.286	0.181	0.005			-0.045
5	0	0	1.02	0.305	0.181	0.025			-0.018
6	0.49	0.173	1	0.301	0.008	0.021			-0.011
7	0.94	0.288	1.04	0.31	0.107	0.03			-0.008
8	1.01	0.303	0.72	0.236	0.122	0.045			-0.008
9									0.005
10									0.021
11									0.025
12									0.026
13									0.03
14									0.107
15									0.122
16									0.239

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-3
Alias:	Chironomid Mortality
Replicates:	8
Mean:	63.538
SD:	31.175
Tr Mean:	63.432
Trans SD:	34.433

Ref Samp:	x2
Ref ID:	Control
Alias:	Chironomid Mortality
Replicates:	8
Mean:	6.25
SD:	7.397
Tr Mean:	10.216
Trans SD:	11.272

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	21.992
SS:	9188.96
K:	8
b:	90.436
Alpha Level:	0.05
Calculated Value:	0.89
Critical Value:	<= 0.887
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	28.035
Test Residual SD:	16.953
Ref. Residual Mean:	10.216
Ref. Residual SD:	2.788
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.9335
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	4.1544
Critical Value:	>= 1.860
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	66.7	54.756	16.7	24.12	8.677	13.904			-33.433
2	25	30	0	0	33.433	10.216			-28.188
3	91.7	73.256	8.3	16.744	9.823	6.528			-28.188
4	100	114.591	0	0	51.159	10.216			-13.655
5	100	114.591	16.7	24.12	51.159	13.904			-10.216
6	58.3	49.778	0	0	13.655	10.216			-10.216
7	33.3	35.244	0	0	28.188	10.216			-10.216
8	33.3	35.244	8.3	16.744	28.188	6.528			-10.216
9									-8.677
10									6.528
11									6.528
12									9.823
13									13.904
14									13.904
15									51.159
16									51.159

Project Name: Test America

Sample:	x1
Samp ID:	WETSED3
Alias:	Hyalella Mortality
Replicates:	8
Mean:	3.75
SD:	4.432
Tr Mean:	0.263
Trans SD:	0.953

Ref Samp:	x2
Ref ID:	Control
Alias:	Hyalella Mortality
Replicates:	8
Mean:	1.25
SD:	2.315
Tr Mean:	-0.263
Trans SD:	0.582

Shapiro-Wilk Results:

Residual Mean:	
Residual SD:	
SS:	
K:	
b:	
Alpha Level:	N/A
Calculated Value:	N/A
Critical Value:	N/A
Normally Distributed:	N/A
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0.84
Test Residual SD:	0.32
Ref. Residual Mean:	0.471
Ref. Residual SD:	0.291
Deg. of Freedom:	14
Alpha Level:	0.1
Calculated Value:	2.4118
Critical Value:	>= 1.761
Variances Homogeneous:	No

Test Results:

Statistic:	Approximate t
Balanced Design:	Yes
Transformation:	Rankits
Experimental Hypothesis	
Null:	x1 <= x2
Alternate:	x1 > x2
Degrees of Freedom:	12
Experimental Alpha Level:	0.05
Calculated Value:	1.3315
Critical Value:	>= 1.782
Accept Null Hypothesis:	Yes
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0	-0.577	0	-0.577	0.84	0.314		-0.577	
2	5	0.68	0	-0.577	0.417	0.314		-0.577	
3	10	1.526	0	-0.577	1.263	0.314		-0.577	
4	10	1.526	5	0.68	1.263	0.943		-0.577	
5	5	0.68	0	-0.577	0.417	0.314		-0.577	
6	0	-0.577	0	-0.577	0.84	0.314		-0.577	
7	0	-0.577	5	0.68	0.84	0.943		-0.577	
8	0	-0.577	0	-0.577	0.84	0.314		-0.577	
9								-0.577	
10								-0.577	
11								0.68	
12								0.68	
13								0.68	
14								0.68	
15								1.526	
16								1.526	

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-3
Alias:	Luminescence 5
Replicates:	5
Mean:	0.812
SD:	0.011
Tr Mean:	N/A
Trans SD:	N/A

Ref Samp:	x2
Ref ID:	Control
Alias:	Luminescence 5
Replicates:	5
Mean:	0.956
SD:	0.026
Tr Mean:	N/A
Trans SD:	N/A

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.038
SS:	0.028
K:	5
b:	0.15
Alpha Level:	0.05
Calculated Value:	0.7975
Critical Value:	<= 0.842
Normally Distributed:	No
Override Option:	Not Invoked

Levene's Results:

Test Residual Mean:	0.031
Test Residual SD:	0.007
Ref. Residual Mean:	0.056
Ref. Residual SD:	0.043
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	1.3107
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Mann-Whitney
Balanced Design:	Yes
Transformation:	rank-order
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Mann-Whitney N1:	5
Mann-Whitney N2:	5
Degrees of Freedom:	
Experimental Alpha Level:	0.05
Calculated Value:	25
Critical Value:	>= 21.000
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.8	1.5	0.94	7	0.038	0.047	1.5		-0.047
2	0.82	4	1	10	0.026	0.129	1.5		-0.047
3	0.82	4	0.94	7	0.026	0.047	4		-0.047
4	0.82	4	0.94	7	0.026	0.047	4		-0.038
5	0.8	1.5	0.96	9	0.038	0.012	4		-0.038
6							7		0.012
7							7		0.026
8							7		0.026
9							9		0.026
10							10		0.129

Project Name: Test America

Sample:	x1
Samp ID:	WETSED-3
Alias:	Luminescence 15
Replicates:	5
Mean:	0.356
SD:	0.023
Tr Mean:	3.419
Trans SD:	0.111

Ref Samp:	x2
Ref ID:	Control
Alias:	Luminescence 15
Replicates:	5
Mean:	0.838
SD:	0.034
Tr Mean:	5.251
Trans SD:	0.107

Shapiro-Wilk Results:

Residual Mean:	0
Residual SD:	0.071
SS:	0.095
K:	5
b:	0.295
Alpha Level:	0.05
Calculated Value:	0.92
Critical Value:	<= 0.842
Normally Distributed:	Yes
Override Option:	N/A

Levene's Results:

Test Residual Mean:	0.092
Test Residual SD:	0.041
Ref. Residual Mean:	0.08
Ref. Residual SD:	0.059
Deg. of Freedom:	8
Alpha Level:	0.1
Calculated Value:	0.3728
Critical Value:	>= 1.860
Variances Homogeneous:	Yes

Test Results:

Statistic:	Student's t
Balanced Design:	Yes
Transformation:	ArcSin
Experimental Hypothesis	
Null:	x1 >= x2
Alternate:	x1 < x2
Degrees of Freedom:	8
Experimental Alpha Level:	0.05
Calculated Value:	26.6272
Critical Value:	>= 1.860
Accept Null Hypothesis:	No
Power:	
Min. Difference for Power:	

Replicate Number	Test Data	Trans. Test Data	Reference Data	Trans. Reference Data	Levene's Test Residuals	Levene's Reference Residuals	Mann-Whitney Ranks	Rankits	Shipiro-Wilk Residuals
1	0.34	3.343	0.85	5.29	0.076	0.038			-0.126
2	0.33	3.293	0.8	5.132	0.126	0.12			-0.12
3	0.38	3.534	0.82	5.195	0.115	0.056			-0.076
4	0.38	3.534	0.83	5.227	0.115	0.024			-0.056
5	0.35	3.392	0.89	5.413	0.028	0.162			-0.028
6									-0.024
7									0.038
8									0.115
9									0.115
10									0.162

APPENDIX C – *Water Quality Summaries*

Appendix Table B-1. Twenty-Day Solid-Phase Results (*Chironomus tentans*)
Test America Sediment Characterization
Water Quality Data

Initiated June 9, 2011

Control								
Day	**Temp (°C)**	**D.O. (mg/l)**	**pH (units)**	**Conductivity (umhos/cm)**	**Alkalinity (mg/L CaCO3)**	**Hardness (mg/L CaCO3)**	**Total Overlying NH_3 (mg/l)**	**Total Sulfides (mg/l)**
0	21.7	8.4	6.58	150	48	80	1.1	0.058
1	22.2	6.3	6.62	127	---	---	---	---
2	22.0	6.4	7.12	165	---	---	---	---
3	21.9	6.0	7.31	173	---	---	---	---
4	22.1	5.8	6.94	216	---	---	---	---
5	22.2	5.8	7.19	188	52	80	1.7	<0.010
6	21.9	5.6	7.27	178	---	---	---	---
7	22.0	5.0	7.11	217	---	---	---	---
8	22.0	5.2	7.17	212	---	---	---	---
9	22.2	6.0	7.14	195	---	---	---	---
10	22.0	6.0	7.20	199	56	88	1.6	<0.010
11	22.2	6.0	7.28	264	---	---	---	---
12	22.1	5.6	7.20	195	---	---	---	---
13	22.2	3.3	7.11	202	---	---	---	---
14	22.1	8.3	7.86	296	---	---	---	---
15	22.1	7.9	7.67	220	60	88	1.7	<0.010
16	22.0	7.8	7.72	232	---	---	---	---
17	21.9	9.0	7.92	276	---	---	---	---
18	22.2	9.0	7.97	219	---	---	---	---
19	21.9	8.9	7.83	248	---	---	---	---
20	21.9	8.3	7.99	190	72	80	1.7	0.011
Mean	**22.0**	**6.7**	**7.34**	**208**	**58**	**83**	**1.6**	**nc**
Min	**21.7**	**3.3**	**6.58**	**127**	**48**	**80**	**1.1**	**<0.010**
Max	**22.2**	**9.0**	**7.99**	**296**	**72**	**88**	**1.7**	**0.058**

Appendix Table B-1. Twenty-Day Solid-Phase Results (*Chironomus tentans*)
Test America Sediment Characterization
Water Quality Data

Initiated June 9, 2011

WETSED-1								
Day	**Temp (°C)**	**D.O. (mg/l)**	**pH (units)**	**Conductivity (umhos/cm)**	**Alkalinity (mg/L CaCO3)**	**Hardness (mg/L CaCO3)**	**Total Overlying NH_3 (mg/l)**	**Total Sulfides (mg/l)**
0	21.8	7.0	6.43	227	64	100	<1.0	0.016
1	22.2	6.1	6.68	215	---	---	---	---
2	21.9	6.0	6.98	200	---	---	---	---
3	21.9	5.8	7.06	186	---	---	---	---
4	22.1	6.6	6.65	185	---	---	---	---
5	22.1	6.5	6.97	180	64	100	1.0	0.014
6	22.0	5.6	7.09	175	---	---	---	---
7	22.1	5.0	6.89	179	---	---	---	---
8	22.0	5.3	7.02	180	---	---	---	---
9	22.2	6.2	6.97	181	---	---	---	---
10	22.2	6.0	7.00	180	68	104	1.2	<0.010
11	22.2	5.5	7.08	190	---	---	---	---
12	22.1	5.8	7.09	184	---	---	---	---
13	22.2	3.5	7.04	186	---	---	---	---
14	21.9	8.1	7.68	162	---	---	---	---
15	22.0	7.7	7.67	171	68	108	1.3	<0.010
16	22.0	7.8	7.69	178	---	---	---	---
17	22.0	8.9	7.35	155	---	---	---	---
18	22.1	8.9	7.89	159	---	---	---	---
19	22.0	9.0	7.76	149	---	---	---	---
20	21.8	8.4	7.70	153	60	80	<1.0	0.054
Mean	**22.0**	**6.7**	**7.18**	**180**	**65**	**98**	**nc**	**nc**
Min	**21.8**	**3.5**	**6.43**	**149**	**60**	**80**	**<1.0**	**<0.010**
Max	**22.2**	**9.0**	**7.89**	**227**	**68**	**108**	**1.3**	**0.054**

Appendix Table B-1. Twenty-Day Solid-Phase Results (*Chironomus tentans*)
Test America Sediment Characterization
Water Quality Data

Initiated June 9, 2011

WETSED-2								
Day	**Temp (°C)**	**D.O. (mg/l)**	**pH (units)**	**Conductivity (umhos/cm)**	**Alkalinity (mg/L CaCO3)**	**Hardness (mg/L CaCO3)**	**Total Overlying NH_3 (mg/l)**	**Total Sulfides (mg/l)**
0	21.9	7.2	6.46	389	68	220	<1.0	<0.010
1	22.1	6.9	6.75	413	---	---	---	---
2	21.9	6.7	6.95	343	---	---	---	---
3	21.8	5.9	6.98	308	---	---	---	---
4	21.9	7.1	6.56	329	---	---	---	---
5	22.0	6.6	6.81	283	72	220	<1.0	<0.010
6	21.8	6.1	6.94	266	---	---	---	---
7	21.9	5.2	6.87	254	---	---	---	---
8	21.9	5.3	6.92	257	---	---	---	---
9	22.0	6.7	6.86	238	---	---	---	---
10	22.0	6.0	6.90	240	68	228	1.3	<0.010
11	22.0	6.6	7.11	225	---	---	---	---
12	22.0	6.5	7.05	214	---	---	---	---
13	22.0	6.0	7.00	206	---	---	---	---
14	22.0	8.4	7.74	191	---	---	---	---
15	22.0	7.8	7.59	194	72	224	1.2	<0.010
16	22.0	7.7	7.63	195	---	---	---	---
17	22.0	8.9	7.28	176	---	---	---	---
18	21.9	8.9	7.80	179	---	---	---	---
19	21.7	9.1	7.76	158	---	---	---	---
20	21.7	8.5	7.71	161	64	84	<1.0	0.044
Mean	**21.9**	**7.1**	**7.13**	**249**	**69**	**195**	**nc**	**nc**
Min	**21.7**	**5.2**	**6.46**	**158**	**64**	**84**	**<1.0**	**<0.010**
Max	**22.1**	**9.1**	**7.80**	**413**	**72**	**228**	**1.3**	**0.044**

Appendix Table B-1. Twenty-Day Solid-Phase Results (*Chironomus tentans*)
Test America Sediment Characterization
Water Quality Data

Initiated June 9, 2011

WETSED-3								
Day	**Temp (°C)**	**D.O. (mg/l)**	**pH (units)**	**Conductivity (umhos/cm)**	**Alkalinity (mg/L CaCO3)**	**Hardness (mg/L CaCO3)**	**Total Overlying NH_3 (mg/l)**	**Total Sulfides (mg/l)**
0	21.9	6.3	6.80	382	84	116	<1.0	0.021
1	22.1	6.5	7.19	373	---	---	---	---
2	21.7	6.2	7.32	340	---	---	---	---
3	21.9	6.0	7.30	301	---	---	---	---
4	21.9	7.0	6.95	311	---	---	---	---
5	22.0	6.3	7.10	274	84	120	<1.0	0.019
6	21.8	5.9	7.19	252	---	---	---	---
7	21.8	5.2	7.13	244	---	---	---	---
8	21.9	5.3	7.15	247	---	---	---	---
9	22.0	6.8	7.13	220	---	---	---	---
10	22.0	6.2	7.15	244	88	136	<1.0	<0.010
11	22.0	6.8	7.32	222	---	---	---	---
12	22.0	6.7	7.24	212	---	---	---	---
13	22.1	5.3	7.16	210	---	---	---	---
14	21.9	8.7	7.92	193	---	---	---	---
15	21.9	7.9	7.70	221	88	140	<1.0	<0.010
16	22.0	7.8	7.67	219	---	---	---	---
17	22.0	9.0	7.52	205	---	---	---	---
18	21.9	8.9	7.99	217	---	---	---	---
19	21.8	8.8	7.78	192	---	---	---	---
20	21.7	8.4	7.73	196	80	100	<1.0	<0.010
Mean	**21.9**	**7.0**	**7.35**	**251**	**85**	**122**	**nc**	**nc**
Min	**21.7**	**5.2**	**6.80**	**192**	**80**	**100**	**<1.0**	**<0.010**
Max	**22.1**	**9.0**	**7.99**	**382**	**88**	**140**	**<1.0**	**0.021**

Appendix Table B-2. Ten-Day Solid-Phase Results (*Hyalella Azteca*)
Test America Sediment Characterization
Water Quality Data

Initiated June 7, 2011

Control

Day	Temp (°C)	D.O. (mg/l)	pH (units)	Conductivity (umhos/cm)	Alkalinity (mg/L CaCO3)	Hardness (mg/L CaCO3)	Overlying NH_3 (mg/l)	Overlying Sulfides (mg/l)
0	23.4	8.0	6.50	145	44	60	<1.0	<0.010
1	22.8	7.1	6.79	149	---	---	---	---
2	22.4	6.8	6.81	162	---	---	---	---
3	22.3	7.0	7.77	189	---	---	---	---
4	21.9	6.2	7.43	180	---	---	---	---
5	21.9	6.8	7.51	172	52	72	<1.0	0.056
6	21.9	8.4	7.14	170	---	---	---	---
7	22.1	7.0	7.54	176	---	---	---	---
8	22.0	6.3	7.79	182	---	---	---	---
9	22.1	5.8	7.21	180	---	---	---	---
10	22.0	7.4	7.37	182	60	76	<1.0	0.125
Mean	**22.3**	**7.0**	**7.26**	**172**	**52**	**69**	**nc**	**nc**
Min	**21.9**	**5.8**	**6.50**	**145**	**44**	**60**	**<1.0**	**<0.010**
Max	**23.4**	**8.4**	**7.79**	**189**	**60**	**76**	**<1.0**	**0.125**

NC = Not Calculable

WETSED-1

Day	Temp (°C)	D.O. (mg/l)	pH (units)	Conductivity (umhos/cm)	Alkalinity (mg/L CaCO3)	Hardness (mg/L CaCO3)	Total Overlying NH_3	Overlying Sulfides (mg/l)
0	23.3	6.6	6.27	262	60	124	<1.0	0.014
1	22.8	6.0	6.22	232	---	---	---	---
2	22.1	6.4	6.39	202	---	---	---	---
3	22.3	6.1	7.20	189	---	---	---	---
4	22.0	6.1	7.02	184	---	---	---	---
5	21.9	6.2	7.00	174	68	132	<1.0	0.036
6	21.9	7.0	7.00	166	---	---	---	---
7	22.1	6.3	7.05	165	---	---	---	---
8	21.9	6.0	7.19	164	---	---	---	---
9	21.9	5.4	6.87	165	---	---	---	---
10	21.9	7.3	6.93	164	72	132	1.0	0.293
Mean	**22.2**	**6.3**	**6.83**	**188**	**67**	**129**	**nc**	**0.114**
Min	**21.9**	**5.4**	**6.22**	**164**	**60**	**124**	**<1.0**	**0.014**
Max	**23.3**	**7.3**	**7.20**	**262**	**72**	**132**	**1.0**	**0.293**

NC = Not Calculable

Appendix Table B-2. Ten-Day Solid-Phase Results (*Hyalella Azteca*)
Test America Sediment Characterization
Water Quality Data

Initiated June 7, 2011

WETSED-2

Day	Temp (°C)	D.O. (mg/l)	pH (units)	Conductivity (umhos/cm)	Alkalinity (mg/L CaCO3)	Hardness (mg/L CaCO3)	Total Overlying NH_3	Overlying Sulfides (mg/l)
0	23.3	6.9	6.45	418	64	192	<1.0	0.012
1	22.8	6.2	6.35	402	---	---	---	---
2	22.2	6.4	6.41	334	---	---	---	---
3	22.3	6.4	7.18	314	---	---	---	---
4	21.9	6.1	6.99	273	---	---	---	---
5	21.9	6.3	6.97	277	80	200	<1.0	0.037
6	22.0	7.2	6.65	253	---	---	---	---
7	22.1	6.8	7.02	241	---	---	---	---
8	21.9	6.1	7.17	210	---	---	---	---
9	22.0	5.4	6.89	201	---	---	---	---
10	21.9	7.1	7.05	190	80	204	<1.0	0.126
Mean	**22.2**	**6.4**	**6.83**	**283**	**75**	**199**	**nc**	**0.058**
Min	**21.9**	**5.4**	**6.35**	**190**	**64**	**192**	**<1.0**	**0.012**
Max	**23.3**	**7.2**	**7.18**	**418**	**80**	**204**	**<1.0**	**0.126**

NC = Not Calculable

WETSED-3

Day	Temp (°C)	D.O. (mg/l)	pH (units)	Conductivity (umhos/cm)	Alkalinity (mg/L CaCO3)	Hardness (mg/L CaCO3)	Total Overlying NH_3	Overlying Sulfides (mg/l)
0	23.2	6.6	6.64	343	68	172	<1.0	<0.010
1	22.8	6.1	6.96	288	---	---	---	---
2	22.2	6.3	6.63	235	---	---	---	---
3	22.3	6.4	7.37	222	---	---	---	---
4	22.0	6.5	7.12	216	---	---	---	---
5	21.9	6.4	7.11	214	76	180	<1.0	0.074
6	21.8	7.3	6.80	203	---	---	---	---
7	22.1	6.9	7.14	204	---	---	---	---
8	21.9	6.1	7.23	159	---	---	---	---
9	22.0	5.6	6.97	187	---	---	---	---
10	21.9	7.2	7.11	184	72	188	<1.0	0.107
Mean	**22.2**	**6.5**	**7.01**	**223**	**72**	**180**	**nc**	**nc**
Min	**21.8**	**5.6**	**6.63**	**159**	**68**	**172**	**<1.0**	**<0.010**
Max	**23.2**	**7.3**	**7.37**	**343**	**76**	**188**	**<1.0**	**0.107**

NC = Not Calculable

APPENDIX D – Laboratory Bench Sheets

20 Day Toxicity Test Data Sheet -- Nautilus Environmental

Freshwater Sediment 20 Day Water Chemistries

Client: Test America Test #: — Start Date & Time: 6/9/11 1100

Site: LDN Test Organism: *Chironomus tentans* End Date & Time: 6/29/11 1300

Day	NH_3 (mg/L)	Sulfide (mg/L)	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp. (°C)	Renewed am	Renewed pm	Fed	Tech. Initials
0	1.1	0.058 ①	48	80	6.58	150	8.4	21.7	✓	✓	✓	JS
1					~~7~~ 6.62	127	6.3	22.2	✓	✓	✓	MF
2					7.12	165	6.4	22.0	✓	✓	✓	MF
3					7.31	~~173~~ MF 173	6.0	21.9	✓	✓	✓	MF
4					6.94	216	5.8	22.1	✓	✓	✓	BP
5	1.7	<0.01	52	80	7.19	188	5.8	22.2	✓	✓	✓	BP
6					7.27	178	5.6	21.9	✓	✓	✓	BP
7					7.11	217	5.0	22.0	✓	✓	✓	BP
8					7.17	212	5.2	22.0	✓	✓	②	EK
9					7.14	195	6.0	22.2	✓	✓	✓	CC
10	1.6	<0.01	56	88	7.20	199	6.0	22.0	✓	✓	✓	(M)
11					7.28	264	6.0	22.2	✓	✓	✓	BP
12					7.20	195	5.6	22.1	✓	✓	✓	EK
13					7.11	202	3.3	22.2	✓	✓	✓	JS *
14					7.86	296	8.3	22.1	✓	✓	✓	BP
15	1.7	<0.01	60	88	7.67	220	7.9	22.1	✓	✓	✓	MF
16					7.72	232	7.8	22.0	✓	✓	✓	EK
17					7.92	276	9.0	21.9	✓	✓	✓	(M)
18					7.97	219	9.0	22.2	✓	✓	✓	MF
19					7.83	248	8.9	21.9	✓	✓	✓	(M)
20	1.7	0.011	72	80	7.99	190	8.3	21.9				BP

① water subsample was dark - MF QA Check: CC ② skipped due to extra food (*) Test duration initiated day 13 Test Chamber: Rm A

20 Day Toxicity Test Data Sheet -- Nautilus Environmental

Freshwater Sediment 20 Day Water Chemistries

Client: Test America Test #: 1106-TU26 Start Date & Time: 6/9/11 1100

Site: WETSED 1 Test Organism: *Chironomus tentans* End Date & Time: 6/29/11 1300

Day	NH_3 (mg/L)	Sulfide (mg/L)	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp. (°C)	Renewed am	Renewed pm	Fed	Tech. Initials
0	<1.0	0.016	64	100	6.43	227	7.0	21.8	✓	✓	✓	DD
1					6.68	215	6.1	22.2	✓	✓	✓	MF
2					6.98	200	6.0	21.9	✓	✓	✓	MF
3					7.06	186	5.8	21.9	✓	✓	✓	MF
4					6.65	185	6.6	22.1	✓	✓	✓	BP
5	1.0	0.014	64	100	6.97	180	6.5	22.1	✓	✓	✓	BP
6					7.09	175	5.6	22.0	✓	✓	✓	BP
7					6.89	179	5.0	22.1	✓	✓	✓	BP
8					7.02	180	5.3	22.0	✓	✓	①	ET
9					6.97	181	6.2	22.2	✓	✓	✓	CC
10	1.2	<0.01	68	104	7.00	180	6.0	22.2	✓	✓	✓	(M)
11					7.08	190	5.5	22.2	✓	✓	✓	BP
12					7.09	184	5.8	22.1	✓	✓	✓	ET
13					7.04	186	3.5	22.2	✓	✓	✓	DD AR
14					7.68	162	8.1	21.9	✓	✓	✓	BP
15	1.3	<0.01	68	108	7.67	171	7.7	22.0	✓	✓	✓	MF
16					7.69	178	7.8	22.0	✓	✓	✓	ET
17					7.35	155	8.9	22.0	✓	✓	✓	(M)
18					7.89	159	8.9	22.1	✓	✓	✓	MF
19					7.76	149	9.0	22.0	✓	✓	✓	(M)
20	<1.0	0.054	60	80	7.70	153	8.4	21.8				BP

QA Check: CC

Test Chamber: RM A

① Skipped due to excess food

* Testaeration initiated

20 Day Toxicity Test Data Sheet -- Nautilus Environmental

Freshwater Sediment 20 Day Water Chemistries

Client: Test America Test #: 1106-T027 Start Date & Time: 6/[illegible]/11 1100

Site: WETSED2 Test Organism: *Chironomus tentans* End Date & Time: 6/29/11 1300

Day	NH_3 (mg/L)	Sulfide (mg/L)	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp. (°C)	Renewed am	Renewed pm	Fed	Tech. Initials
0	<1.0	MF ~~2~~ <0.010	68	220	6.46	389	7.2	21.9	✓	✓	✓	BS
1					6.75	413	6.9	22.1	✓	✓	✓	MF
2					6.95	343	6.7	21.9	✓	✓	✓	MF
3					6.98	308	5.9	21.8	✓	✓	✓	MF
4					6.516	329	7.1	21.9	✓	✓	✓	BP
5	<1.0	~~2~~ <0.01	72	220	6.81	283	6.6	22.0	✓	✓	✓	BP
6					6.94	2616	6.1	21.8	✓	✓	✓	BP
7					6.87	254	5.2	21.9	✓	✓	✓	BP
8					6.92	257	5.3	21.9	✓	✓	①	CK
9					6.86	238	6.7	22.0	✓	✓	✓	CC
10	1.3	<0.01	68	228	6.90	240	6.0	22.0	✓	✓	✓	M
11					7.11	225	6.6	22.0	✓	✓	✓	BP
12					7.05	214	6.5	22.0	✓	✓	✓	CK
13					7.00	206	6.0	22.0	✓	✓	✓	BS *
14					7.74	191	8.4	22.0	✓	✓	✓	BP
15	1.2	<0.01	72	224	7.59	194	7.8	22.0	✓	✓	✓	MF
16					7.63	195	7.7	22.0	✓	✓	✓	CK
17					7.28	176	8.9	22.0	✓	✓	✓	M
18					7.80	179	8.9	21.9	✓	✓	✓	MF
19					7.76	158	9.1	21.7	✓	✓	✓	M
20	<1.0	0.044	64	84	7.71	161	8.5	21.7				BP

QA Check: CC Test Chamber: RM A

① Skipped due to excess food

* Test aeration initiated

20 Day Toxicity Test Data Sheet -- Nautilus Environmental

Freshwater Sediment 20 Day Water Chemistries

Client: Test America Test #: 1106-T028 Start Date & Time: 6/9/11 1100

Site: WETSED3 Test Organism: *Chironomus tentans* End Date & Time: 6/29/11 1300

Day	NH_3 (mg/L)	Sulfide (mg/L)	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp. (°C)	Renewed am	Renewed pm	Fed	Tech. Initials
0	<1.0	0.021	84	116	6.80	382	6.3	21.9	✓	✓	✓	BP
1					7.19	373	6.5	22.1	✓	✓	✓	MF
2					7.32	340	6.2	21.7	✓	✓	✓	MF
3					7.30	301	6.0	21.9	✓	✓	✓	MF
4					6.95	311	7.0	21.9	✓	✓	✓	BP
5	<1.0	0.019	84	120	7.10	274	6.3	22.0	✓	✓	✓	BP
6					7.19	252	5.9	21.8	✓	✓	✓	BP
7					7.13	244	5.2	21.8	✓	✓	✓	BP
8					7.15	247	5.3	21.9	✓	✓	①	BP
9					7.13	220	6.8	22.0	✓	✓	✓	CC
10	<1.0	<0.01	88	136	7.15	244	6.2	22.0	✓	✓	✓	BP
11					7.32	222	6.8	22.0	✓	✓	✓	BP
12					7.24	212	6.7	22.0	✓	✓	✓	BP
13					7.16	210	5.3	22.1	✓	✓	✓	BP *
14					7.92	193	8.7	21.9	✓	✓	✓	BP
15	<1.0	<0.01	88	140	7.70	221	7.9	21.9	✓	✓	✓	MF
16					7.67	219	7.8	22.0	✓	✓	✓	BP
17					7.52	205	9.0	22.0	✓	✓	✓	BP
18					7.99	217	8.9	21.9	✓	✓	✓	MF
19					7.78	192	8.8	21.8	✓	✓	✓	BP
20	<1.0	<0.01	80	100	7.73	196	8.4	21.7				BP

QA Check: CC Test Chamber: RM A

① Skipped due to excess food

* Test aeration initiated

20 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 20 day Survival

Client: Test America
Test #: 1106-T026, -T027, -T028

Start Date & Time: 6/9/11 1100
End Date & Time: 6/29/11 1300
Test Organism: *Chironomus dilutus*

Site	Rep #	Cont #	Day 0	Survival Day 20 total	#larvae	#pupae	#flies	Initials/Comments
CON	1	29	12	10	10	0	0	JJ
	2	8	12	12	12			BP
	3	18	12	11	11			JJ
	4	21	12	12	12			BP
	5	24	12	10	10			JJ
	6	10	12	12	12			BP
	7	4	12	12	12			JJ
	8	31	12	~~8~~ 11	11			BP
WETSED1	1	13	12	12	12			JJ
	2	11	12	12	12			BP
	3	22	12	10	10			JJ *
	4	1	12	7	7			BP
	5	26	12	12	12			BP
	6	3	12	9	9			BP
	7	16	12	5	5			JJ
	8	6	12	9	9			BP
WETSED2	1	14	12	9	9			JJ
	2	12	12	10	10			BP
	3	9	12	9	9			JJ
	4	15	12	10	10			BP
	5	19	12	8	8			JJ *
	6	30	12	12	12			JJ
	7	27	12	7	7			BP
	8	17	12	8	8			JJ
WETSED3	1	20	12	4	4			BP
	2	2	12	9	9			JJ
	3	25	12	1	1			BP
	4	7	12	0	0			JJ *
	5	5	12	0	0			BP
	6	28	12	5	~~2~~ 5			JJ
	7	32	12	8	8			BP
	8	23	12	8	8			JJ
	1		12					
	2		12					
	3		12					
	4		12					
	5		12					
	6		12					
	7		12					
	8		12					
	1		12					
	2		12					
	3		12					
	4		12					
	5		12					
	6		12					
	7		12					
	8		12					

QA Check: CC

* nematodes present

Nautilus Environmental
Washington Laboratory
5009 Pacific Hwy., E. Suite 2
Tacoma, WA 98424

Client: Test America
Organism: *Chironomus tentans*
Test no.: 1106-T026-T028

Site	Rep #	Cont #	Pan wt. (gm)	Dry wt. (gm)	Ash wt. (gm)	Ash free dry wt. (gm)	No. organisms	Avg. per site (mg)
CON	1	29	0.07546	0.09222	0.08391		10	
	2	8	0.06494	0.07685	0.06647		12	
	3	18	0.07001	0.08554	0.07609		11	
	4	21	0.07103	0.08411	0.07296		12	
	5	24	0.07895	0.09140	0.08119		10	
	6	10	0.07216	0.08637	0.07433		12	
	7	4	0.06317	0.08488	0.07236		12	
	8	31	0.07244	0.08211	0.07417		11	
WETSED1	1	13	0.05852	0.07271	0.06070		12	
	2	11	0.06237	0.07411	0.06493		12	
	3	22	0.07449	0.07955	0.07526		10	
	4	1	0.06514	0.07418	0.06674		7	
	5	26	0.06976	0.09202	0.07306		12	
	6	3	0.06418	0.08309	0.06717		9	
	7	16	0.07372	0.07854	0.07440		5	
	8	6	0.06733	0.08448	0.07116		9	
WETSED2	1	14	0.06840	0.08015	0.07159		9	
	2	12	0.06564	0.07537	0.06878		10	
	3	9	0.07099	0.08530	0.07540		9	
	4	15	0.06877	0.07905	0.07249		10	
	5	19	0.07891	0.09458	0.08453		8	
	6	30	0.06799	0.08315	0.07383		12	
	7	27	0.06780	0.07498	0.06983		7	
	8	17	0.06625	0.07560	0.06909		8	
WETSED3	1	20	0.06439	0.07396	0.06746		4	
	2	2	0.06548	0.07344	0.06792		9	
	3	25	0.07850	0.07868	0.07854		1	
	4	7	0.06719	0.08—	—	—	0	
	5	5	0.06683	—	—	—	0	
	6	28	0.07732	0.08079	0.07833		5	
	7	32	0.07895	0.09078	0.08325		8	
	8	23	0.06552	0.07726	0.06901		8	
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	Tech Initials		KS	KS	MF		MF	

1) Dry wt. Date/time in: 6/29/11 1430 T° 62.0
Dry wt. Date/time out: 7/5/11 1400 T° 61.0
Dry wt. Tech: KS

2) Furnace date/time in: 7/7/11 ~~5~~ T° 550 ~~1200~~ @ 1100
Furnace date/time out: 7/8/11 1300 T° 550
Furnace tech: RT
QA Check: DC

10 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 10 day Water Chemistries

Client: Test America

Conc. or Site: 100%

Test #: —

Start Date & Time: 6/7/11 1445

End Date & Time: 6/17/11 1545

Test Organism: *H. azteca*

Day	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	Ammonia (mg/L)	Sulfide (mg/L)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp (°C)	Fed	Comments	Technician Initials
0	44	60	<1.0	<0.010	6.50	145	8.0	23.4	✓		
1					6.79	149	7.1	22.8	✓		
2					6.81	162	6.8	22.4	✓		
3					7.77	189	7.0	22.3	✓		MF
4					7.43	180	6.2	21.9	✓		MF
5	52	72	<1.0	0.056	7.51	172	6.8	21.9	✓		MF
6					7.14	170	8.4	21.9	✓		BP
7					7.54	176	7.0	22.1	✓		BP
8					7.79	182	6.3	22.0	✓		BP
9					7.21	180	5.8	22.1	✓		BP
10	60	76	<1.0	0.125	7.37	182	7.4	22.0	✓		CT

Test Chamber: Rm. A

QA Check: CC

10 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 10 day Water Chemistries

Client: Test America

Conc. or Site: WETSED1

Test #: 1106-T013

Start Date & Time: 6/7/11 1445

End Date & Time: 6-17-11 1545

Test Organism: *H. azteca*

Day	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	Ammonia (mg/L)	Sulfide (mg/L)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp (°C)	Fed	Comments	Technician Initials
0	60	124	<1.0	0.014	6.27	262	6.6	23.3	✓		DS
1					6.22	232	6.0	22.8	✓		DS
2					6.39	202	6.4	22.1	✓		DS
3					7.20	189	6.1	22.3	✓		MF
4					7.02	184	6.1	22.0	✓		MF
5	68	132	<1.0	0.036	7.00	174	6.2	21.9	✓		MF
6					7.00	166	7.0	21.9	✓		BP
7					7.05	165	6.3	22.1	✓		BP
8					7.19	164	6.0	21.9	✓		BP
9					6.87	165	5.4	21.9	✓		BP
10	72	132	1.0	0.293	6.93	164	7.3	21.9	✓		BP

Test Chamber: Rm. A

QA Check: [illegible]

10 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 10 day Water Chemistries

Client: Test America

Conc. or Site: WETSED2

Test #: 1106-T014

Start Date & Time: 6/7/11 1445

End Date & Time: 6-17-11 1545

Test Organism: *H. azteca*

Day	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	Ammonia (mg/L)	Sulfide (mg/L)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp (°C)	Fed	Comments	Technician Initials
0	64	192	<1.0	0.012	6.45	418	6.9	23.3	✓		JS
1					6.35	402	6.2	22.8	✓		JS
2					6.41	334	6.4	22.2	✓		JS
3					7.18	314	6.4	22.3	✓		MF
4					6.99	273	6.1	21.9	✓		MF
5	80	200	<1.0	0.037	6.97	277	6.3	21.9	✓		MF
6					6.65	253	7.2	22.0	✓		BP
7					7.02	241	6.8	22.1	✓		BP
8					7.17	210	6.1	21.9	✓		BP
9					6.89	201	5.4	22.0	✓		BP
10	80	204	<1.0	0.126	7.05	190	7.1	21.9	✓		BP

Test Chamber: Rm. A

QA Check: CC

10 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 10 day Water Chemistries

Client: Test America

Conc. or Site: WETSED3

Test #: 1106-T015

Start Date & Time: 6/7/11 1445

End Date & Time: 6-17-11 1545

Test Organism: *H. azteca*

Day	Alk (mg/L as CaCO3)	Hard (mg/L as CaCO3)	Ammonia (mg/L)	Sulfide (mg/L)	pH (units)	Conductivity (umhos/cm)	Dissolved O_2 (mg/L)	Temp (°C)	Fed	Comments	Technician Initials
0	68	172	<1.0	<0.010	6.64	343	6.6	23.2	✓		DS
1					6.61	288	6.1	22.8	✓		DS
2					6.63	235	6.3	22.2	✓		DS
3					7.37	222	6.4	22.3	✓		MF
4					7.12	216	6.5	22.0	✓		MF
5	76	180	<1.0	0.074	7.11	214	6.4	21.9	✓		MF
6					6.80	203	BP 6.7.3	21.8	✓		BP
7					7.14	204	6.9	22.1	✓		BP
8					7.23	159	6.1	21.9	✓		BP
9					6.97	187	5.6	22.0	✓		BP
10	72	188	<1.0	0.107	7.11	184	7.2	21.9	✓		BP

Test Chamber: Rm. A

QA Check: CC

10 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 10 day Survival

Client: Test America
Test #: 1106-TD13, TD14, TD15

Start Date & Time: 6/7/11 1445
End Date & Time: 6/17/11 1545
Test Organism: *H. azteca*

Conc. or site	Cont. #	Survival Day 0	Survival Day 10
CON 29		20	19 20
26		20	20
4		20	20
23		20	19
30		20	20
27		20	20
8		20	19
5		20	20
SED1 3		20	0
14		20	0
6		20	0
16		20	0
32		20	0
28		20	0
17		20	0
13		20	0
SED2 10		20	18
7		20	19
2		20	19
15		20	16
22		20	14
24		20	14
18		20	20
31		20	18
SED3 21		20	20
1		20	19
12		20	18
20		20	18
25		20	19
11		20	20
9		20	20
19		20	20
		20	
		20	
		20	
		20	
		20	
		20	
		20	
		20	
		20	
	Tech Initials		QA

Animal Source: Aquatic Indicators
Date Received: 6/2-11
Age at test initiation: 8 days

QA Check: CC

10 Day Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 10 day Observations

Client: Test America
Test #: 1106-TD13, TD14, TD15

Start Date & Time: 6/7/11 1445
End Date & Time: 6/17/11 1545
Test Organism: *H. azteca*

N = normal
B= no burrows
M= dead on surface
A= avoidance
L = anoxic surface
F= fungal patches
D= no air flow (DO?)
U= excess food

	Initials	Day 1 6/8/11	Day 2 6/9/11	Day 3 6/10/11	Day 4	Day 5	Day 6 6/13	Day 7	Day 8	Day 9
WETSED3	1	N	N	N	N	N	N	N	N	N
WETSED2	2									
WETSED1	3									
CON	4									
CON	5									
WETSED1	6									
WETSED2	7									
CON	8									
WETSED3	9									
WETSED2	10									
WETSED3	11									
WETSED3	12									
WETSED1	13									
WETSED1	14									
WETSED2	15									
WETSED1	16									
WETSED1	17									
WETSED2	18									
WETSED3	19									
WETSED3	20									
WETSED3	21									
WETSED2	22									
CON	23									
WETSED2	24									
WETSED3	25									
CON	26									
CON	27									
WETSED1	28									
CON	29									
CON	30									
WETSED2	31									
WETSED1	32									

Nautilus Environmental
Washington Laboratory
5009 Pacific Hwy. E., Suite 2
Tacoma, WA 98424

Physical and Chemical
Measurements of Porewaters
Sediment Bioassays

Analyst: ET

Client : Test AMERICA

Test Date: 6/6/11

Test Type: Microtox 100% Porewater Toxicity Test

Test No: 1106-T040 → T042

Test Species: *Vibrio fischeri*

	Site	Initial Salinity (ppt)	Final Salinity (ppt)	Initial D.O. (mg/L)	Final D.O (mg/L)	Initial pH	Adjusted pH	NaOH or HCl Vol. Used	Final Porewater Conc.	Ammonia
S11-048	WETSED-1	0.8	20.2	7.3	7.3	7.18	7.92	120µL 0.1N NaOH	99%	1.3
S11-049	WETSED-2	1.2	19.5	7.2	7.2	7.33	ET 7.92 ~~7.2~~	200µL 0.1N NaOH	99%	2.7
S11-050	WETSED-3	1.3	20.1	7.5	7.5	7.95	—	—	100%	<1.0
	CON	20.1	20.1	8.2	8.2	8.64	8.18	80µL 0.1HCl	99%	—

Sample Description: _____

Comments: _____

QA Check: CC

Nautilus Environmental
Washington Laboratory
5009 Pacific Hwy. E., Suite 2
Tacoma, WA 98424

Raw Data Sheet
Microtox
100% Sediment Porewater Toxicity

Client Name: Test America **Test Date:** 6/6/11

Sample ID: WETSED-1,2,3 **Test No.:** 1106-T040-1106-T042

Site	Light Reading	Time	Replicate 1	2	3	4	5
CON	$I_{(o)}$	5 min	96	100	104	102	98
	$I_{(5)}$	10min	90	100	98	96	94
	$I_{(15)}$	20 min	82	80	85	85	87
WETSED-1	$I_{(o)}$	5 min	80	75	75	80	77
	$I_{(5)}$	10min	58	49	54	51	53
	$I_{(15)}$	20 min	13	13	12	13	14
WETSED-2	$I_{(o)}$	5 min	81	84	74	78	79
	$I_{(5)}$	10min	57	59	54	56	57
	$I_{(15)}$	20 min	19	21	19	19	21
WETSED-3	$I_{(o)}$	5 min	74	78	77	77	75
	$I_{(5)}$	10min	59	64	63	63	60
	$I_{(15)}$	20 min	25	26	29	29	26
	$I_{(o)}$	5 min					
	$I_{(5)}$	10min					
	$I_{(15)}$	20 min					
	$I_{(o)}$	5 min					
	$I_{(5)}$	10min					
	$I_{(15)}$	20 min					

Comments: CC QA

APPENDIX E – Reference Toxicant Tests

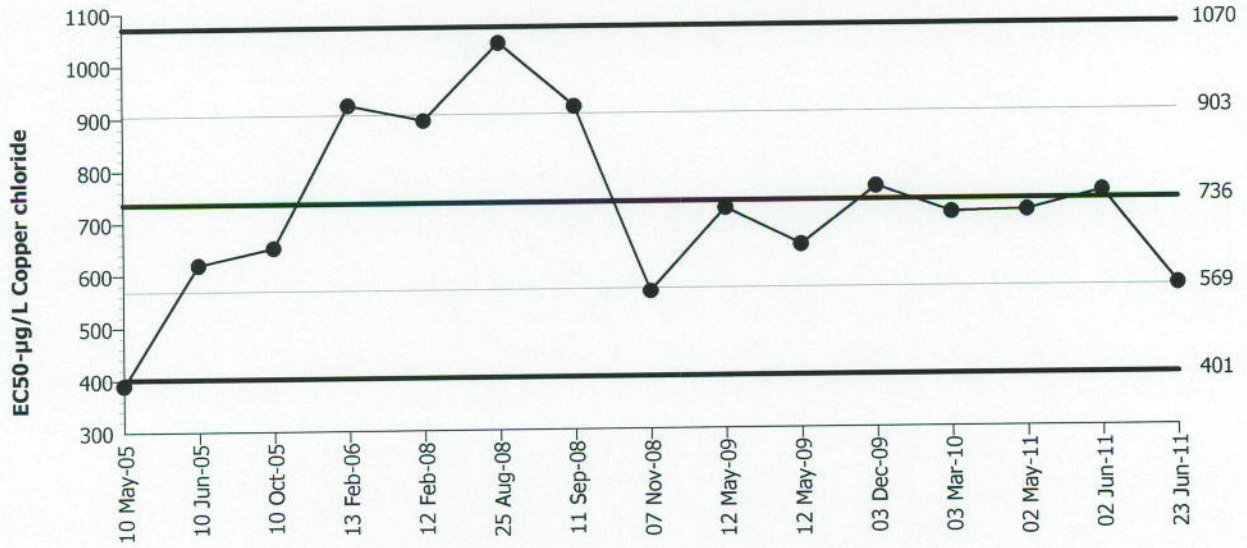
CETIS QC Plot

Report Date: 27 Jun-11 13:02 (1 of 1)

Chironomus 96-h Acute Survival Test — Nautilus Environmental WA

Test Type:	Survival (96h)	**Organism:**	Chironomus tentans (Midge)	**Material:**	Copper chloride
Protocol:	EPA/600/R-99/064 (2000)	**Endpoint:**	96h Survival Rate	**Source:**	Reference Toxicant-REF

Chironomus 96-h Acute Survival Test



Mean:	735.9	**Count:**	14	**-1s Warning Limit:**	568.5	**-2s Action Limit:**	401.1
Sigma:	167.4	**CV:**	22.70%	**+1s Warning Limit:**	903.3	**+2s Action Limit:**	1071

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2005	May	10	389.8	-346.1	-2.068	(-)	(-)	03-9785-3768	06-1599-1620
2		Jun	10	619.3	-116.6	-0.6962			08-3314-6775	08-1540-4607
3		Oct	10	651.6	-84.26	-0.5034			08-1025-4680	04-9254-8883
4	2006	Feb	13	921.9	186	1.111	(+)		08-9851-1226	07-3219-0331
5	2008		12	892.6	156.7	0.9359			15-6976-5200	18-3934-0764
6		Aug	25	1040	304	1.816	(+)		06-6119-9769	09-7546-4295
7		Sep	11	917.7	181.8	1.086	(+)		12-5480-0473	10-6515-6515
8		Nov	7	563	-172.9	-1.033	(-)		11-4948-7713	17-3277-7072
9	2009	May	12	721.9	-14.01	-0.08366			07-7016-2012	11-9025-1031
10			12	650.3	-85.61	-0.5114			10-1811-8659	15-1190-7362
11		Dec	3	760.9	24.96	0.1491			06-1499-1772	06-0264-7224
12	2010	Mar	3	710.4	-25.51	-0.1524			17-7743-6517	09-5758-4695
13	2011	May	2	713.8	-22.13	-0.1322			05-0735-0656	07-1751-6097
14		Jun	2	750	14.1	0.08423			17-9270-0205	04-9353-7895
15			23	570.5	-165.4	-0.9882			15-0478-1400	20-5891-4291

CETIS Summary Report

Chironomus 96-h Acute Survival Test — **Nautilus Environmental WA**

Batch ID:	06-1890-9822	**Test Type:**	Survival (96h)	**Analyst:**	Meghan Feuk
Start Date:	23 Jun-11 11:00	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Diluted Mineral Water (8:2)
Ending Date:	27 Jun-11 12:00	**Species:**	Chironomus tentans	**Brine:**	
Duration:	4d 1h	**Source:**	Aquatic Biosystems, CO	**Age:**	

Sample ID:	00-0348-0792	**Code:**	RA062311CT	**Client:**	Reference Toxicant Test
Sample Date:	23 Jun-11 11:00	**Material:**	Copper chloride	**Project:**	
Receive Date:	23 Jun-11 11:00	**Source:**	Reference Toxicant		
Sample Age:	N/A	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
13-8997-0043	96h Survival Rate	375	750	530.3	26.9%		Steel Many-One Rank Test

Point Estimate Summary

Analysis ID	Endpoint	Level	µg/L	95% LCL	95% UCL	TU	Method
20-5891-4291	96h Survival Rate	EC50	570.5	465.9	698.5		Spearman-Kärber

96h Survival Rate Summary

Conc-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	0.95	0.9127	0.9873	0.8	1	0.05	0.1	10.53%	0.0%
187.5		4	0.95	0.9127	0.9873	0.8	1	0.05	0.1	10.53%	0.0%
375		4	0.7	0.6036	0.7964	0.4	1	0.1291	0.2582	36.89%	26.32%
750		4	0.35	0.256	0.444	0	0.6	0.1258	0.2517	71.9%	63.16%
1500		4	0	0	0	0	0	0	0		100.0%
3000		4	0	0	0	0	0	0	0		100.0%

96h Survival Rate Detail

Conc-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	0.8	1	1
187.5		0.8	1	1	1
375		1	0.6	0.4	0.8
750		0.6	0.4	0	0.4
1500		0	0	0	0
3000		0	0	0	0

96 Hour Reference Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 96-hr Chronic

Client: Reference Toxicant

Sample ID: 3000 ug/L $CuCl_2$

Test #: RTD0622 11CE (3 [illegible])

Start Date & Time: 6/23/11 1100

End Date & Time: 6/27/11 1200

Test Organism: *Chironomus tentans*

Conc. $CuCl_2$	Cont. #	Survival 0	Survival 96	Dissolved O_2 (mg/L) 0	24	48	72	96	pH (units) 0	24	48	72	96	Cond. µS/cm 0	24	48	72	96	Temperature (°C) 0	24	48	72	96
0 ug/L	13	5	5	8.0	6.3	6.5	6.6	7.0	7.71	7.44	7.52	7.50	7.82	184	193	194	190	245	21.8	21.1	21.2	21.2	21.8
	19	5	4																				
	17	5	5																				
	18	5	5																				
187.5 ug/L	11	5	4	8.0	7.0	7.2	7.0	7.1	7.70	7.43	7.51	7.51	7.81	181	187	182	188	204	21.9	21.4	21.4	21.2	22.2
	3	5	5																				
	22	5	5																				
	15	5	5																				
375 ug/L	23	5	5	8.0	7.2	7.0	7.0	6.9	7.69	7.41	7.52	7.49	7.76	180	186	185	185	202	21.6	21.3	21.2	21.2	22.1
	1	5	3																				
	12	5	2																				
	2	5	4																				
750 ug/L	21	5	3	7.9	7.7	7.3	7.2	6.9	7.67	7.45	7.51	7.49	7.85	179	186	185	185	200	21.6	21.4	21.2	21.3	22.2
	20	5	2																				
	16	5	0																				
	5	5	2																				
1500 ug/L	4	5	0	7.9	7.9	7.4	7.0	7.0	7.60	7.44	7.47	7.36	7.66	181	184	187	176	200	21.6	21.3	21.2	21.3	22.1
	8	5	0																				
	14	5	0																				
	7	5	0																				
3000 ug/L	24	5	0	8.0	8.0	7.4	7.1	7.3	7.57	7.37	7.42	7.40	7.69	180	186	186	192	196	21.5	21.2	21.4	21.2	22.2
	9	5	0																				
	10	5	0																				
	6	5	0																				
			Tech. Initials:	[illegible]	BP	[illegible]	[illegible]	NF															

Test Chamber: Rm. C

QA Check: [illegible]

Animal Source: ~~Rm. C~~ ABS

Date Received: 6/8/11

Age at test initiation: 2nd Instar

Comments:

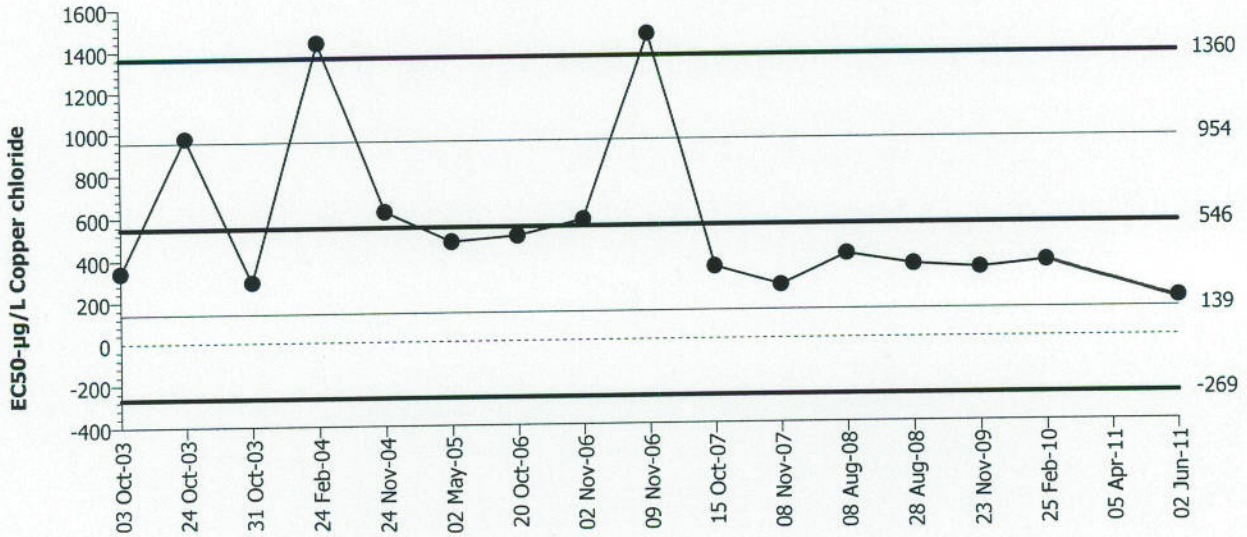
CETIS QC Plot

Report Date: 06 Jun-11 12:58 (1 of 1)

Acute Amphipod Survival Test — **Nautilus Environmental WA**

Test Type:	Survival	**Organism:**	Hyalella azteca (Freshwater Amphip	**Material:**	Copper chloride
Protocol:	ASTM E1706-00 (2000)	**Endpoint:**	Survival Rate	**Source:**	Reference Toxicant-REF

Acute Amphipod Survival Test



Mean:	546.4	**Count:**	16	**-1s Warning Limit:**	138.9	**-2s Action Limit:**	-268.6
Sigma:	407.5	**CV:**	74.60%	**+1s Warning Limit:**	953.9	**+2s Action Limit:**	1361

Quality Control Data

Point	Year	Month	Day	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2003	Oct	3	341.2	-205.2	-0.5035			06-0775-4420	15-2295-2416
2			24	975.3	428.9	1.053	(+)		04-6438-3508	07-9828-8060
3			31	292.7	-253.7	-0.6225			08-3475-1373	04-5200-0455
4	2004	Feb	24	1434	887.3	2.177	(+)	(+)	07-1118-0626	17-7524-5953
5		Nov	24	620.2	73.81	0.1811			10-9772-9874	17-7888-1382
6	2005	May	2	477.4	-69.01	-0.1694			07-5117-5111	11-6732-4104
7	2006	Oct	20	503.5	-42.94	-0.1054			10-2603-2608	05-1924-5921
8		Nov	2	576.5	30.14	0.07397			04-1292-4263	07-3082-5987
9			9	1464	917.7	2.252	(+)	(+)	06-5458-2190	12-2747-1591
10	2007	Oct	15	348.4	-198	-0.486			13-4692-2778	05-0675-3882
11		Nov	8	257.2	-289.2	-0.7097			06-6607-2454	13-7012-4549
12	2008	Aug	8	403.7	-142.7	-0.3503			00-5616-2222	16-0415-1126
13			28	351.6	-194.8	-0.4781			02-4459-4152	20-2603-1886
14	2009	Nov	23	332.8	-213.6	-0.5242			20-2294-2173	19-9301-0079
15	2010	Feb	25	365	-181.4	-0.4452			16-9659-3406	11-7559-2786
16	2011	Apr	5	0	-546.4	-1.341	(-)		12-7538-8678	19-5580-0324
17		Jun	2	187.5	-358.9	-0.8807			04-1031-1615	02-7338-9085

CETIS Summary Report

Acute Amphipod Survival Test — **Nautilus Environmental WA**

Batch ID:	17-7102-7421	**Test Type:**	Survival	**Analyst:**	Meghan Feuk
Start Date:	02 Jun-11 13:10	**Protocol:**	ASTM E1706-00 (2000)	**Diluent:**	Diluted Mineral Water (8:2)
Ending Date:	06 Jun-11 13:10	**Species:**	Hyalella azteca	**Brine:**	
Duration:	96h	**Source:**	Aquatic Indicators	**Age:**	

Sample ID:	17-8648-9088	**Code:**	RA060211HA	**Client:**	Reference Toxicant Test
Sample Date:	02 Jun-11 13:10	**Material:**	Copper chloride	**Project:**	
Receive Date:	02 Jun-11 13:10	**Source:**	Reference Toxicant		
Sample Age:	N/A	**Station:**			

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
09-8560-0831	Survival Rate	<187.5	187.5	N/A	4.59%		Steel Many-One Rank Test

Point Estimate Summary

Analysis ID	Endpoint	Level	µg/L	95% LCL	95% UCL	TU	Method
02-7338-9085	Survival Rate	EC50	187.5	150.6	233.5		Trimmed Spearman-Kärber

Survival Rate Summary

Conc-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	4	1	1	1	1	1	0	0	0.0%	0.0%
187.5		4	0.5	0.4695	0.5305	0.4	0.6	0.04082	0.08165	16.33%	50.0%
375		4	0	0	0	0	0	0	0		100.0%
750		4	0	0	0	0	0	0	0		100.0%
1500		4	0	0	0	0	0	0	0		100.0%
3000		4	0	0	0	0	0	0	0		100.0%

Survival Rate Detail

Conc-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
187.5		0.5	0.5	0.4	0.6
375		0	0	0	0
750		0	0	0	0
1500		0	0	0	0
3000		0	0	0	0

96 Hour Reference Toxicity Test Data Sheet - Nautilus Environmental

Freshwater Sediment 96-hr Chronic

Client: Reference Toxicant
Sample ID: 3000 µg/L $CuCl_2$
Test #: RA0180211 Ha

Start Date & Time: 6/13/11 1310
End Date & Time: 6/16/11 1310
Test Organism: *H. azteca*

Conc. $CuCl_2$	Cont. #	Survival 0	Survival 96	Dissolved O_2 (mg/L) 0	24	48	72	96	pH (units) 0	24	48	72	96	Cond. µS/cm 0	24	48	72	96	Temperature (°C) 0	24	48	72	96
0 ug/L	21	10	10	8.3	8.1	8.0	8.0	8.0	7.81	7.83	7.87	7.20	7.19	189	205	204	210	209	22.7	23.0	23.2	23.5	23.2
	15	10	10																				
	19	10	10																				
	18	10	10																				
187.5	13	10	5	8.2	8.2	8.1	8.3	8.0	7.80	7.83	7.84	7.20	7.16	184	206	200	206	209	22.7	23.0	23.3	23.5	23.3
	1	10	5																				
	14	10	4																				
	3	10	6																				
375	4	10	0	8.3	7.9	8.1	8.2	7.9	7.77	7.80	7.78	7.17	7.00	184	202	202	207	206	22.6	23.3	23.4	23.5	23.5
	11	10	0																				
	10	10	0																				
	12	10	0																				
750	2	10	0	8.3	8.2	8.2	8.2	8.0	7.71	7.78	7.72	7.14	7.02	184	204	200	206	206	22.5	23.5	23.3	23.4	23.5
	20	10	0																				
	22	10	0																				
	9	10	0																				
1500	5	10	0	8.3	8.2	8.3	8.3	8.1	7.55	7.70	7.61	7.08	7.02	183	204	201	207	210	22.4	23.4	23.3	23.5	23.3
	24	10	0																				
	8	10	0																				
	7	10	0																				
3000	17	10	0	8.3	8.3	8.3	8.3	8.1	7.27	7.61	7.50	7.05	7.00	184	204	200	207	208	22.5	23.3	23.3	23.4	23.4
	6	10	0																				
	23	10	0																				
	16	10	0																				
Tech Initials:		DD	M	BP	MF	BP	BP	M															

Animal Source: AI
Date Received: 6/2/11
Age at test initiation:

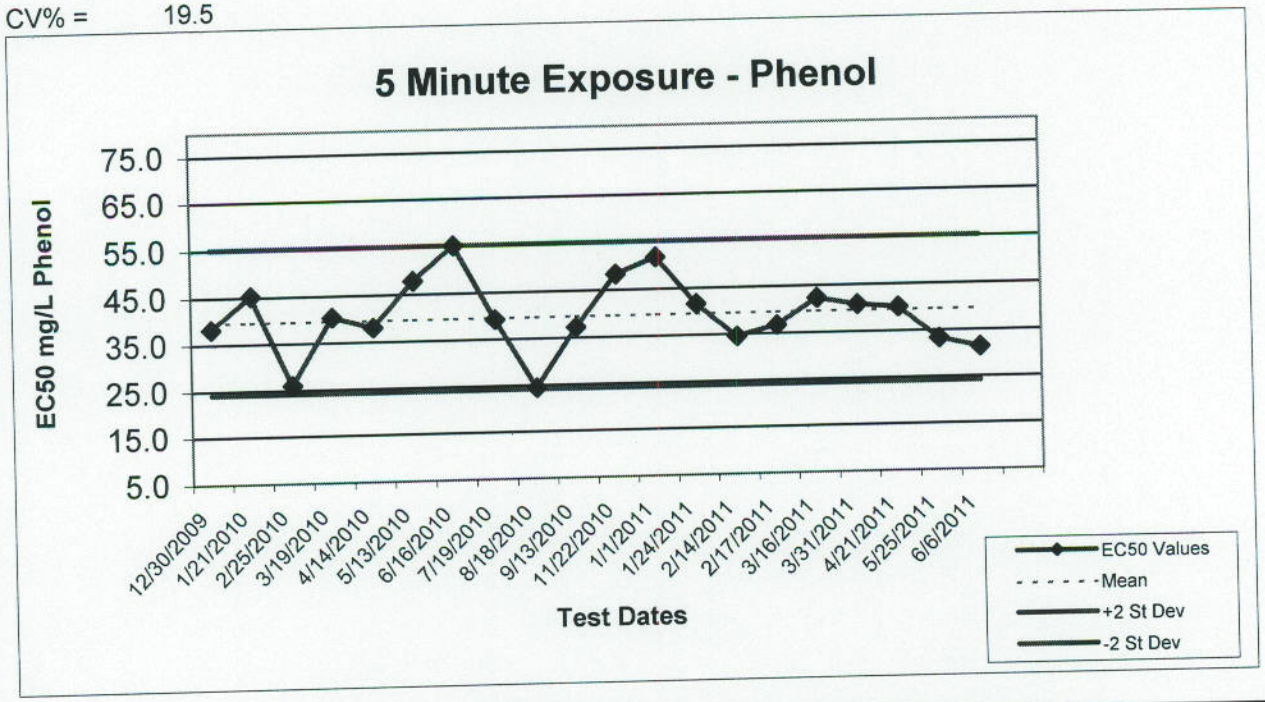
Dilution Water: 8:2
Test Chamber: Rm. A

Comments:

QA Check: M

Reference Toxicant Control Chart
Microtox 5-Minute Exposure

CV% = 19.5

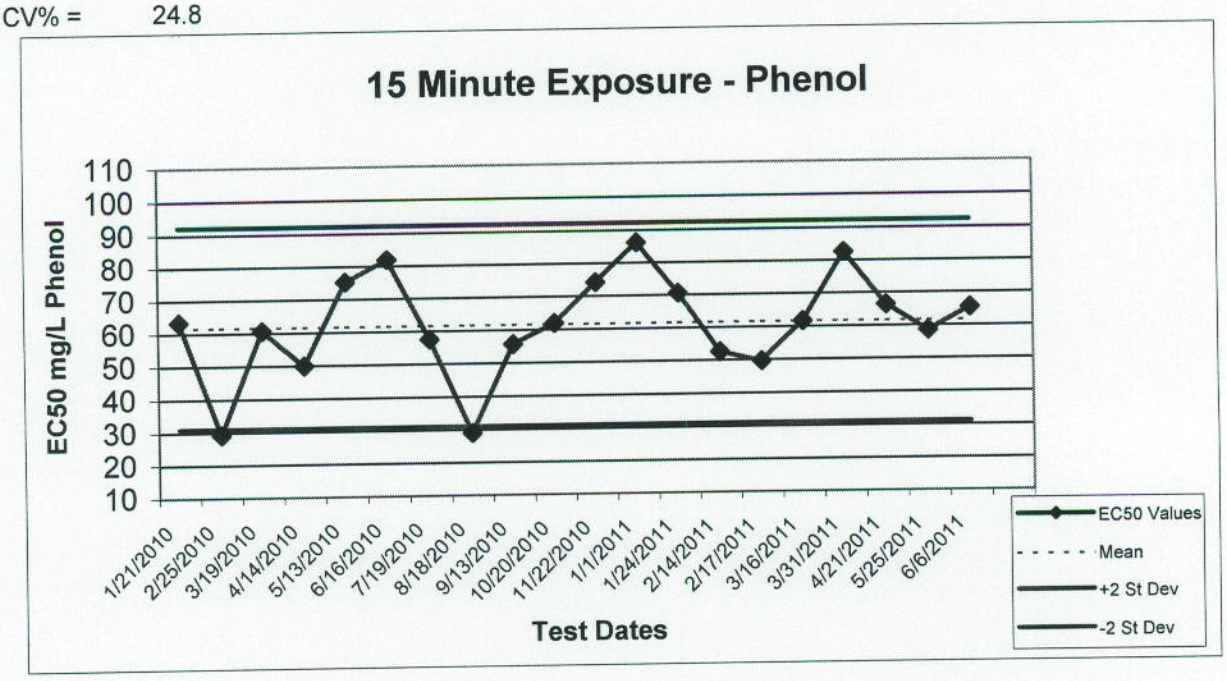


Date	Time	EC50 %	EC50 mg/L Phenol [a]	Mean	StDev	-2 SD	+2 SD
12/30/2009	911	22.5	38.3	39.6	7.7	24.2	55.1
1/21/2010	1015	26.6	45.2	39.6	7.7	24.2	55.1
2/25/2010	1223	15.3	26.0	39.6	7.7	24.2	55.1
3/19/2010	833	23.8	40.5	39.6	7.7	24.2	55.1
4/14/2010	934	23.8	38.1	39.6	7.7	24.2	55.1
5/13/2010	939	29.9	47.8	39.6	7.7	24.2	55.1
6/16/2010	912	34.4	55.0	39.6	7.7	24.2	55.1
7/19/2010	830	24.5	39.2	39.6	7.7	24.2	55.1
8/18/2010	1018	15.3	24.4	39.6	7.7	24.2	55.1
9/13/2010	1214	23.3	37.3	39.6	7.7	24.2	55.1
11/22/2010	1100	30.2	48.3	39.6	7.7	24.2	55.1
1/1/2011	1436	32.3	51.7	39.6	7.7	24.2	55.1
1/24/2011	829	26.0	41.7	39.6	7.7	24.2	55.1
2/14/2011	1339	21.6	34.5	39.6	7.7	24.2	55.1
2/17/2011	1010	23.0	36.8	39.6	7.7	24.2	55.1
3/16/2011	812	26.5	42.3	39.6	7.7	24.2	55.1
3/31/2011	1154	25.5	40.8	39.6	7.7	24.2	55.1
4/21/2011	917	25.1	40.2	39.6	7.7	24.2	55.1
5/25/2011	848	20.8	33.3	39.6	7.7	24.2	55.1
6/6/2011	1220	19.6	31.4	39.6	7.7	24.2	55.1

a - Highest concentration of Phenol is 160 mg/L

Reference Toxicant Control Chart
Microtox 15-Minute Exposure

CV% = 24.8



Date	Time	EC50 %	EC50 mg/L Phenol [a]	Mean	StDev	-2 SD	+2 SD
1/21/2010	1015	37.3	63.3	61.6	15.3	31.0	92.2
2/25/2010	1223	17.2	29.2	61.6	15.3	31.0	92.2
3/19/2010	833	35.6	60.5	61.6	15.3	31.0	92.2
4/14/2010	934	31.2	49.9	61.6	15.3	31.0	92.2
5/13/2010	939	47.0	75.2	61.6	15.3	31.0	92.2
6/16/2010	912	51.2	81.9	61.6	15.3	31.0	92.2
7/19/2010	830	35.9	57.4	61.6	15.3	31.0	92.2
8/18/2010	1018	18.2	29.1	61.6	15.3	31.0	92.2
9/13/2010	1214	34.8	55.7	61.6	15.3	31.0	92.2
10/20/2010	904	38.7	61.9	61.6	15.3	31.0	92.2
11/22/2010	1100	46.4	74.2	61.6	15.3	31.0	92.2
1/1/2011	1436	53.9	86.2	61.6	15.3	31.0	92.2
1/24/2011	829	44.1	70.5	61.6	15.3	31.0	92.2
2/14/2011	1339	32.9	52.6	61.6	15.3	31.0	92.2
2/17/2011	1010	31.0	49.6	61.6	15.3	31.0	92.2
3/16/2011	812	38.5	61.6	61.6	15.3	31.0	92.2
3/31/2011	1154	51.6	82.6	61.6	15.3	31.0	92.2
4/21/2011	917	41.5	66.4	61.6	15.3	31.0	92.2
5/25/2011	848	36.5	58.4	61.6	15.3	31.0	92.2
6/6/2011	1220	40.9	65.4	61.6	15.3	31.0	92.2

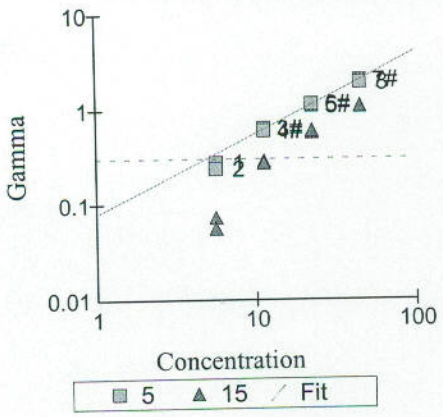
a - Highest concentration of Phenol is 160 mg/L

MicrotoxOmni Test Report

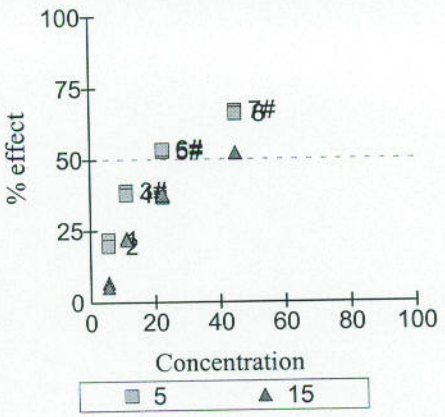
Date: 06/06/2011 12:20 PM

Test Protocol: Basic Test
Sample: 160mg/L Phenol
Toxicant: 160mg/L Phenol
Reagent Lot no.: 10K1032
Test description: Reference Toxicant
Test name: RT060611VF
Database file: C:\Program Files\MicrotoxOmni\Edge Analytical.mdb

Plot of Gamma vs Concentration



Plot of %Effect vs Concentration



			5 Mins Data:			15 Mins Data:		
Sample	Conc	Io	It	Gamma	% effect	It	Gamma	% effect
Control	0.000	95.37	94.07	0.9864 #		64.12	0.6723 #	
Control	0.000	96.55	96.74	1.002 #		65.20	0.6753 #	
1	5.625	102.88	79.94	0.2795	21.84%	64.63	0.0726	6.768%
2	5.625	99.02	79.24	0.2423	19.51%	63.20	0.0557	5.277%
3	11.25	103.46	62.83	0.6371 #	38.91%	54.10	0.2886	22.40%
4	11.25	105.65	65.49	0.6038 #	37.65%	55.82	0.2753	21.59%
5	22.50	107.92	50.83	1.111 #	52.62%	46.07	0.5784 #	36.65%
6	22.50	109.63	50.79	1.146 #	53.40%	46.09	0.6027 #	37.61%
7	45.00	109.14	35.85	2.027 #	66.96%	35.13	1.093 #	52.23%
8	45.00	108.87	36.88	1.935	65.93%	35.23	1.082 #	51.98%

- used in calculation; * - invalid data; D - deleted from calcs.
Autocalc has been used.

Calculations on 5 Mins data:
EC50 Concentration:19.62% (95% confidence range: 18.81 to 20.48)
95% Confidence Factor: 1.043
Estimating Equation:LOG C =1.167 x LOG G +1.293
Coeff. of Determination (R^2):0.9980
Slope: 0.8554
Correction Factor: 0.9942

Calculations on 15 Mins data:
EC50 Concentration:40.88% (95% confidence range: 38.35 to 43.57)
95% Confidence Factor: 1.066
Estimating Equation:LOG C =1.132 x LOG G +1.611
Coeff. of Determination (R^2):0.9976
Slope: 0.8815
Correction Factor: 0.6738

APPENDIX F – Chain-of-Custody Forms

TestAmerica Seattle
5755 8th Street East
Tacoma, WA 98424
Phone (253) 922-2310 Fax (253) 922-5047

Chain of Custody Record

TestAmerica

Client Information (Sub Contract Lab)	Sampler:	Lab PM: Armstrong, Curtis	Carrier Tracking No(s):	COC No: 580-5839.1
Client Contact: Shipping/Receiving	Phone:	E-Mail: curtis.armstrong@testamericainc.com		Page: Page 1 of 1
Company: Nautilus Environmental				Job #: 580-26360-1
Address: 5009 Pacific Hwy. East, Suite 2,	Due Date Requested: 6/6/2011			
City: Tacoma	TAT Requested (days):			
State, Zip: WA, 98424				
Phone:	PO #:			
Email:	WO #:			
Project Name: Yakima Steel	Project #: 58004867			
Site:	SSOW#:			

Analysis Requested

Columns: Field Filtered Sample (Yes or No); Perform MS/MSD (Yes or No); SUBCONTRACT; Amphipod mortality 10days; Midge Larvae mortality and Growth 20days; micro tox 100% porewater; 15 min (Vivo fischeri); Total Number of containers

Preservation Codes:

A - HCL	M - Hexane
B - NaOH	N - None
C - Zn Acetate	O - AsNaO2
D - Nitric Acid	P - Na2O4S
E - NaHSO4	Q - Na2SO3
F - MeOH	R - Na2S2SO3
G - Amchlor	S - H2SO4
H - Ascorbic Acid	T - TSP Dodecahydrate
I - Ice	U - Acetone
J - DI Water	V - MCAA
K - EDTA	W - ph 4-5
L - EDA	Z - other (specify)

Other:

Sample Identification - Client ID	Sample Date	Sample Time	Sample Type (C=Comp, G=grab)	Matrix (W=water, S=solid, O=waste/oil, BT=Tissue, A=Air)	SUBCONTRACT	Total Number of containers	Special Instructions/Note:
				Preservation Code:			
E-WetSed-1-052311	5/23/11	10:10 Pacific		Solid	X →	1	4°C S11-048
E-WetSed-2-052311	5/23/11	10:35 Pacific		Solid	X →	1	S11-049
E-WetSed-3-052311	5/23/11	11:10 Pacific		Solid	X →	1	S11-050

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

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

Deliverable Requested: I, II, III, IV, Other (specify)

Special Instructions/QC Requirements:

Empty Kit Relinquished by:	Date:	Time:	Method of Shipment:

Relinquished by:	Date/Time:	Company	Received by:	Date/Time:	Company
Cathy Gamble	5/25/11 13:40	TA-Sea	Cat Curran	5-25-11 1600	Nautilus

Custody Seals Intact: X Yes Δ No

Custody Seal No.:

Cooler Temperature(s) °C and Other Remarks:

ATTACHMENT D
ENVIRON AGRI-TECH YAKIMA STEEL SEDIMENT EVALUATION

WETLAND EVALUATION TECHNICAL MEMORANDUM
Agri-Tech and Yakima Steel Fabricators Site
Yakima, Washington
Agreed Order No. DE 6091

Farallon PN: 765-001

Wetland Sediment Evaluations at the Agri-Tech/Yakima Steel Fabricators Site

Agency Review Draft

May 7, 2014

Revised: December 30, 2014

Prepared for:

Farallon Consulting
Issaquah, Washington

Prepared by:

ENVIRON
Port Gamble, Washington

PO Box 216, 4729 North East View Drive, Port Gamble, Washington 98364 T. 360.297.6040

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Glossary of Terms

Acute toxicity: Toxicity due to a short-term exposure. The measured effect may be lethal or sub-lethal.

AFDW: Ashed-free dry weight

Amphipod: *Hyalella azteca:* For this program, the amphipod, *Hyalella azteca* was used to evaluate toxicity.

Benthic Test: A whole-sediment test, conducted with animals exposed to test sediments

C: Control

Chironomus: The genus for the midge test species, *Chironomus dilutus*. For this report, *Chironomus* is sometimes used to refer to *Chironomus dilutus*.

Chronic toxicity: Toxicity due to a longer duration exposure. The measured effect may be lethal or sub-lethal (e.g. growth).

COPC: Chemicals of Potential Concern

CSL: Cleanup screening level; levels which may require action

EC50: Median effective concentration. That concentration that elicits an effect on 50% of the test population.

Ecology: Washington Department of Ecology

Hyalella: The genus for the amphipod test species, *Hyalella azteca*. For the purposes of this report, *Hyalella* is sometimes used to refer to *Hyalella azteca*.

LC50: Median lethal concentration. That concentration that is lethal to 50% of the test population.

M: Mortality

Midge: *Chironomus dilutus* – for this program, the midge *Chironomus dilutus* was used to evaluate toxicity.

MIG: Mean individual growth

Porewater Test: Toxicity test with test organisms exposed to porewater extracted from test sediments

RSET: Regional Sediment Evaluation Team

SCO: Sediment cleanup objective; long-term sediment quality goals for cleanup actions

SMS: Sediment management standards

TNWR: Toppenish National Wildlife Refuge

YSF: Yakima Steel Fabricators

1. Introduction

Farallon Consulting LLC (Farallon) is conducting a remedial investigation of a light industrial site in Yakima, Washington. The Agri-Tech/Yakima Steel Fabricator (YSF) property includes a small Type 3 wetland. Previous studies with sediment collected from three wetland stations found cadmium levels above the State screening levels; sediment toxicity testing showed the potential for adverse biological effects. However, the results of previous tests were equivocal. ENVIRON (formerly NewFields) were requested to conduct an evaluation of toxicity and the potential causes of toxicity in sediments from the wetland. The purpose of this supplemental remedial investigation was to inform the feasible remedial analysis and cleanup action plan as it relates to the wetland area by:

- Reevaluating the potential for toxicity in site wetland sediments; and,
- If toxicity is observed, determine whether cadmium or other metals of potential concern are the likely cause.
- Generate data that can lead to a cleanup level for the site.

1.1 Background and 2011 Investigation

Prior studies evaluated wetland soils and sediments at the south end of the Agri-Tech/YSF property (Figure 1) for contaminants of potential concern (COPC) and sediments were evaluated for toxicity (Farallon 2011). Based on the soil and sediment chemistry, cadmium was the only analyte observed at concentrations exceeding the preliminary soil screening levels (Table 1). For the sediment samples, cadmium was the only COPC that exceeded the State of Washington's recently promulgated freshwater sediment cleanup screening level (CSL) and sediment cleanup objective (SCO) criterion. The CSL values represent levels which may require action; whereas the SCO values represent long-term sediment quality goals for cleanup. The CSL chemical criteria are higher than the SCO criteria; likewise, the toxicity thresholds for CSL are higher than those of the SCO. The Freshwater CSL and SCO values are based on a regional dataset with concomitant sediment chemistry and bioassay data. However, this dataset did not include small wetlands and as such they may not necessarily represent the bioavailability and toxicity of chemicals in the largely static sediment reducing environments found in small wetlands.

As required by the Sediment Management Standards (SMS), toxicity tests were conducted on the wetland sediments in 2011. Tests included the 10-day amphipod survival test with the amphipod, *Hyalella azteca*, the 20-day midge growth and survival test with the midge, *Chironomus dilutus*, and the Microtox® test. The bioassay report (Nautilus 2011; Appendix A) compared the test results to control samples based on criteria as defined in the Regional Sediment Evaluation Team (RSET) sediment evaluation framework for dredged material (USACE/EPA 2009). Since that time, the Washington Department of Ecology (Ecology) promulgated biological criteria for the freshwater sediment tests with *Hyalella* and *Chironomus*. The results of the wetland sediment toxicity tests are compared to the Ecology criteria in Table 2. For the Microtox® test, RSET criteria were used as the SMS revisions do not include Microtox® criteria. It should be noted that the RSET criteria are based on a "one-hit/two-hit" evaluation. Toxicity observed at the two-hit level represents a lower level of toxicity and indicates that two toxicity tests would need to exceed the two-hit criteria to fail a sediment treatment. The one-hit

criteria represents a higher level of toxicity and indicates that one toxicity test exceeding the one-hit criteria would fail a sediment treatment.

Toxicity exceeding the CSL criteria was observed in WETSED-1 for the *Hyalella* test, whereas no toxicity was observed in the *Chironomus* test for both survival and growth. WETSED-2 passed the CSL and SCO criteria for *Hyalella* survival and *Chironomus* growth, with *Chironomus* mortality slightly above the SCO criteria. In contrast, the WETSED-3 sediment passed the SCO criteria for the *Hyalella* test, but failed the CSL criteria for *Chironomus* mortality. Survival among the replicates for the *Chironomus* test was highly variable, ranging from 0 to 9 individuals per replicate. Marginal toxicity exceeding the CSL and SCO criteria were observed for each of the test treatments in the Microtox® test.

Table 1. Summary of Wetland Soil and Sediment Chemistry, Agri-Tech/YSF 2011 Survey.

Analyte	WETSED			WETSOIL			SL[1]	SCO[2]	CSL[3]
	1	2	3	1	2	3			
Grain Size									
Sand	40.4	14.1	4.1	--	--	--	--	--	--
Silt	48.1	76.8	61.9	--	--	--	--	--	--
Clay	11.5	9.1	34.0	--	--	--	--	--	--
TOC (%)	5.3	4.7	3.6	--	--	--	--	--	--
TVS (%)	82	63	60	--	--	--	--	--	--
As	<5.8	7.6	8.5	<5.1	<3.4	<2.4	20	14	120
Cd	**9.2**	**6.8**	**7.8**	**3.7**	1.8	1.5	2	2.1	5.4
Cu	36	41	52	39	19	16	2,960	400	1200
Hg	0.07[3]	0.04[3]	0.14[3]	0.14	0.071	0.14	2	0.66	0.80
Mn	210	220	270	190	250	210	11,000	--	--
Pb	190	150	180	110	19	3.5	1,000	360	>1300
Sb	<5.8	<6.9	<6.1	<5.1	<3.4	<2.4	32	--	--
Zn	2700	2800	2700	1700	670	41	24,000	3200	>4200
TPH-GRO	ND	ND	ND	ND	ND	ND	10	--	--
TPH-DRO	ND	ND	ND	ND	ND	ND	2,000	--	--
TPH-ORO	ND	ND	ND	ND	ND	ND	2,000	--	--
Pesticides/Herbicides	ND	ND	ND	ND	ND	ND	--	--	--
Acetone	0.082	<0.039	0.110	0.094	0.029	<0.019	3.21	--	--
Carbon Disulfide	<0.003	0.003	<0.003	0.064	0.010	<0.001	5.651	--	--
MEK	<0.014	<0.013	0.025	0.010	<0.0045	<0.0064	22	--	--
Other VOCs	ND	ND	ND	ND	ND	ND		--	--

[1] RI Screening Level

[2] Sediment Cleanup Objective; [3] Cleanup Screening Level

[3] Reported value from nearby WETSOIL station

Bold: Exceeds SCO

Underline: Exceeds SCO and CSL

Table 2. Summary of 2011 Toxicity Test Results for Wetland Sediments, Agri-Tech/YSF.

Test	SCO[1]	CSL[1]	WETSED-1	WETSED-2	WETSED-3
Hyalella 10-day					
Mortality	M_T-M_C[2] >15%	M_T-M_C >25%	**<u>100%</u>** CSL	13.8% Pass	3.8% Pass
Chironomus 20-day					
Mortality	M_T-M_C >15%	M_T-M_C >25%	14.6% Pass	**17.7%** SCO	**<u>57.3%</u>** CSL
Growth	(MIG_c-MIG_t) /MIG_c >0.25	(MIG_c-MIG_t) /MIG_c >0.40	-0.23 Pass	0.04 Pass	**0.34** SCO
Microtox® (evaluated with RSET criteria)					
Test	RSET Criteria "two hit"	RSET Criteria "one hit"	WETSED-1	WETSED-2	WETSED-3
Change in light output @ 5 minutes	T/C <85%	T/C <75%	**<u>70.8%</u>**	**75.0%**	**84.4%**
Change in light output @ 15 minutes	T/C <85%	T/C <75%	**<u>20.2%</u>**	**<u>29.8%</u>**	**<u>41.7%</u>**
COPCs					
Cadmium	2.1	5.4	**<u>9.2</u>**	**<u>6.8</u>**	**<u>7.8</u>**

[1] Biological criteria in revised Sediment Management Standards

[2]M: mortality; MIG: mean individual growth: T: treatment; C: control

Bold: Exceeds SCO

<u>Underline</u>: Exceeds SCO and CSL

Overall the QA/QC was acceptable for the toxicity tests (summary in Table 3; full report in Appendix A). Survival and growth in the negative control sediment (clean silica sand routinely used in freshwater sediment tests or laboratory seawater for the Microtox® test) were within acceptable limits. The positive control (reference-toxicant tests) with the exception of the Microtox® LC_{50} for the 5 minute reading, which was slightly below the acceptable range. Water quality parameters, including ammonia and sulfide values were within the tolerance limits for the test organisms. The amphipod test was initiated with 20 test organisms rather than 10; however, the food ration was not altered for the increased loading rate. While this may have affected test organism fitness and growth, it is unlikely that this would result in the high mortality observed in WETSED-1. For the *Chironomus* test, there was high inter-replicate variability with coefficients of variation ranging from 49% to 102%. This test can be subject to error at test initiation if proper care is not taken placing the extremely small larval *Chironomus* into the test chambers. Nematodes were observed in some test replicates, which could result in predation and loss of early Chironomid larvae which are very small (about the size of an eyelash). Additionally, the duration of this test is very near the hatch stage and it is possible to have a loss of test organisms when they have developed into flies. While it is not possible to determine if these were sources of the variability from the available data, high variability is an indication that non-contaminant interactions may have affected the test results.

Table 3. Negative and Positive Control Performance, 2011 Toxicity Tests.

Test	Negative Control Performance	Acceptable Limit	Positive Control Performance	Acceptable Range
Hyalella	1.3% mortality	<20%	188 µg/L Cu	0 – 1,360 µg/L Cu
Chironomus	6.3% mortality 0.91 mg AFDW/ind	<32% >0.48 mg AFDW/ind	571 µg/L Cu	401 – 1,070 µg/L Cu
Microtox	5 min: 96% 5 min: 84%	72% - 110%	19.6 mg/L phenol 40.9 mg/L phenol	24.2 – 55.1 mg/L 31.0 – 92.2 mg/L

Although cadmium concentrations were generally similar for the three wetland sediments (6.8 to 9.2 mg/kg), the observed toxicity was highly variable across the site. Sample WETSED-1 had 100% mortality in the *Hyalella* test, but did not show toxicity in the *Chironomus* test; sample WETSED-3 had 57% mortality in the *Chironomus* test, but high survival in the *Hyalella* test. With the exception of the Microtox® test, WETSED-2 showed little toxicity. While it would not be unexpected to have different cadmium sensitivities among test species, the pattern of responses for each test would be expected to be somewhat consistent across the test treatments if cadmium was the primary cause of toxicity as the sediment chemistry might suggest.

There was consistency in response for all sediment treatments for the Microtox® test results. However, Microtox® tests have been shown to be highly sensitive to non-contaminant factors such as turbidity, ammonia, sulfides, organics, and holding times (Brouwer and Murphy 1994; Benton et al. 1995; Pardos et al 1999; Bennet and Cubbage 1992). In Microtox® tests with marine samples, holding times have been associated with toxicity (NewFields 2009). In a holding-time study, no toxicity was observed for samples tested within 2 to 4 days of collection; however, nearly half of the samples were found to exceed SMS criteria for samples tested 20 days after collection. All samples tested 37 days after collection failed in the Microtox®. In the Microtox® tests conducted with the Agri-Tech/YSF wetland sediments holding times were 15 days and likely affected the test results.

Site-specific factors (e.g. pH, redox potential, sediment grain size, and organic carbon) can affect metals availability and toxicity, as well as the ability of chemical criteria to predict a relationship between COPCs and toxicity. In many cases, the pH in wetland sediments may be lower than for larger, more dynamic water bodies. Lower pH tends to favor adsorption of metals onto finer sediment particles (John and Leventhal 1994). Furthermore, wetland sediments typically have elevated total organic carbon content due to the dense vegetation, which is not exported, from the system. Binding with organic carbon also reduces availability. Organically enriched sediments can form a strongly reducing (anoxic) environment which promotes sulfate reduction and sulfide mineral deposition. In such environments, free cadmium (the more toxic fraction) can form less toxic insoluble sulfide complexes. As such, the measured cadmium concentrations may not be similarly available or toxic as in riverine or lake systems. National chemical criteria or guidance values (e.g. Threshold and Probable Effects Levels), are based on datasets developed in water bodies that are quite different than the small wetland on the Agri-Tech/YSF

site. The dataset used in developing the recently promulgated SMS criteria includes large water bodies such as Portland Harbor, the Columbia River, Lake Roosevelt and the Spokane River.

The potential differences in availability and toxicity in wetland sediments versus sediments from larger water bodies are a significant source of uncertainty in developing a cause-effect relationship between screening level exceedances of chemicals of potential concern and toxicity. This is reinforced by a lack of consistency between the observed concentrations of cadmium and other metals in the sediment samples and toxicity among the three sediment samples. Confirming the cause of toxicity is an important step to determining appropriate subsequent actions for the wetland site, for completing the Feasibility Study, developing the conceptual site model, and for developing the cleanup action plan (CAP). Since Ecology has indicated that the success of the cleanup action will be based on the absence of toxicity, it is critical that appropriate criteria define any cleanup action for the wetland and be used to determine when the cleanup action is complete.

1.2 Approach for 2013 Supplemental Investigation

In order to determine whether site-related metals were associated with the observed toxicity, ENVIRON conducted a targeted study to accomplish the following objectives:

- Verify toxicity in the WETSED samples from each of the three stations;
- If toxicity is confirmed, determine whether cadmium or other metals present in the wetland site are the likely cause;
- If toxicity is confirmed and related to metals, determine whether a site-specific clean-up level would be appropriate.

The approach to address these study objectives was to conduct a sampling and analysis program that included resampling the three wetland stations previously tested, conducting confirmatory toxicity tests and targeted analytical chemistry, and performing a suite of forensic toxicity tests called toxicity identification evaluations (TIEs). The TIEs are a series of sample manipulations intended to alter the availability of certain classes of compounds (such as cationic metals) which are followed by toxicity tests with the manipulated sample. If sample toxicity changes in a manner predicted by the TIE manipulation, it provides a line of evidence that that class of compounds is associated with the observed toxicity. A suite of manipulations are included in this program to provide multiple lines of evidence. It should be noted that the TIE may not necessarily identify synergistic or additive effects, however, it may identify key factors that are driving factors in any observed toxicity. The results of the toxicity tests and TIE studies will then be evaluated in combination with the analytical chemistry to better understand the availability of site-related metals and the potential sources of observed toxicity.

2 Methods

2.1 Sediment Collection and Handling

Surface sediment collection was conducted on December 3, 2013. Surface samples were collected from the three previously sampled WETSED stations at the Agri-Tech/YSF site (Site; Figure 1) as well as from one location at the Toppenish National Wildlife Refuge (TNWR) for use in dilution series testing. The WETSED stations were located within the wetland and were immediately east of, and distinctly separate from the previous backfill area associated with Bay Chemical sediment removal. Stations were located using a WAAS enabled GPS and visual landmarks. Final station coordinates were recorded in the field and are presented in Table 4.

Surface sediment to a depth of 6" was collected from each of the WETSED stations. This sampling depth targeted the depth of sediment considered to be biologically active and most relevant to evaluating risk at the site. The site was dominated by cattails (*Typha* sp.) which had a root system that extended to approximately 6". Additionally, many of the wetland invertebrates (e.g. amphipods, Chironomids) occupy the upper most sediment surface (1"-2"). The wetland at the Site was dry at the time of sampling and sediment was collected by hand to a depth of 6 inches using stainless steel scoops. Collection tools were washed with warm soapy water, rinsed with deionized water, and then rinsed with acetone. Stainless steel spoons and scoops were cleaned at the Port Gamble laboratory and wrapped in foil.

Prior to sampling, above-ground vegetation was cleared from the sampling area. Care was taken during sampling to avoid roots and other large organic debris. Sediment from the TNWR was collected using a small stainless steel van Veen sampler from Toppenish Creek. Sediment was collected from an area closed to hunting, approximately 25 to 30 ft. upstream of a small bridge. Approximately five gallons of sediment was collected from each location to provide sufficient sample volume to support the analyses and TIE manipulations. Sediment from each station was placed into clean, food-grade plastic bags, labeled with station number, and then placed into a cooler. Sediment for AVS/SEM analysis was placed directly into certified clean glass sample jars with no head space. The samples remained on ice and in the dark until they were delivered to the ENVIRON laboratory for processing.

At the laboratory, sediment from each station was homogenized and then subsampled for chemical analysis. Samples were sent to the analytical laboratory (Analytical Resources Incorporated). Target analytes for project sediments included sediment grain size, total organic carbon, AVS/SEM, and total Cd, Mn, Pb, and Zn.

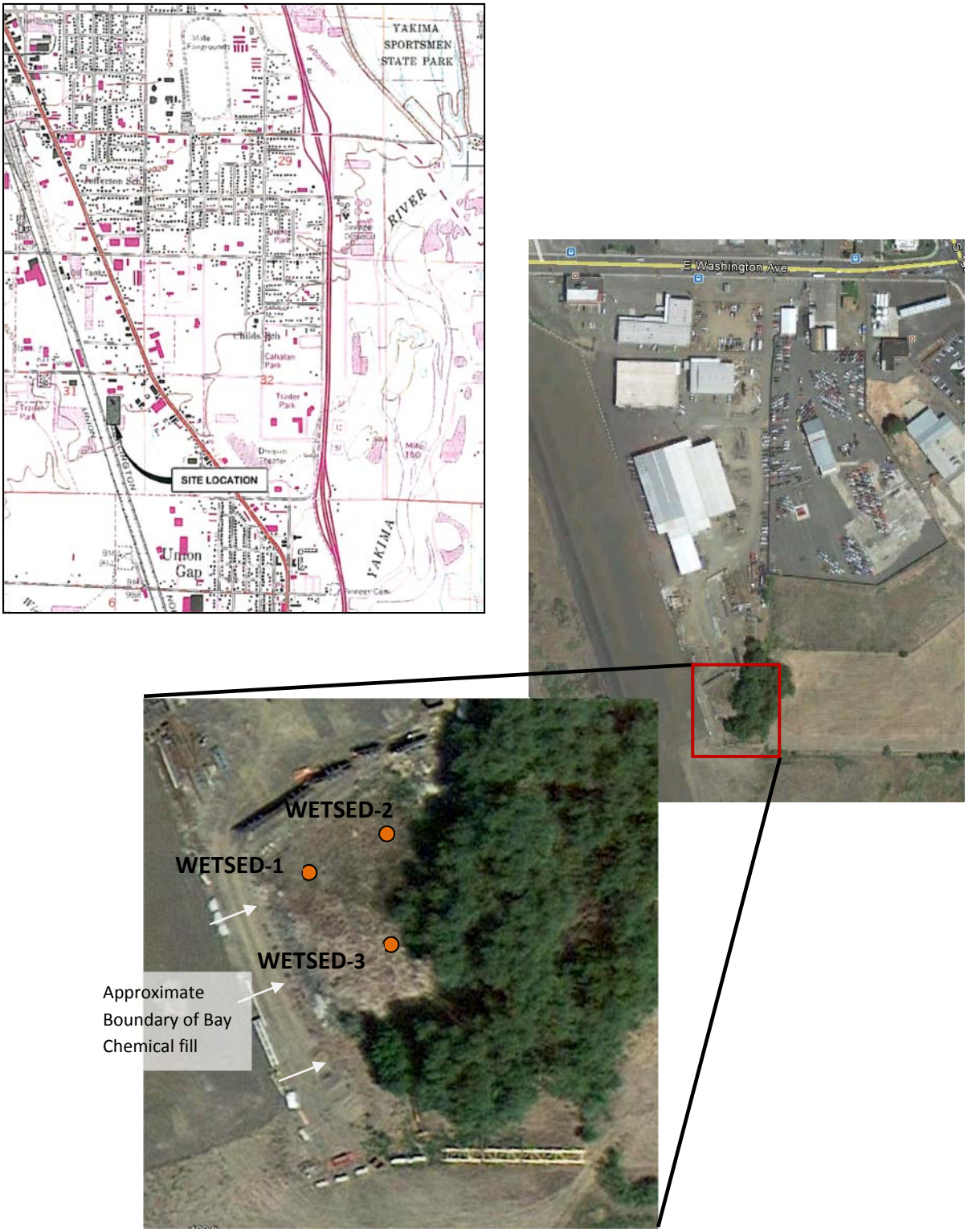

Figure 1. Agri-Tech/Yakima Steel Wetland study area.

Table 4. Station locations, Agri-Tech/YSF 2013.

Station	Latitude	Longitude	Time	Comments
WETSED-1-13	46° 34.034	120° 20.416	12:31	Dry silt/clay overlying wet cobble; heavy vegetation
WETSED-2-13	46° 34.036	120° 29.406	13:06	Dry silt/clay; heavy vegetation
WETSED-3-13	46° 34.028	120° 29.406	13:36	Dry silt/clay with sand overlying moist silt/sand; heavy vegetation
TNWR	46° 18.508	120° 20.786	10:01	Silty sand

2.2 Chemical Analysis

The three WETSED test sediments and dilution series sediments were analyzed for grain size, total organic carbon (TOC), porewater ammonia and sulfides, the metals cadmium (Cd), lead (Pb), manganese (Mn), and zinc (Zn), and AVS/SEM (Table 5). Note that the 0% dilution (TNWR only) was not submitted for chemical analysis. With the exception of ammonia and sulfides, laboratory analyses were conducted by Analytical Resources Inc. of Tukwila, Washington. Porewater ammonia and sulfides were measured at the ENVIRON laboratory.

Sediment grain size was analyzed to determine the general size classes that make up the sediment (e.g., gravel, sand, silt, and clay). Grain size was conducted using the gravimetric procedure described in PSEP (1986) and Plumb (1981). The TOC, made up of volatile and nonvolatile organic compounds, was determined following Plumb (1981). This procedure involved dissolving inorganic carbon (carbonates and bicarbonates) with hydrochloric acid or sulfuric acid prior to TOC analysis. Total solids were also measured to convert concentrations of the chemical parameters from a wet-weight to a dry-weight basis. Percent solids were determined by Standard Method SM2540G (APHA 2002).

The analysis for the project specific metals was conducted using an inductively coupled plasma emissions spectrometer equipped with a mass detector (ICP-MS), in accordance with USEPA 6010C Rev.3 (EPA 2007). Porewater samples were collected by ENVIRON and were analyzed for ammonia and dissolved sulfides. Total ammonia as nitrogen was measured using an Orion meter fitted with an ammonia ion-specific probe. Total sulfides as S^{-2} were measured using a HACH DR/2800V Spectrophotometer.

The methods for acid volatile sulfides followed EPA (1991). In this colorimetric method, sulfide in the sample was converted to hydrogen sulfide by the addition of hydrochloric acid at room temperature. The hydrogen sulfide (H_2S) was purged from the sample by an inert gas and trapped in a sodium hydroxide (NaOH) solution. With the addition of a mixed-diamine reagent (MDR), the sulfide was

Table 5. Chemical and Physical Parameters, Analytical Methods, and Target Detection Limits, Agri-Tech/ YSF 2013.

Parameter	Method	Procedure	Sediment Target Reporting Limit (dry weight)
Conventionals			
Grain Size	PSEP; Plumb (1981)	Sieve/Pipette	1.0%
TOC	Plumb (1981)	Combustion IR	0.1%
Percent Solids	SM2540G	Gravimetric	0.1%
Dissolved Sulfides	SM4500	Colorimetric	0.001 mg/L
Ammonia	SM 4500N H3F	Probe	0.001 mg/L
Metals			
Cadmium (Cd)	USEPA 6010c	ICP-MS	0.2 mg/kg
Lead (Pb)	USEPA 6010c	ICP-MS	2 mg/kg
Manganese (Mn)	USEPA 6010c	ICP-MS	0.1 mg/kg
Zinc (Zn)	USEPA 6010c	ICP-MS	1 mg/kg
AVS	EPA 1991	Colorimetric	0.05
SEM	EPA 1991	ICP-MS	As above
Bioassays			
Acute Toxicity	USEPA 100.1	Amphipod	NA
Acute Toxicity	SAPA 2008	Microtox®	NA
Chronic Toxicity	USEPA 100.5	Larval Midge	NA

converted to methylene blue and measured on a UV-VIS spectrometer. The acid-sediment slurry was centrifuged to settle the sediment. The supernatant was poured into an acid cleaned Teflon bottle and then analyzed by Inductively Coupled Plasma Mass Spectrometry (ICP-MS) for cadmium, lead, manganese, and zinc following a modification of EPA Method 1638. The amount of each metal that is soluble in the porewater is dependent upon the amount of sulfides to bind with and the relative affinity of the metal to bind with sulfides. For these four metals, lead can replace the other three metals bound to sulfides, followed by cadmium replacing zinc and manganese (EPA 2005). Zinc and manganese will then bind to what sulfides are available.

2.3 Test Treatment Preparation

2.3.1 Test Sediments for Baseline and Dilution Series Toxicity Testing

The potential for benthic toxicity in sediment from the three stations was evaluated using three benthic toxicity tests: the 10-day acute toxicity test with the amphipod *Hyalella azteca*, the 20-day chronic test with the midge *Chironomus dilutus*, and the Microtox® test using bioluminescent bacteria. The purpose of the baseline toxicity tests was to establish a baseline for subsequent TIE and to confirm or refine earlier estimates of toxicity from the 2011 toxicity tests. A dilution series test was also conducted using decreasing concentrations of WETSED-3 test sediment mixed with sediment collected from TNWR. The dilution series test was included to determine whether there was a dose-response to the test sediment

to assist in determining a site-specific clean up criteria if required. As indicated in the results section, there was no response in the WETSED-3 sediment dilution test.

The baseline tests were conducted with homogenized sediment from the three on-site stations (WETSED 1, WETSED-2, and WETSED-3), a series of dilutions of WETSED-3, and a laboratory control sediment. The laboratory control sediment was tested with two benthic tests to validate test results and verify that test conditions were suitable for test organism health. The laboratory control sediment was silica sand that was thoroughly rinsed with diluted mineral water (DMW).

The dilution series test was conducted with a series of sediment dilutions prepared using sediment from WETSED-3 and gradually increasing volumes of TNWR sediment. Sediment dilutions tested were 100%, 67%, 33%, and 11% test sediment in reference sediment and targeted whole sediment cadmium concentrations of 9, 6, 3, 1 mg/kg Cd. Sediment dilutions were prepared volumetrically based on the whole sediment concentration of 9 mg/kg Cd in WETSED-3 sediment. An appropriate mass of test and dilution sediment was combined in 1-gal glass jars. The sediment was homogenized using a clean, stainless-steel spoon and then fitted with Teflon-line lids. Jars were then placed onto a roller table and mixed continuously for 24 hours to evenly distribute the test and dilution sediment. After the mixing period, the test jars were placed in the cold-room (4°C) to allow for equilibration. A subsample of each dilution was submitted to the analytical laboratory to confirm the test cadmium concentration.

2.4 TIE Manipulations

Based on the results of the baseline testing, TIE tests were conducted with both sediment and porewater from the WETSED-1 sample. TIE procedures followed methods outlined in EPA (2007) and WERF (2007). Porewater was collected by double centrifugation. After the sediment was centrifuged once, the supernatant was decanted into another clean Teflon jar and centrifuged again. The supernatant in this jar was decanted into a glass container. This was the unmanipulated WETSED-1 sample for the porewater TIE. A TIE treatment control was tested concurrent to each of the sediment and porewater TIE manipulations. For sediment tests, the TIE control was comprised of silica sand (control sediment) plus the respective treatment. For the porewater TIE manipulations, the negative controls were diluted mineral water (control water) plus the respective treatment. The TIE manipulations included in this evaluation are summarized in Table 6 and the methods are summarized in the following sections.

Table 6. Toxicity Tests and TIE Manipulations Included in Agri-Tech/YSF 2013.

Matrix	TIE Method	Target Chemical Class	Test	Control
Sediment	SIR-300	Cationic Metals	10-d Amphipod	Silica sand + SIR-300
Sediment	Powdered Coconut Charcoal	Organics	10-d Amphipod	Silica sand + PCC
Porewater	EDTA (4 and 2 mg/L)	Metals	10-d Amphipod	Control water + EDTA (4 and 2 mg/L)
Porewater	SIR-300	Cationic Metals	10-d Amphipod Microtox	Control water filtered through SIR-300
Porewater	C18 Column	Organics	10-d Amphipod	Control water filtered through C18 column
Porewater	Filtration	Particulate bound contaminants	10-d Amphipod	Filtered control water

2.4.1 Whole Sediment TIE Manipulations

Two whole sediment manipulations were included in the TIE evaluations to evaluate the role of metals and organic contaminants of potential concern. Whole sediment TIE tests were conducted with *Hyalella azteca*. The following section describes the methods for the whole sediment TIE manipulations.

2.4.1.1 Cation-exchange Resin Beads in Sediment

SIR-300 is a macroporous, weak-acid cation exchange resin which has chelating properties for heavy metal ions. SIR-300 beads can be mixed directly into sediments to reduce cationic metal bioavailability (Burgess et al. 2000).

To prepare the resin beads, approximately 50 g of beads (Resin Tech Inc. West Berlin NJ), were placed in a polycarbonate tube fitted with a nytex screen and rinsed with tapwater and then deionized (DI) water. A 10% mixture of SIR-300 resin in test sediment by wet weight was prepared by manually mixing 25 g of resin beads into 225g sediment for a total mass of 250 g. Once visually homogenous, the mixture was placed on a rolling table for 24 hours, and then placed in test chambers and tested following the standard procedure for the 10-day test.

A SIR-300 blank was also tested concurrently by creating a 10% mixture of the resin beads in control sediment following the procedure described above.

2.4.1.2 Powdered Coconut Charcoal (PCC) in Sediment

Powdered coconut charcoal is pyrolized activated coconut husk that has been ground to <45 µm. PCC can be added to whole sediment to reduce bioavailability of a broad spectrum of organic contaminants (Ho et al. 2004). This treatment was added to determine whether site-related organics were related to observed toxicity. Previous studies have shown a toxic threshold for PCC at 15% (WERF 2007), therefore a 5% mixture was used.

PCC was prepared by hydrating the charcoal with deionized water in a 2000 mL Erlenmeyer flask. Excess moisture was then removed after hydration using a vacuum filter. Once the free moisture was removed from the PCC, a 5% mixture by wet weight was prepared by homogenizing 40 g of PCC in 800 g of WETSED-1 test sediment. Once uniform in appearance, the test sediment was placed on rolling table for 24 hours, and then placed in test chambers following the standard procedure.

A PCC blank was also tested concurrently by creating a mixture of PCC in control sediment (45 g PCC in 900 g control sediment) following the procedure described above.

2.4.2 Porewater TIE Manipulations

Porewater from WETSED-1 was extracted from the whole sediment and treated with several targeted TIE manipulations. Porewater toxicity tests were conducted with amphipods and Microtox®; larval midge (*C. dilutus*) do not survive well in water-only exposures and are not typically included in porewater evaluations.

2.4.2.1 Baseline Toxicity

The baseline toxicity test was conducted on unmanipulated porewater samples. For the purposes of this study, undiluted porewater was tested without a dilution series. Porewater was collected from the whole sediment by double centrifugation as described above. The supernatant was then collected into a clean, glass jar taking care to avoid collection of the fine particulates from the sediment-water interface. Porewater was then held at 4°C until it was used in toxicity tests or treated following the TIE procedures described below.

2.4.2.2 Cation-Exchange Column

Sediment interstitial water was pumped through a cation exchange column to extract cationic metals. When combined with chemical analysis of the rinsate, a removal of toxicity in the rinsate can be used to identify the cause of toxicity (USEPA 1996; Burgess et al. 1997).

The cation exchange column was prepared by packing SIR-300 resin beads in a Supelco LC-WCX column. A peristaltic pump fitted with solastic tubing was attached to the input fitting of the extraction column and the flow adjusted to 2.5 mL per minute. In order to prepare the resin beads, 2 mL of methanol was pumped through the column followed by 6 mL of deionized water. Care was taken to keep the resin column moist between each step.

Control water was passed through the cation-exchange column at a flow rate of 2.5 mL per minute and collected in a clean glass beaker. The column was re-prepared using methanol followed by deionized water prior to filtering the WETSED-1 porewater. Sufficient porewater was passed through the resin column to allow for testing and chemical analysis. The SIR-300 control and the treated porewater were then placed in the temperature-controlled room to equilibrate to test temperature prior to testing.

2.4.2.3 C-18 Column

Sediment interstitial water was pumped through an organic compound solid-phase extraction column, or C-18 exchange column, to remove non-ionic organic toxicants from interstitial water. Reduction of toxicity in the column rinsate provides evidence to characterize toxicity caused by organic compounds (USEPA 1991).

An Oasis HLB organic solid-phase extraction column was fitted with solastic tubing. A peristaltic pump was used with the flow adjusted to 1 mL per minute. In order to prepare the column, 3 mL of methanol was pumped through the column followed by 5 mL of DI water. Care was taken to keep the column moist between each step.

Control water was passed through the C18 column at a flow rate of 2 mL per minute and collected in a clean glass beaker. The column was re-prepared using methanol followed by DI water prior to filtering the WETSED-1 porewater. Sufficient porewater was passed through the column to allow for testing and chemical analysis. The C18 control and the treated porewater were then placed in the temperature-controlled room to equilibrate to test temperature.

2.4.2.4 EDTA

Disodium ethylenediaminetetraacetic acid (EDTA) is an organic chelating molecule that preferentially binds divalent metals. When added directly to interstitial water samples, EDTA can reduce the bioavailability and toxicity of metals such as cadmium and zinc. EDTA can also exhibit toxicity to aquatic invertebrates, so care must be taken not to use concentrations that approach the effects thresholds for *Hyalella*.

An EDTA stock solution was prepared by adding 2.78 g disodium EDTA in 100-mL of DI water and mixed with a stir bar. While some guidance recommends EDTA concentrations as high as 60 mg/L, we have previously observed *Hyalella* toxicity at 8 mg/L (Weston 2007). The target EDTA concentrations for this study were 4 mg/L and 2 mg/L in order to minimize EDTA toxicity in the treated porewater preparations. WETSED-1 porewater was treated with 0.16 µL and 0.08 µL of stock solution for each mL of test water. The EDTA was mixed with the control and test porewater for 3 hours. The resulting pH of the treated porewater sample was low (pH = 2) and was adjusted to within the test range by adding NaOH. A high and low EDTA control was prepared in a similar manner with 0.16 µL and 0.08 µL of stock solution per mL dilution water.

2.4.2.5 Filtration Tests

Filtration tests were performed to determine whether the chemicals causing toxicity were bound to particulate matter in the porewater. A reduction in toxicity following filtration indicates that chemicals are particulate bound; the filtration step is also used as a control for the SIR-300 and C18 methods that filter samples during treatment. The WETSED-1 porewater was prepared by filtering the sample (50 mL) through a 1 µm glass fiber filter with a vacuum pump. A filtration-control was prepared by filtering dilution water (control water) in a similar manner.

2.5 Toxicity Test Methods

2.5.1 10-d Acute Amphipod Sediment Test with *Hyalella azteca*

Testing methods for the amphipod bioassay followed procedures outlined in the test method 100.1 of the Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (USEPA 2000). The 10-day endpoint measured the impact of the site sediments on the survival of *H. azteca*.

Test organisms were exposed to the test sediments and the laboratory control sediment in 300-mL glass jars fitted with screened ports to allow for water renewals. Approximately 100 mL of test and control sediment (to a depth of 1 cm) was placed in each of eight replicate test chambers with 175 mL of moderately hard diluted mineral water (DMW; 80 – 100 mg/L $CaCO_3$). Two surrogate chambers were set up for each treatment to allow for pore water ammonia measurement at test initiation and termination. An additional surrogate was set up for water quality measurements on days 0 - 10 to limit the impact of disturbance to the test organisms. Test chambers were placed in predetermined random positions and allowed to equilibrate to test conditions overnight. The amphipod test was run under a 16-hour light: 8-hour dark photoperiod at a temperature of 23 $\pm$ 1°C.

Prior to test initiation, an initial set of water quality parameters was measured in the overlying water of the water quality surrogate. The water quality parameters included temperature, dissolved oxygen, pH, and conductivity. Hardness, alkalinity, and ammonia were measured in the overlying water of a composite from replicates within each treatment. In addition, one surrogate replicate from each test treatment was used to extract pore water via centrifugation for subsequent analysis of ammonia. The water quality instruments were calibrated daily or on their recommended schedule. Records of instrument calibration were retained in the laboratory logs.

Amphipods (*H. azteca*) were supplied by Aquatic Biosystems of Fort Collins, Colorado. To initiate the test, 10 amphipods were randomly selected and placed into each test chamber. Amphipods remaining in the water column and exhibiting abnormal behavior after one hour were replaced. Each test chamber was outfitted with a Zumwalt style water delivery system to facilitate twice daily water renewals. Each test chamber was fed daily with 1 mL of stock YCT/Tetrafin™ solution. The number of dead and surfaced animals was noted for each replicate daily. On Day 10, the sediments from each chambers was sieved through a 0.5-mm screen and the number of survivors was recorded. Test acceptability criterion was greater than 80 percent mean control survival.

To evaluate the relative sensitivity of the organisms, a 4-day water-only reference toxicant test was conducted using ammonium chloride with nominal concentrations of 0, 5, 10, 20, 40, and 80 mg/L total ammonia to establish the sensitivity of test organisms used in the evaluation of the project sediments. The reference-toxicant LC_{50} for the population of test organisms used in the project tests were compared to laboratory control charts to determine their sensitivity relative to populations previously tested at the ENVIRON laboratory.

2.5.2 20-d Chronic Midge Sediment Test with *Chironomus dilutus*

Testing methods for the midge larvae bioassay followed procedures outlined in the test method 100.5 of the Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates (EPA 2000). The 20-day endpoint measured the impact of the site sediments on the survival and growth of *C. dilutus*.

Test organisms were exposed to the test sediments and the laboratory control sediment in 300-mL glass jars fitted with screened ports to allow for water renewals. Approximately 100 mL of test and control sediment (to a depth of 1 cm) was placed in each of eight replicate test chambers with 175 mL of moderately hard diluted mineral water (DMW; 80 – 100 mg/L $CaCO_3$). Two surrogate chambers were set up for each treatment to allow for pore water ammonia measurement at test initiation and termination. An additional surrogate was set up for water quality measurements on days 0 - 10 to limit the impact of disturbance to the test organisms. Test chambers were placed in predetermined random positions and allowed to equilibrate to test conditions overnight. The larval midge test was run under a 16-hour light: 8-hour dark photoperiod at a temperature of 22 $\pm$ 1°C.

Prior to test initiation, an initial set of water quality parameters was measured in the overlying water of the water quality surrogate. The water quality parameters included temperature, dissolved oxygen, pH, and conductivity. Hardness, alkalinity, and ammonia were measured in the overlying water of a composite from replicates within each treatment. In addition, one surrogate replicate from each test treatment was used to extract pore water via centrifugation for subsequent analysis of ammonia. Water quality instruments were calibrated daily or on their recommended schedule. Records of instrument calibration were retained in the laboratory logs.

Chironomus dilutus egg cases were obtained from Aquatic BioSystems of Fort Collins, Colorado and cultured to obtain larvae <2-hours in age for the test. Egg cases were held in diluted mineral water at 23°C until test initiation. Larvae began hatching after approximately 2 – 4 days. To select organisms for the test, egg cases were transferred to petri dishes with culture water and observed under a dissecting microscope. Healthy organisms were considered those actively moving and less than two hours separated from their egg cases. Twelve (12) larvae were transferred directly to each test chamber using a fine-tip Pasteur pipette. A squirt bottle with diluted mineral water was used to spray the surface to ensure no animals were caught in the surface tension and to allow animals to successfully bury into the sediment. The chambers were outfitted with a Zumwalt style water delivery system to facilitate twice daily water renewals. Water quality parameters were measured in the water quality surrogate. The number of dead and surfaced animals was noted for each replicate daily. Organisms were fed 6 mg of ground Tetramin™ per test chamber daily.

On Day 20, the sediments from the chambers were sieved through a 0.5-mm screen and the number of survivors was recorded. Survivorship was measured as the number of *C. dilutus* larvae, pupae, and flies remaining at test termination; however, only the larvae were utilized for determining the growth endpoint. Surviving larvae from each replicate were placed in pre-ashed and pre-weighed aluminum

boats and dried at 60°C for 24 hours to determine dry weights. The weigh boats were subsequently ashed at 550°C for 2 hours and reweighed in order to calculate the ash-free dry weight (AFDW) of the surviving larvae. Mean AFDW per surviving individual (growth) and per original number (biomass) was calculated. Test acceptability criteria were >68% mean control survival (≤32% mean mortality) and a mean growth per survivor (MIG) of greater than 0.60 mg AFDW. The formula for growth was as follows:

$$\text{Growth} = (\text{Dry Weight} - \text{Ashed Weight})/N_t$$

$$\text{Biomass} = (\text{Dry Weight} - \text{Ashed Weight})/N_i$$

$$\text{MIG} = [(\text{Dry Weight} - \text{Ashed Weight})/N_t]/20$$

where:

N_t = total number of animals recovered at test termination
N_i = number of animals added at test initiation.

A reference toxicant test was conducted using copper sulfate with concentrations of 0, 250, 500, 1000, 2000, and 4000 µg/L Cu^{2+} to establish the sensitivity of test organisms used in the evaluation of the project sediments. The reference-toxicant LC_{50} for the population of test organisms used in the project tests were compared to laboratory control charts to determine their sensitivity relative to populations previously tested at the ENVIRON laboratory.

2.5.3 Microtox® Test

The Microtox® test was performed by Rainier Environmental LLC. The Microtox test exposed the luminescent marine bacterium *Vibrio fischeri* to porewater extracted from test sediments, as well as for the SIR-300 treated porewater and SIR-300 control. Bacterial light output was measured using the Microtox® Model 500 Analyzer at 5 and 15 minutes of exposure. Light output from the test porewater was compared to that of the reference treatments at both time intervals. A complete description of the Microtox® test methods is presented in Appendix B.

2.5.4 Porewater Toxicity Tests

Porewater toxicity tests were conducted during the toxicity identification evaluations with the amphipod *Hyalella azteca*. Tests were conducted as static, acute exposures with 15 mL of whole and treated porewater, treatment controls, and a laboratory control in 20 mL glass vials. Porewater was collected from the whole sediment by double centrifugation. Test sediment was placed in 1-L Teflon jars and centrifuged for 30 minutes at 3200 g. After the sediment was centrifuged once, the supernatant was decanted into another clean Teflon jar and centrifuged again. The supernatant was then collected into a clean, glass jar taking care to avoid collection of the fine particulates from the sediment-water interface. Prior to testing, porewater and control samples were placed in a temperature-controlled room and allowed to equilibrate. Porewater samples were provided trickle flow aeration prior to testing to ensure that dissolved oxygen would remain within acceptable ranges throughout the test.

The porewater tests were conducted with four amphipods in each of five test chambers for a total test population of 20 organisms. Test chambers were placed in predetermined random positions and allowed to equilibrate to test conditions. The amphipod test was run under a 16-hour light: 8-hour dark photoperiod at a temperature of 23 $\pm$ 1°C.

Prior to test initiation, an initial set of water quality parameters was measured. Amphipods (*H. azteca*) were supplied by Aquatic Biosystems and were 6 to 8 days old at test initiation. To initiate the test, four amphipods were randomly selected and placed into each test chamber. Each test chamber was fed with 1 mL of stock YCT/Tetrafin™ solution on test day 5. The number of dead animals was noted for each replicate on test days 4 and 10. Test acceptability criterion was greater than 80 percent mean control survival.

2.5.5 Water for Bioassay Testing

The laboratory water used in this study was diluted mineral water (DMW). This water was prepared by diluting Perrier® mineral water with laboratory de-ionized water to the appropriate hardness. This water source has been used successfully on numerous similar bioassay testing programs conducted at the Port Gamble Laboratory. Extensive testing with a variety of species has shown that this water source provide good survival in laboratory controls.

2.5.6 Water Quality

Water quality was monitored daily and readings were recorded on data sheets. Dissolved oxygen and temperature were measured using a Hach™ HQ40d multimeter with a Luminescent Dissolved Oxygen (LDO) probe. Conductivity was measured using an Orion™ 5-Star multimeter with a conductivity probe; pH was measured using a YSI™ pH100 meter with a pH probe. Ammonia was analyzed using an Orion™ 5-Star multimeter with an ammonia ion-selective electrode calibrated with a three-point calibration curve (1, 10, and 100 mg/L). Hardness and alkalinity were measured utilizing Hach™ titration kits.

2.6 Data Analysis and QA/QC

Water quality and endpoint data were entered into Excel spreadsheets. Water quality parameters were summarized by calculating the mean, minimum, and maximum values for each test treatment. Endpoint data were calculated for each replicate and the mean values and standard deviations were determined for each test treatment.

Hand-entered data was reviewed for data entry errors, which were corrected prior to summary calculations. A minimum of 10% of the calculations and data sorting were reviewed for errors. Review counts were conducted on apparent outliers.

Statistical comparisons were made using a t-test following guidance in USEPA (2000). Data reported as percent survival were transformed using an arcsine square root transformation prior to statistical analysis. Data were tested for normality using the Wilk-Shapiro test and equality of variance using Levene's test. Determinations of statistical significance were based on one-tailed Student's t-tests with an alpha of 0.05. For samples failing to meet assumptions of normality, a Mann-Whitney test was

conducted to determine significance. For those samples failing to meet the assumptions of normality and equality of variance, a t-test on rankits was used.

For AVS/SEM evaluations, total SEM was calculated as the sum of the four metals analyzed during SEM and AVS measurements. Total excess SEM (free metal ions) was calculated as the molar AVS concentration subtracted from the molar total SEM concentration. This value was divided by the fraction of TOC in the sediment sample for comparison to the equilibrium sediment benchmarks as described by the EPA (EPA 2005). The result is the TOC normalized-total SEM in excess of the sediment binding capacity (µmol SEM/g_{TOC}).

3. Results

Each of the three WETSED stations was reoccupied and sediment was collected to a depth of 6". There was no standing water at the time of sampling, with the water-level at approximately 6" below ground surface (Figures 2 and 3). Sediment was moist at the surface to wet at the bottom of the 6" sampling horizon. At each of the stations, the sediment surface was covered with a heavy layer of large organic debris, primarily dead and decaying cattails. Care was taken to remove heavy organic debris and large root matter.

Sediment from WETSED-1 was dominated by sand (68%), with moderate amounts of silt (28.3%) and clay (13.4%; Table 7). Total organic carbon was 5.15%. Sediment from Stations WETSED-2 and WETSED-3 were dominated by clayey silt, with 76.7% and 88.3% silt and clay, respectively. TOC for sediment from WETSED-2 and WETSED-3 was 3.79% and 4.37%, respectively. While large plant material was removed from samples prior to chemical analysis, it is likely that this material contributed to the organic carbon. Porewater ammonia concentrations were generally low, below 1 mg/kg in each of the sediment treatments. Similarly, porewater sulfide concentrations were generally low, ranging from 0.036 to 0.055 mg/L. Porewater pH ranged from 7.14 to 7.28.

Figure 2. Wetland study area with approximate station locations.

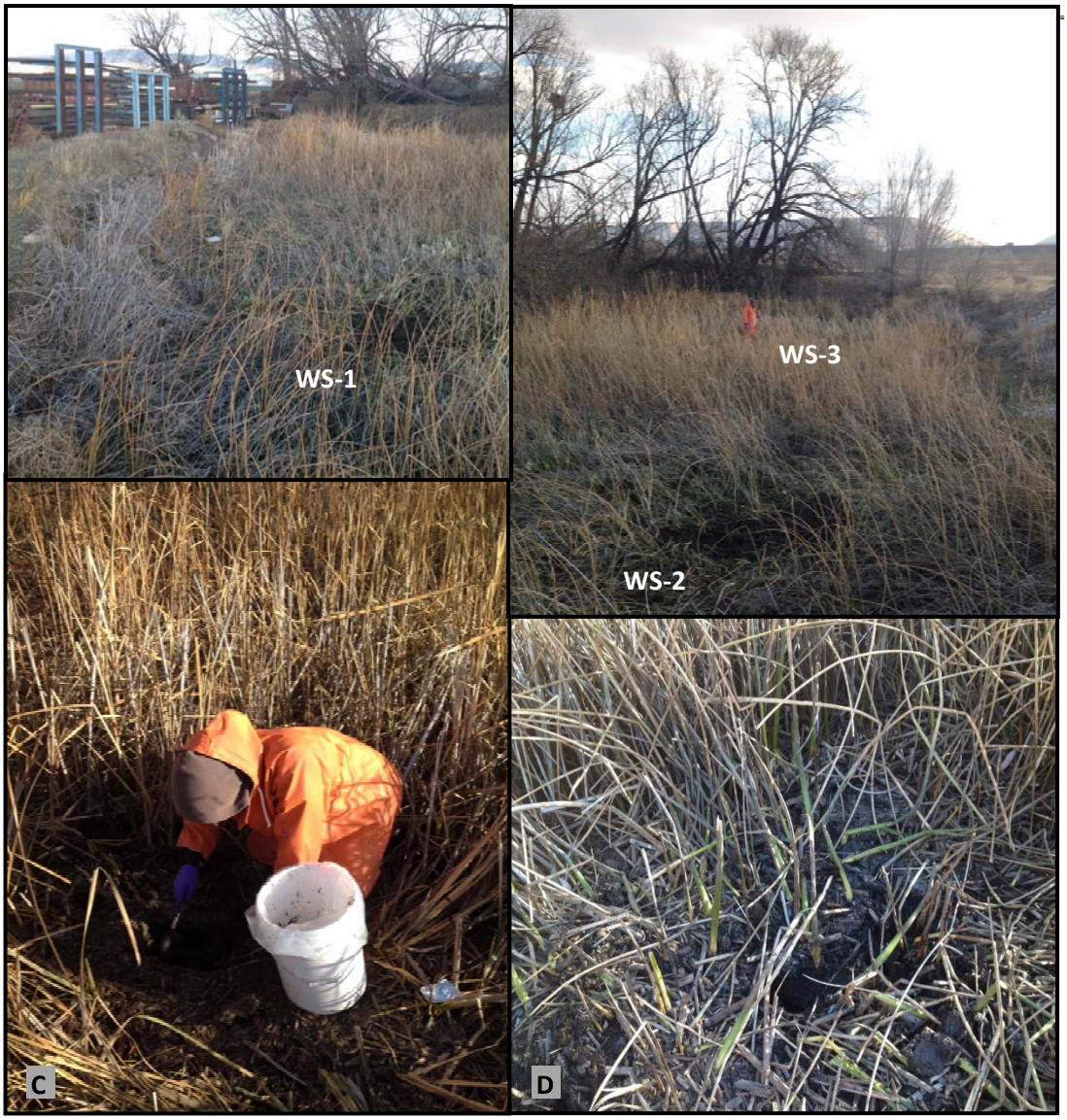

Figure 3. A and B. Wetland study area; C and D. Sampling Station WS-3.

Table 7. Results of Chemical Analysis of Test Sediments, Agri-Tech/YSF 2013.

Analyte	SCO	CSL	WETSED-1	WETSED-2	WETSED-3
Sand/Gravel (%)	--[a]		58.3	23.4	11.8
Silt (%)	--		28.3	56.7	63.6
Clay (%)	--		13.4	20.0	24.7
TOC (%)	--		5.15	3.79	4.37
Total Solids (%)	--		46.9	47.2	38.7
Acid Volatile Sulfides (mg/kg)	--		1570	294	231
Total Ammonia (mg/L)	--		0.46	0.35	0.61
Total Sulfides (mg/L)	--		0.046	0.055	0.036
Porewater pH	--		7.14	7.25	7.28
Cadmium	2.1	5.4	**6.5**	**7.4**	**9.4**
Lead	360	1300	147	146	178
Manganese	--	--	189	342	324
Zinc	3200	4200	2240	2940	**3810**

Analyte	Test Treatment			
	100% WETSED-3	67% WETSED-3	33% WETSED-3	10% WETSED-3
Cadmium	7.1	5.1	2.9	1.1
Lead	139	97	48	20
Manganese	158	436	571	1560
Zinc	3,090	2150	1,140	451

[a]--: no value

Bold: Fails SCO

Underline: Fails SCO and CSL

Concentrations of metals were generally similar to those observed during the initial site investigation (Farallon 2011). Cadmium concentrations in the 2013 sediment samples ranged from 6.5 to 9.4 mg/kg; cadmium concentrations in 2011 ranged from 6.8 to 9.2 mg/kg. Concentrations of lead, manganese, and zinc in 2013 were generally similar across the site and were also similar to values observed in 2011. Zinc concentrations were 2240 to 3810 mg/kg in the 2013 samples.

3.1 Baseline and Dilution Series Whole-Sediment Tests

3.1.1 10-Day Benthic Amphipod Test

The 10-d amphipod test with *Hyalella azteca* was initiated on December 13, 2013. A summary of test conditions, test results and water quality observations for the test are presented in Tables 8 to 10. All data sheets are presented in Appendix C. With the exception of temperature and pH, water quality parameters remained within the recommended ranges throughout the duration of the test. Temperature was within range from Day 0 to 9; test temperature on Day 10 was 20.0° to 20.5°C. This temperature is within the tolerance range for *Hyalella azteca* and was observed only at test termination, and therefore was unlikely to have affected test performance. Porewater ammonia in the three test treatments was 0.3 to 1.1 mg/L total ammonia in the treatments. This was below the project-specific LC_{50} of for ammonia of 1.46 mg/L total ammonia. The test was validated by 91% survival in the controls. The LC_{50} for the ammonia reference-toxicant test was 1.46 mg/L total ammonia, within the control chart limits (1.2 – 26 mg/L), indicating that the test animals were similar in sensitivity to previous populations used at the Port Gamble laboratory.

Mean percentage mortality in the test treatments WETSED-2 and WETSED-3 was 5% and was not significantly different than that of the control. Mean mortality in the two treatments was lower than that of the control, passing the SMS criteria. Mean mortality in the WETSED-1 sediment was 100% and was significantly different from the control. Mean mortality in the WETSED-1 treatment was 91.8% greater than that of the control and failing the CSL for the amphipod test (M_T-M_C>25%).The dilution series test was conducted concurrent with the baseline tests to evaluate the relationship between the cadmium concentration and toxicity. Based on an initial screen of metals concentrations, WETSED-3 was selected for use in the dilution series test,with test concentrations targeting cadmium concentrations of 9, 6, 3, and 1 mg/kg. Concentrations observed in the 100%, 67%, 33%, and 11% treatments were 7.1, 5.1, 2.9, 1.1 mg/kg Cd, respectively (Table 7). The dilution series showed no relationship between the total cadmium concentration and survival, with no significant changes in mean percentage survival, relative to the control, across the dilution series. This was true for total lead, manganese, and zinc as well. Survival ranged from 88.8% to 97.5% for the different test treatments.

Table 8. Survival Summary for the 10-day Benthic Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Treatment	Mean Percentage Survival	Standard Deviation	Mean Percentage Mortality	M_T-M_C[3]
Baseline Test				
Control	91.2	8.3	8.8	--
WETSED-1	0.0 **S**[1]	0.0	**100**	**91.2**
WETSED-2	95.0	5.3	5.0	-3.8
WETSED-3	95.0	7.6	5.0	-3.8
Dilution Series Test[2]				
100% WETSED-3	95.0	7.6	5.0	-3.8
67% WETSED-3	93.8	7.4	6.2	-2.6
33% WETSED-3	88.8	5.3	11.2	1.4
11% WETSED-3	93.8	7.4	6.2	-2.6
TNWR	97.5	7.0	2.5	-7.3

[1] **S**: Mean value is statistically different than the mean value in the control treatment
[2]Treatments listed as nominal concentrations
[3]SCO: M_T-M_C>15%; CSL: M_T-M_C>25%
Bold: Fails SCO
Underline: Fails SCO and CSL

Table 9. Water Quality Summary for the 10-day Benthic Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Conductivity (mS/cm)			pH		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Baseline Test												
Control	6.6	5.4	8.6	22.3	20.3	22.8	197	183	203	7.5	7.3	8.1
WETSED-1	5.7	4.5	7.5	22.4	20.4	23.2	233	199	320	7.1	6.8	7.3
WETSED-2	5.8	4.7	7.2	22.3	20.3	23.2	255	231	307	7.4	7.3	7.5
WETSED-3	6.0	5.2	7.9	20.0	19.4	20.2	268	229	354	7.5	7.3	7.8
Dilution Series Test[1]												
100% WETSED-3	6.0	5.2	7.9	22.5	20.4	23.9	268	229	354	7.5	7.3	7.8
67% WETSED-3	5.6	3.8	6.9	22.3	20.2	23.5	263	229	343	7.4	7.3	7.6
33% WETSED-3	5.6	4.1	6.9	22.5	20.4	23.4	239	217	283	7.3	7.1	7.6
11% WETSED-3	5.3	2.9	8.0	22.2	20.3	22.7	231	204	269	7.4	7.0	8.0
TNWR	6.2	4.6	8.5	21.9	20.1	23.7	216	202	225	7.5	7.2	8.1

[1]Treatments listed as nominal concentrations

Table 10. Test Condition Summary for *Hyalella azteca*, Agri-Tech/YSF 2013.

Test Conditions: *H. azteca*		
Supplier	Aquatic Biosystems	
Date acquired	12/11/2013	
Acclimation/holding time	2 days	
Age class	Adult	
Test type/duration	10-Day Benthic	
Test dates	December 13 - 23	
Weeks of Holding	<2 weeks	
Control Sediment	Silica Sand	
Test temperature	Recommended: 23 ± 1 °C	Achieved: 19.4 – 23.9 °C
Test dissolved oxygen	Recommended: > 2.5 mg/L	Achieved: 2.9 – 8.6 mg/L
Test pH	Recommended: 6-9	Achieved: 7.0 – 8.1
Control performance	Recommended: Control ≤ 10% mortality	Achieved: 9%
Reference Toxicant LC50	1.46 mg/L total ammonia	
Acceptable Range	1.2 – 26 mg/L total ammonia	
Test chamber	300 mL glass chamber	
Replicates/treatment	8 + 2 surrogates for measuring porewater ammonia levels	
Organisms/replicate	10	
Exposure volume	100 mL sediment/ 275 mL water	
Feeding	Daily with 1 mL of stock YCT/Tetrafin™ solution	
Water renewal/Lighting	Twice daily/16:8	
Test Protocol Deviations	Temperature	

3.1.2 Benthic toxicity tests with *Chironomus dilutus*

The 20-d chronic test with larval midge (*C. dilutus*) was initiated on December 13, 2013. A summary of test conditions, test results and water quality observations for the test are presented in Tables 11 through 13. Test results and water quality observations for each of the test replicates and supporting information of the *Chironomus* test is presented in Appendix C. Mean percentage survival in the control sediment was 90.6%, meeting the performance criteria of >68% survival for the controls. Mean growth in the controls was 1.82 mg AFDW/ind, meeting the performance criteria of ≥0.60 mg/ind.

Water quality measurements were within target limits with the exception of dissolved oxygen and temperature. Dissolved oxygen dropped to below target parameters on Day 19 and trickle-flow aeration was added to all chambers for the duration of the test period. Because the decrease in DO was observed at the end of the test period and renewals were performed twice daily limiting the duration of the deviation, it is unlikely that survival or growth endpoints were affected. While the published range for temperature is 23° ±1°C, the test conducted for this study targeted a range of 21° to 23°C to prevent larvae from prematurely pupating. Temperatures were slightly above this range at test initiation; however, at the time animals were placed in the test chambers, test temperatures were within range. On test day 10, test temperature was below 21°C, but was within 1°C in all chambers. Ammonia values

were below NOEC values for *C. dilutus*. The LC_{50} values for the copper sulfate reference-toxicant tests were 1.18 mg/L, within the control chart limits of 0.30 – 2.12 mg/L. This indicates that the test organisms were of similar sensitivity to those previously tested at the Port Gamble Laboratory.

Mean mortality in the test treatments ranged from 22.9% to 29.2%. There was no statistically significant increase in mortality in WETSED-1, relative to the control. Mean percent mortality in WETSED-2 and WETSED-3 were statistically different from the control; however, the difference between mean mortality observed in each of the WETSED test treatments and the control was 13.5% to 19.8%, which was within the CSL criterion for *Chironomus* survival (M_T-M_C >25%). Mean mortality in WETSED-2 and WETSED-3 was slightly above the SCO for mortality (M_T-M_C >15%). *Chironomus* survival in both the WETSED-2 and WETSED-3 test treatments exceeded the control performance criteria.

No statistical decreases in growth were observed in the test treatments, relative to the control. With the exception of WETSED-1, growth in the test treatments exceeded that of the control. Mean individual growth in WETSED-1 was 1.61 mg/ind AFDW, which was 11.5% of the control treatment. This difference was within both the SCO and CSL for freshwater sediments.

The dilution series showed no relationship between the total metals concentrations and survival, with no significant changes in mean percentage survival, relative to the control, across the dilution series. Mean mortality for the different test treatments ranged from 22.3% to 37.5%, with the TNWR (0% WETSED-3) showing the highest mortality for each of the dilution series treatments. *Chironomus* growth in each of the dilution series treatments was greater than that of the control. The highest growth was observed in the 10% and 0% treatments, however, there were no significant differences across the treatments.

Table 11. Survival Summary for the 20-day Benthic Test with *Chironomus dilutus*, Agri-Tech/YSF 2013.

Treatment	Mean Percentage Survival	SD	Mean Percentage Mortality	M_T-M_C[3,4]	Mean AFDW per Survivor[2] (mg)	SD	(MIG_c-MIG_t) / MIG_c[3,4]
Baseline Test							
Control	90.6	9.4	9.4	--	1.82	0.17	--
WETSED-1	77.1	19.3	22.9	13.5	1.61	0.28	0.12
WETSED-2	74.0	10.4	26.0	**16.6 S**[1]	2.39	0.49	-0.31
WETSED-3	70.8	7.7	29.2	**19.8 S**	1.83	0.63	-0.01
Dilution Series Test[2]							
100% WETSED-3	70.8	7.7	29.2	**19.8 S**	1.83	0.63	-0.01
67% WETSED-3	72.9	20.8	27.1	17.7	2.39	0.74	-0.31
33% WETSED-3	77.1	22.2	22.3	13.5	2.06	0.28	-0.13
11% WETSED-3	62.5	27.8	37.5	**28.1 S**	3.16	0.84	-0.74
TNWR	69.8	16.6	30.2	**20.8 S**	2.86	0.52	-0.57

[1] **S**: Mean value is statistically different than the mean value in the control treatment

MIG_c: Mean individual growth in the control; MIG_t: Mean individual growth in the treatment

[2]Treatments listed as nominal concentrations

[3]SCO: M_T-M_C>15%; (MIG_c-MIG_t) /MIG_c >0.25

[4]CSL: M_T-M_C>25%; (MIG_c-MIG_t) /MIG_c >0.40

Bold: Fails SCO

Underline: Fails SCO and CSL

Table 12. Water-Quality Summary - 20-day Benthic Test with *Chironomus dilutus*, Agri-Tech/YSF 2013.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Conductivity (mS/cm)			pH		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Baseline Test												
Control	5.3	2.3	8.7	22.7	20.0	23.9	201	170	213	7.3	7.0	7.8
WETSED-1	5.1	2.0	8.6	22.6	20.0	24.0	213	183	318	7.1	6.8	7.8
WETSED-2	4.8	1.8	7.6	22.3	20.1	23.0	246	219	306	7.4	7.1	7.6
WETSED-3	4.7	2.1	7.8	22.4	20.0	23.6	248	228	341	7.4	7.2	7.6
Dilution Series Test[1]												
100% WETSED-3	4.7	2.1	7.8	22.4	20.0	23.6	248	228	341	7.4	7.2	7.6
67% WETSED-3	4.5	3.0	7.7	22.3	20.4	23.6	243	222	323	7.4	7.1	7.7
33% WETSED-3	6.6	3.1	9.0	22.3	20.0	22.9	234	214	301	7.6	7.1	8.2
11% WETSED-3	6.7	2.8	8.4	22.4	20.1	24.0	225	210	259	7.6	7.2	8.0
TNWR	7.0	2.7	9.3	22.1	20.0	24.0	219	183	242	7.7	7.2	8.5

[1]Treatments listed as nominal concentrations

Table 13. Test Condition Summary for *Chironomus dilutus*, Agri-Tech/YSF 2013.

Test Conditions: *C. dilutus*		
Supplier	Aquatic Biosystems	
Date acquired	12/11/13	
Acclimation/holding time	NA	
Age class	<2-day old	
Test type/duration	20-Day Benthic Chronic	
Test dates	December 13 – January 2, 2014	
Weeks of Holding	<2 weeks	
Control Sediment	Silica sand	
Test temperature	Recommended: 22 ± 1 °C	Achieved: 20.0 – 24.0 °C
Test dissolved oxygen	Recommended: > 2.5 mg/L	Achieved: 1.8 – 9.3 mg/L
Test pH	Recommended: 6-9	Achieved: 6.8 – 8.5
Control performance	Recommended: Control ≤ 10% mortality	Achieved: 9%
Reference Toxicant LC50	1.18 mg/L Cu	
Acceptable Range	0.3 – 2.12 mg/L Cu	
Test chamber	300 mL glass chamber	
Replicates/treatment	8 + 2 surrogates for measuring porewater ammonia levels	
Organisms/replicate	12	
Exposure volume	100 mL sediment/ 275 mL water	
Feeding	6 mg of ground Tetramin™ per test chamber daily	
Water renewal/Lighting	Twice daily/16:8	
Test Protocol Deviations	DO, Temperature	

3.1.3 Benthic toxicity tests with Microtox®

The Microtox® tests were performed by Rainier Environmental using the luminescent marine bacterium *Vibrio fischeri* in combination with the Microtox® Model 500 Analyzer. Light output of the bacterium reacting with the test sample was measured at 5 and 15 minutes of exposure. The test compared sample porewater extracts to the controls and the data was evaluated statistically on the change in output over time. Full test results with benchsheets are presented in Appendix B.

Water quality parameters were within target ranges with dissolved oxygen ranging from 6.2 to 7.5 mg/L and pH ranging from 7.14 to 8.15. The final mean light output in the control treatment was 80% of initial output, exceeding the control performance criteria of 72% (Table 14). The estimated LC_{50} for the reference toxicant test was 1209 µg/L and 438 µg/L Cu for the 5 and 15 minute exposures, respectively. These values were within the laboratory historical limits (5 min: 929 – 1666 µg/L; 15 min: 425-613 µg/L Cu), indicating that the test organisms were similar to those tested previously at the Rainier Environmental laboratory.

Table 14. Summary of Test Results for the Microtox® Test, Agri-Tech/YSF 2013.

Treatment[2]	5-Minute Reading		15-Minute Reading	
	Mean Percentage Change in Light Output	T/C[3,4]	Mean Percentage Change in Light Output	T/C[3,4]
Control	91 ±4	--	80 ±4	--
WETSED-1	59 ±3	**0.65 S[1]**	11 ±1	**0.14 S**
WETSED-2	94 ±3	1.03	78 ±4	0.98
WETSED-3	97 ±2	1.07	80 ±2	1.00
Control	91 ±3	--	79 ±4	--
100% WETSED-3	95 ±5	1.04	77 ±4	0.97
67% WETSED-3	94 ±3	1.03	80 ±7	1.01
33% WETSED-3	98 ±3	1.08	84 ±5	1.06
11% WETSED-3	98 ±2	1.08	85 ±2	1.08
TNWR	97 ±1	1.07	86 ±2	1.09

[1] S: Mean value is statistically different than the mean value in the control treatment
[2]Dilution series treatments listed as nominal concentrations
[3]RSET low (two hit): T/C <0.85
[4]RSET high (one-hit): T/C <0.75
Bold: Fails SCO; Underline: Fails SCO and CSL

With the exception of WETSED-1, no significant differences in mean percentage light output were observed in the WETSED or dilution test samples. Light output was >90% of the initial reading at 5 minutes, and >77% at 15 minutes; ≥97% of the control. Light output in the WETSED-1 treatment was 35% that of the control at 5 minutes and was 14% of the control at 15 minutes (a reduction in light output of 86%). The WETSED-1 light output failed the RSET Microtox® criteria for both time intervals.

3.2 Toxicity Identification Tests

Porewater was extracted from the whole sediment collected from Station WETSED-1 using centrifugation. Porewater samples and whole sediment were then treated following the methods outlined in Section 2.4. The toxicity identification evaluation of the WETSED-1 sediment included the following targeted chemical classes and associated methods:

- Cationic metals – cation exchange resin beads in sediment and in porewater filtered through SIR-300 to address the role of cationic metals;
- Metals – EDTA in porewater to address the role of metals in general;
- Organics – Powdered coconut charcoal (PCC) in sediment and sediment filtered through a solid-phase extraction column (C-18 cartridge) to address the potential role of non-ionic organics;
- Ammonia/sulfides – compare porewater concentration with species sensitivity data; and,
- Particulates – filtered sample to address the potential role of particulates.

3.2.1 Porewater Chemistry

Treated and untreated porewater samples were analyzed for metals (Table 15). Cadmium and lead were undetected in the WETSED-1 porewater, with detection limits of 0.002 mg/L and 0.02 mg/L, respectively. Zinc was observed at a concentration of 28.3 mg/kg in the WETSED-1 porewater, with a manganese concentration of 4.49 mg/kg. Ammonia in the WETSED-1 porewater was 0.46 mg/L.

With the exception of the SIR-300 treatment, porewater concentrations of metals were unchanged by the TIE manipulations. Two concentrations of EDTA were added to the porewater; however, neither treatment decreased the concentration of manganese or zinc in the porewater. The target concentrations of EDTA were 0.25 and 0.5 times the EDTA LC_{50} and were considered an upper concentration for testing with *Hyalella azteca*. Filtration of the porewater also did not decrease the concentration of manganese or zinc, indicating that these metals were not associated with particulates but were present in a dissolved phase. As expected, treatment of the WETSED-1 porewater with the C18 column did not alter the concentrations of metals in the porewater.

Treatment of the WETSED-1 porewater with the SIR-300 cation-exchange resin effectively decreased the concentrations of both manganese and zinc. The concentration of manganese was decreased from 4.49 mg/L to 0.053 mg/L Mn; zinc was decreased from 28.3 to 0.13 mg/L Zn.

Table 15. Metals in Untreated and Treated WETSED-1 Porewater, Agri-Tech/YSF 2013.

Treatment	Metal (mg/L)				Ammonia (mg/L Total)
	Cadmium	Lead	Manganese	Zinc	
WETSED-1	0.002 U	0.02 U	4.49	28.3	0.46
WS-1 SIR-300	0.002 U	0.02 U	**0.053**	**0.13**	0.40
WS-1 EDTA Low	0.002 U	0.02 U	4.18	26.0	--
WS-1 EDTA High	0.002 U	0.02 U	4.36	26.9	--
WS-1 C18	0.002 U	0.02 U	4.25	26.0	--
WS-1 Filtered	0.002 U	0.02 U	4.37	25.8	--

U: Undetected. Actual concentration below reported concentration

3.2.2 Porewater Toxicity Tests with *Hyalella azteca*

Water-only toxicity tests were conducted with the amphipod *Hyalella azteca*. The porewater test was conducted as a 10-day test, with both a 96-h and 10-d endpoint. The porewater test was initiated on January December 13, 2013. A summary of test conditions, test results, and water quality observations for the test are presented in Tables 16 to 18. Data for all replicates, as well as testing bench sheets are presented in Appendix D. Water quality parameters remained within the recommended ranges throughout the duration of the test. The test was validated by 90% survival in the controls. The LC_{50} for the ammonia reference-toxicant test was 6.79 mg/L total ammonia, within the control chart limits (0.0 – 26.5 mg/L), indicating that the test animals were similar in sensitivity to previous populations used at the Port Gamble laboratory.

Mean percentage survival in the unfiltered WETSED-1 porewater was 0.0%, with complete effects observed at the 96-h endpoint. Mean percentage survival in the two EDTA treatments, the C18 treated and filtered porewater was also 0%, indicating that these treatments did not decrease toxicity. Survival in the EDTA and C18 controls (clean DI treated in a similar manner) ranged from 75% to 95%, indicating that the observed toxicity was not associated with the EDTA or C18 treatments.

Mean percentage survival in the SIR-300 treated porewater was 50% at 96-hours, showing a significant increase in survival relative to the WETSED-1 porewater. This provided a strong indication cationic metals were likely to have had a role in the toxicity observed in the WETSED-1 porewater. This observation was further strengthened by the low ammonia concentrations observed in the porewater samples (<1 mg/L total ammonia). Ammonia concentrations can sometimes be increased by SIR-300 treatment, potentially contributing to toxicity. No significant toxicity was observed in the SIR-300 control, indicating that the cation exchange resin did not affect amphipod survival.

While there was some additional mortality at 10-days of exposure, this was due to one to two additional mortalities in both the SIR-300 treatment and control. Because the effects in the WETSED-1 treatment were observed at 96-hours and little change was observed across the test between 96-hour and 10-day, the 96-hour endpoint was used for evaluating toxicity.

Table 16. Summary of Results for the 4-day and 10-day Porewater TIE Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Treatment	96-h Endpoint		10-day Endpoint	
	Mean Percentage Survival	Standard Deviation	Mean Percentage Survival	Standard Deviation
Control	90.0	13.7	90.0	13.7
WETSED-1	0.0	0.0	--[1]	--
WS-1 Filtered	0.0	0.0	--	--
WS-1 SIR-300	50.0 **S**[2]	30.6	40.0 **S**	37.9
SIR-300 Control	90.0	13.7	85.0	13.7
WS-1 EDTA Low	0.0	0.0	--	--
EDTA-Low Control	75.0	30.6	--	--
WS-1 EDTA High	0.0	0.0	--	--
EDTA High Control	95.0	11.2	--	--
WS-1 C18	0.0	0.0	--	--
C18 Control	90.0	22.4	--	--

[1]Test treatment terminated at 96-hours.
[2]S: Statistically significantly different, relative to the TIE treatment control.

Table 17. Summary of Water Quality for the Porewater Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Conductivity (mS/cm)			pH		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	7.6	4.8	9.1	22.6	21.9	23.8	325	195	505	7.4	6.8	7.9
WETSED-1	7.3	4.7	8.3	23.1	22.0	23.9	1723	1612	1805	5.9	5.1	6.5
WS-1 Filtered	8.1	7.3	9.1	23.4	22.3	24.5	1721	1655	1772	7.0	6.9	7.1
WS-1 SIR-300	6.7	4.3	8.9	22.9	22.1	23.9	2031	1631	2270	7.3	6.5	8.6
SIR-300 Control	6.1	3.5	8.8	22.7	21.8	24.5	262	179	381	7.3	6.7	7.8
WS-1 EDTA Low	7.8	6.1	8.9	23.2	22.0	24.3	1728	1672	1798	7.3	7.2	7.5
EDTA-Low Control	8.0	7.1	8.9	23.6	22.9	24.5	162	155	173	7.0	6.0	7.5
WS-1 EDTA High	7.9	6.0	9.4	23.4	22.0	24.4	1719	1648	1793	6.9	6.7	7.1
EDTA High Control	7.9	6.0	9.4	23.4	22.0	24.4	467	161	561	6.9	6.7	7.1
WS-1 C18	7.6	6.3	8.5	23.1	22.2	23.9	1688	1589	1751	7.1	6.9	7.2
C18 Control	8.4	7.5	8.8	23.2	22.2	23.7	220	188	272	7.8	7.7	7.8

Table 18. Test Condition Summary for the Porewater Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Test Conditions: *H. azteca*		
Supplier	Aquatic Biosystems	
Date acquired	01/28/14	
Acclimation/holding time	2 days	
Age class	Adult	
Test type/duration	96-h and 10-d Porewater Test	
Test dates	January 31	
Weeks of Holding	8 weeks	
Control Sediment	Silica Sand	
Test temperature	Recommended: 23 ± 1 °C	Achieved: 21.8 – 24.7 °C
Test dissolved oxygen	Recommended: > 2.5 mg/L	Achieved: 3.5 – 7.9 mg/L
Test pH	Recommended: 6-9	Achieved: 7.7 – 8.5
Control performance	Recommended: Control ≤ 10% mortality	Achieved: 10%
Reference Toxicant LC50	6.79 mg/L total ammonia	
Acceptable Range	0.0 – 26.5 mg/L total ammonia	
Test chamber	20-mL glass vials	
Replicates/treatment	5	
Organisms/replicate	4	
Exposure volume	15 mL	
Feeding	Day 5; 1 mL of stock YCT/Tetrafin™ solution	
Water renewal/Lighting	None/16:8	
Test Protocol Deviations	Temperature	

3.2.3 Porewater Toxicity Tests with *Microtox*®

Based on the results of the amphipod TIE tests, the Microtox® TIE included the WETSED-1 porewater and SIR-300 treated porewater. A summary of the test results are presented in Table 19. Data for all replicates, as well as testing bench sheets are presented in Appendix D. The final mean light output in the control treatment was 77% of initial output, meeting the control performance criteria of >72%.

The WETSED-1 porewater sample showed significantly decreased light output, relative to the control, at both the 5 minute and 15 minute time interval. Light output in the untreated WETSED-1 porewater was 88% and 67% that of the control for the 5 and 15 minute interval, respectively. While this is decreased relative to the control, the effects were less than those observed from the whole sediment samples. This may have been due to the loss of fines during the centrifugation process.

Treatment with SIR-300 completely removed toxicity, with no significant effects observed in the SIR-300 treated porewater. Light output in this treatment exceeded the control water both at the 5 and 15 minute interval (104% of the control). No effects were observed in the SIR-300 control.

Table 19. Summary of Test Results for the Porewater Microtox® Test, Agri-Tech/YSF 2013.

Treatment	5-Minute Reading		15-Minute Reading	
	Mean Percentage Change in Light Output	T/C[1,2]	Mean Percentage Change in Light Output	T/C[1,2]
Control	85 ±2	--	77 ±3	--
WS-1	75 ±2	0.88 **S**	49 ±3	**0.63 S**
WS-1 SIR300	89 ±3	1.04	81 ±3	1.04
SIR300 Control	93 ±4	1.09	86 ±3	1.11

[1]RSET low (two hit): T/C <0.85

[2]RSET high (one-hit): T/C <0.75

S: Significantly different than treatment control

Bold: Fails SCO

Underline: Fails SCO and CSL

3.2.4 10-Day Benthic (Whole Sediment) Amphipod TIE Test

The 10-d benthic TIE test with *Hyalella azteca* was initiated on January 31, 2014. A summary of test conditions, test results and water quality observations for the test are presented in Tables 20 to 22 and Appendix E. With the exception of temperature, water quality parameters remained within the recommended ranges throughout the duration of the test. Temperature generally ranged between 21.0 to 23.0°C, which is within the tolerance range for this species and was unlikely to have affected test performance. The test was validated by 87.5% survival in the controls, which met the control performance standard of ≥80% survival. The LC_{50} for the ammonia reference-toxicant test was 6.79 mg/L total ammonia, within the control chart limits (0.0 – 26.5 mg/L), indicating that the test animals were similar in sensitivity to previous populations used at the Port Gamble laboratory.

Mean percentage mortality in the WETSED-1 sediment was similar to that of the first round of tests, with 100% mortality. Treatment with SIR-300 decreased toxicity, with mean percentage mortality of 32.5%. Survival in the SIR-300 treated sediment was not statistically different from the control and the difference between the SIR-300 treated sediment and the control was 20%, within the CSL criteria of ≤25%.

Treatment with powdered coconut charcoal did not alter toxicity, with 0% survival in the PCC amended WETSED-1 sediment. However, survival in the PCC control was 5%, indicating that the PCC amendment likely contributed to toxicity in the PCC treatments.

Table 20. Survival Summary for the 10-day Benthic Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Treatment	Mean Percentage Survival	Standard Deviation	Mean Percentage Mortality	M_T-M_C[2]
TIE Tests				
Control	87.5	9.6	12.5	--
WETSED-1	0.0 **S**[1]	0.0	100	**<u>87.5</u>**
WETSED-1 SIR-300	67.5	25.0	32.5	**20.0**
SIR-300 Blank	82.5	12.6	17.5	5.0
WETSED-1 PCC	0.0 **S**	0.0	100	**<u>87.5</u>**
PCC Blank	5.0 **S**	5.8	95	**<u>82.5</u>**

[1] **S**: Mean value is statistically different than the mean value in the control treatment

[2]SCO: M_T-M_C >15%; CSL: M_T-M_C >25%

Bold: Fails SCO

<u>Underline</u>: Fails SCO and CSL

Table 21. Summary of Water Quality for the Benthic TIE Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Treatment	Dissolved Oxygen (mg/L)			Temperature (°C)			Conductivity (mS/cm)			pH		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
Control	6.4	5.0	8.9	21.9	21.2	22.3	201	189	207	7.5	7.2	7.8
WETSED-1	5.8	4.5	8.4	21.9	20.8	22.6	229	186	326	7.2	6.8	7.6
WETSED-1 SIR-300	6.2	4.6	8.3	22.0	21.1	22.5	239	172	430	7.1	6.6	7.4
SIR-300 Blank	8.3	7.0	8.8	21.9	21.5	22.7	172	145	235	7.7	7.0	8.1
WETSED-1 PCC	5.9	3.7	8.5	21.9	21.4	22.6	241	184	399	7.2	6.9	7.4
PCC Blank	5.7	4.4	8.9	21.9	21.2	22.5	208	188	239	7.4	7.1	8.0

Table 22. Test Condition Summary for the Benthic TIE Test with *Hyalella azteca*, Agri-Tech/YSF 2013.

Test Conditions: *H. azteca*		
Supplier	Aquatic Biosystems	
Date acquired	01/28/14	
Acclimation/holding time	2 days	
Age class	Adult	
Test dates	January 31	
Weeks of Holding	8 weeks	
Control Sediment	Silica Sand	
Test temperature	Recommended: 23 ± 1 °C	Achieved: 20.8 -22.7 °C
Test dissolved oxygen	Recommended: > 2.5 mg/L	Achieved: 3.7 -8.9 mg/L
Test pH	Recommended: 6-9	Achieved: 6.6 – 8.0
Control performance	Recommended: Control ≤ 10% mortality	Achieved: 12.5%
Reference Toxicant LC50	6.79 mg/L total ammonia	
Acceptable Range	0.0 – 26.5 mg/L total ammonia	
Test chamber	300-mL glass chamber	
Replicates/treatment	5	
Organisms/replicate	4	
Exposure volume	100 mL with 175 mL water	
Feeding	Daily; 1 mL of stock YCT/Tetrafin™ solution	
Water renewal/Lighting	None/16:8	
Test Protocol Deviations	Temperature	

4. Discussion

As part of the remedial investigation of the Agri-Tech/YSF property, sediment evaluations were conducted to refine estimates of toxicity in wetland sediments and to better understand the potential relationship between site-related chemicals and observed affects. The results of this investigation are intended to inform the cleanup action plan as it pertains to the wetland.

4.1 Summary of Whole-Sediment Baseline Tests

Concentrations of cadmium exceeded the CSL of 5.4 mg/kg in each of the sediment treatments. With the exception of zinc in sediment from WETSED-3, concentrations of lead, manganese, and zinc were below screening levels. Zinc in sediment from WETSED-3 was 3810 mg/kg, slightly above the SCO of 3200 mg/kg.

In the baseline toxicity tests, WETSED-1 failed the CSL criteria for both the 10-day acute amphipod test and the Microtox® test (Table 23). No significant toxicity was observed in WETSED-1 sediment for either mortality or growth in the 20-day chronic test with *Chironomus dilutus*. Sediment from WETSED-2 and WETSED-3 met the CSL criteria for all three sediment tests. Mortality in the chronic toxicity test with *Chironomus dilutus* exceeded the SCO for both of these treatments, however, control-normalized mortality was within 2% and 5% of the criterion for WETSED-2 and 3, respectively.

Table 23. Summary of Wetland Soil and Sediment Chemistry, Agri-Tech/YSF 2013.

Toxicity Endpoint	SCO	CSL	WETSED-1	WETSED-2	WETSED-3
Amphipod $M_T - M_C$	>15%	>25%	**Fails CSL**	Pass	Pass
Chironomus $M_T - M_C$	>15%	>25%	Pass	**Fails SCO** Pass CSL	**Fails SCO** Pass CSL
Chironomus $(MIG_C - MIG_T)\ /MIG_C$	>0.25	>0.40	Pass	Pass	Pass
Microtox® 5 minute T/C	<85%	<75%	**Fails CSL**	Pass	Pass
Microtox® 15 minute T/C	<85%	<75%	**Fails CSL**	Pass	Pass
Station Summary			**Fails CSL**	Fails SCO	Fails SCO

4.2 Comparison to the Previous Investigation

In general, the conventional sediment characteristics and metals concentrations were similar between the current samples (2013) and those samples during the previous wetland investigation (2011). Sediment from Station WETSED-1 was characterized as a mixture of sand and silt/clay, with 5% TOC (Table 24). Both WETSED-2 and WETSED-3 were dominated by fine-grained sediment, with slightly lower TOC (3.6% to 4.7% TOC).

Concentrations of cadmium were similar across the two studies, with concentrations ranging from 6.6 to 9.9 mg/kg, with all measured concentrations exceeding the CSL for cadmium. As in the initial investigation, concentrations of lead and zinc were below CSL levels.

The results of the 2013 amphipod tests confirmed the findings of the 2011 study. Acute toxicity was observed for sediment from WETSED-1, with 100% mortality. While mortality was higher in 2011 for WETSED-2 (14%), this treatment met SMS criteria in both studies. No significant mortality was observed in sediment from WETSED-3 in either 2011 or 2013.

For the chronic sediment test with *Chironomus dilutus*, earlier results for WETSED-1 and WETSED-2 sediments were confirmed with no significant mortality or decreased growth observed in sediment from WETSED-1; marginal mortality was observed in WETSED-2, passing CSL criteria. Mortality and growth in WETSED-3 passed CSL criteria, which failed CSL criteria during the 2011 tests.

Microtox® tests showed marked improvement during the current study. Tests were conducted within two days of collection to minimize effects associated with holding times. No toxicity was observed for either the WETSED-2 or WETSED-3 treatments for either the 5 minute or 15 minute endpoint. Both sediment treatments failed CSL criteria in 2011. The CSL failures observed in the WETSED-1 treatment in 2011 was confirmed, with similar responses to those of 2011.

Table 24. Summary of Wetland Sediment Chemistry and Test Results, Agri-Tech/YSF, 2011 and 2013.

Analyte	WETSED-1		WETSED-2		WETSED-3		SMS[1]	
	2011	2013	2011	2013	2011	2013	SCO[2]	CSL[3]
% Sand and Gravel	40.4	58.3	14.1	23.4	4.1	11.8	--	--
% Fines (silt/clay)	59.6	41.7	85.9	76.6	95.9	88.2	--	--
TOC (%)	5.3	5.2	4.7	3.8	3.6	4.4	--	--
Cd	**9.2**	**6.5**	**6.8**	**7.4**	**7.8**	**9.4**	2.1	5.4
Mn	210	147	220	146	270	178	--	--
Pb	190	189	150	342	180	324	360	>1300
Zn	2700	2240	2800	2940	2700	**3810**	3200	>4200
Toxicity Tests								
Analyte	WETSED-1		WETSED-2		WETSED-3		SMS	
	2011	2013	2011	2013	2011	2013	SCO	CSL
Hyalella Mortality M_T-M_C	**100%**	**91%**	14%	-4%	4%	-4%	>15%	>25%
Chironomus Mortality M_T-M_C	15%	14%	**18%**	**17%**	**58%**	**20%**	>15%	>25%
Chironomus Growth $(MIG_c-MIG_t)/MIG_c$	-0.22	0.12	0.04	-0.31	**0.34**	-0.01	>0.25	>0.40
Microtox® 5 minute T/C	**0.71**	**0.65**	**0.75**	1.03	**0.84**	1.07	<0.85	<0.75
Microtox® 15 minute T/C	**0.20**	**0.14**	**0.30**	0.98	**0.42**	1.00	<0.85	<0.75

[1]Sediment Management Standards

[2]Sediment Cleanup Objective

[3]Cleanup Screening Level

Bold: Fails SCO

Underline: Fails SCO and CSL

4.3 Dilution Series Test

Each of the toxicity tests (*Hyalella*, *Chironomus*, and Microtox) were conducted with a series of sediment dilutions prepared with test sediment WETSED-3 diluted with reference sediment from the Toppenish National Wildlife Refuge. The dilution series test was conducted concurrent to the baseline tests. WETSED-3 was selected based on the concentration of cadmium, which was highest among the three test treatments. Measured concentrations of cadmium, lead, and zinc showed a decrease with test sediment dilutions, with cadmium concentrations generally achieving the target concentration (Table 7). Manganese concentrations in the test sediments increased with dilution, with the highest concentration of manganese found in the 1% WETSED-3 treatment.

In general, there was little difference in response across the dilution series for each of the tests. *Chironomus* growth was higher in the 0% and 11% WETSED-3 treatments (Table 25); however, the variability for this endpoint was quite high and differences were not significant. In all treatments, *Chironomus* growth was greater than in the control sediment. Based on the dilution series test, the total metals concentrations in the WETSED-3 treatment did not appear to be predictive of effects.

Table 25. Summary of Dilution Series Test Results, Agri-Tech/YSF, 2013.

Treatment (Nominal)	*Hyalella* Survival M_T-M_C	*Chironomus*		Microtox®	
		Survival M_T-M_C	Growth $(MIG_c-MIG_t)/MIG_c$	5 minute T/C	15 minute T/C
Control Result	91%	91%	1.82 mg/ind/d	91%	80%
100% WETSED-3	-3.8	**19.8**	-0.01	1.04	0.97
67% WETSED-3	-2.6	17.7	-0.31	1.03	1.01
33% WETSED-3	1.4	13.5	-0.13	1.08	1.06
11% WETSED-3	-2.6	28.1	-0.74	1.08	1.08
TNWR	-7.3	20.8	-0.57	1.07	1.09

Bold: Fails SCO

Underline: Fails SCO and CSL

4.4 Toxicity Identification Evaluation

Based on the results of the baseline toxicity tests, WETSED-1 was selected for further evaluations of the source of toxicity. Toxicity identification evaluations with both sediment and porewater samples provided multiple lines of evidence to relate the observed toxicity in WETSED-1 with contaminants of potential concern. The following section provides a summary of the TIE findings which are then used in a weight of evidence approach to draw conclusions regarding the source(s) of toxicity with the sediments represented by WETSED-1.

4.4.1 AVS/SEM

Total metals concentrations in sediment can be unreliable predictors of toxicity because the availability of metals to aquatic organisms depends upon a number of site-specific factors. .. The primary route of exposure for benthic organisms is uptake via the interstitial pore water that occurs between the grains of sediment. Metals in this aqueous phase tend to be more bioavailable than those bound to sediment (DiToro et al. 1991). Metals bound to sediment solids in various forms are largely unavailable to aquatic organisms and are considered to be far less toxic than dissolved metals in the pore water. The precipitation of metal sulfides (AVS) and the adsorption of metals to organic carbon in sediment are two processes that serve to control the equilibrium between metals on the sediment and dissolved metals in the pore water. The AVS:SEM ratio based on measured acid volatile sulfides (AVS) and simultaneously extracted metals (SEM) allow for a site-specific prediction of the bioavailability of certain metals. The AVS:SEM analysis addresses the question of whether certain metals are present at concentrations that exceed the binding capacity of the sediment matrix. If those metals are not bound, they may be more readily available and more biologically active.

AVS is an operationally defined measurement of metal sulfides that naturally occur in sediments. AVS represents the iron and manganese sulfide minerals in the sediments that react with certain metals. Cationic metals, such as cadmium, form sulfide minerals less soluble than natural AVS. As a result, these toxic metals displace iron or manganese from AVS and are themselves sequestered in a very insoluble and biologically unavailable form. (U.S. EPA 1994; DiToro et al. 1996). The precipitation of metals by AVS is assumed to eliminate the mobility and toxicity of that metal, so it is important to account for this removal when computing the porewater concentration of metal from the concentration on the solids. The amount of AVS can vary in different sediments, resulting in differing binding capacities. Once the binding capacity of the AVS is met, the metals are available for uptake or for other binding mechanisms. Thus, the ratio of simultaneously extracted metals (SEM) to AVS can be used to predict whether metals toxicity should not occur; when SEM:AVS is less than 1. It should be noted that the SEM/AVS model does not necessarily predict toxicity when the SEM:AVS is greater than 1, due to other factors that may control toxicity.

The binding capacity of AVS is competitive between metals with the sulfide form of each metal having its own solubility. The least soluble sulfide-metal will precipitate completely before the other metals are bound by the available AVS. The complete order of sulfide solubilities is: Cu < Pb < Cd < Zn < Ni. This means that for a given amount of AVS, CuS will always precipitate before any others. If the total Hg is greater than the AVS, then all the AVS will be CuS and the remaining metals would not for insoluble precipitates. Mercury will also bind with AVS, however, concentrations observed in previous wetland soil samples were between 0.04 and 0.14 mg/kg (Table 1) and would not result in significant binding of the observed AVS. .

The SEM and AVS measured in the WETSED-1 treatment and the SEM-AVS ratio is presented in Table 26. The SEM for cadmium, lead, and manganese were similar to those of the whole sediment, whereas the SEM_{Zn} was 4,790 mg/kg, which is higher than the total zinc measured in the initial analysis of the WETSED-1 sediment. The total SEM, based on a suite of five metals was 5,096 mg/kg (Table 25, Column 3) or 76.3 µmol/g (Table 25, Column 4). The AVS in the WETSED-1 was 48.9 µmol/g (Table 25, Column 6) and the SEM:AVS ratio was greater than 1 indicating the potential for metals toxicity. Based on the preferential binding capacity of AVS (Table 25, Column 8), all of the copper, cadmium, and lead were predicted to be entirely bound by AVS and in the particulate form. Approximately 60% of the zinc SEM was predicted to be bound to sulfides, with approximately 40% of the zinc and all the remaining manganese predicted to be unbound by sulfides.

Table 26. Results of AVS and SEM Analysis for Sediment from WETSED-1, Agri-Tech/YSF 2013.

1	2	3	4	5	6	7	8	9
Metal	MW[1]	SEM (mg/kg)	SEM (µmol/g)	AVS (mg/kg)	AVS[2] (µmol/g)	Fraction TOC	Total $SEM - AVS$ (µmol/g)	TOC-Normalized $SEM - AVS$ (µmol/gOC)
Cu[3]	63.6	36	0.6				-48.4	
Cd	112.4	6.6	0.1				-48.3	
Pb	207.2	183	0.9				-47.4	
Zn	65.4	4790	73.2				+25.8	
Mn	54.9	80.9	1.5				+26.7	
Total		5096.5	76.3	1570	48.9	0.052	+26.7	518

[1] MW= molecular weight;
[2] Mass of AVS divided by molecular weight of sulfur (32.087) to obtain AVS molar mass
[3]Copper concentration based on total copper measurement (Table 1).

As indicated above, simply knowing that metals are available does not predict effects. Previous studies have compared the available metals (SEM-AVS) to the fraction of total organic carbon (TOC) in the sediments and ranked the likelihood of toxicity (Besser et al. 2013; DiToro et al. 1991; 1992). The TOC normalized SEM/AVS (SEM-AVS divided by the fraction of TOC) can be ranked into one of three categories: metals unlikely to cause toxicity (<130 µmol/g_{OC}), potential metals toxicity (130-3000 µmol/g_{OC}) and metals toxicity expected (>3000 µmol/ g_{OC}). The TOC-normalized SEM-AVS for the WETSED-1 sediment was 518 µmol/g_{OC}, falling in the category of metals potentially being the cause of observed toxic effects (Table 26).

4.4.2 Whole Sediment TIE Toxicity Testing

To confirm the role of metals in the toxicity predicted by the SEM/AVS model, amphipod toxicity tests were conducted with WETSED-1 sediment treated with SIR-300 cation-resin beads. The SIR-300 resin preferentially binds cationic metals, reducing their bioavailability and resulting toxicity. Mean percentage survival in the treated sediment was then compared to the untreated sample.

A significant decrease in toxicity was observed in the SIR-300 treated sediment, with 32% mortality in the SIR-300 treatment compared to 100% mortality in the untreated WETSED-1 sediment (Figure 4). Furthermore, amphipod survival in the SIR-300 treated sample met the CSL criteria for the amphipod test.

The WETSED-1 sediment was also treated with powdered coconut charcoal to confirm that site-related organics are not associated with toxicity in the WETSED-1 sediment. PCC binds non-ionic organic contaminants. Toxicity was not altered in the PCC treatment with 100% mortality, indicating that toxicity was not associated with organics (removal of organics present did not alter toxicity). However, the PCC control (PCC in control sediment) also showed toxicity, with 95% mortality. PCC has been shown to elicit a toxic response in some invertebrates, with the fine powder adhering to the gills and other external surfaces. While PCC was added at concentrations below toxicity thresholds, effects were clearly present, making it difficult to distinguish between toxicity associated with PCC and that of the original sample.

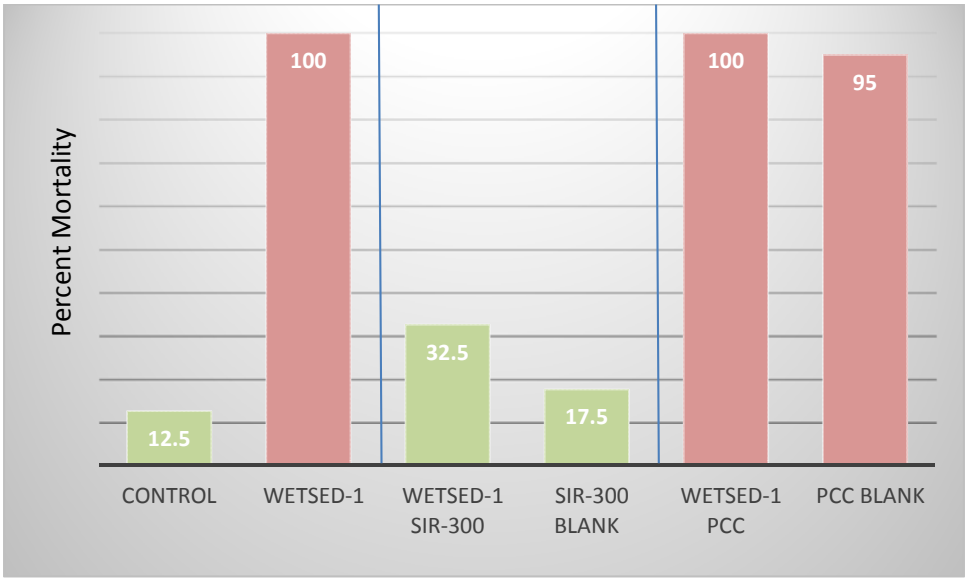

Figure 4. TIE Test Results for the Whole Sediment Test with *Hyalella azteca*.

4.4.3 Porewater TIE Toxicity Testing

In order to further assess the role of metals in toxicity observed in the WETSED-1 sediment, TIE tests were conducted with porewater extracted from the whole sediment. Porewater tests have the advantage of focusing toxicity estimates on the more bioavailable form of contaminants of potential concern. Toxicity evaluations were conducted with the two species that showed toxicity in the baseline tests, *Hyalella azteca* (96-h endpoint) and Microtox®. Analytical chemistry was conducted on untreated and treated porewater to directly measure changes in metals concentrations before and after treatment.

4.4.3.1 Porewater TIEs

The porewater TIE study included six treatments (Table 27), including the following:

- untreated WETSED-1 porewater;
- treatments to reduce metals availability (cation-exchange resin, EDTA Low and High);
- a treatment to reduce organics availability (solid-phase extraction (SPE) C18 column); and,
- a treatment to reduce particulate-bound metals (filtration).

Toxicity was observed in the untreated porewater in both the amphipod and Microtox® tests. Amphipod mortality was 100% and Microtox® showed a 66% reduction in light output, relative to the control.

Treatment of the WETSED-1 porewater with the cation-exchange resin resulted in a significant decrease in toxicity for both the amphipod and Microtox® tests. Control normalized mortality in the amphipod test was reduced to 44%. While there was a significant reduction in amphipod toxicity, some toxicity remained in the SIR-300 treated porewater. Toxicity removal was complete in the Microtox® test with light output exceeding that of the control for both the 5-minute and 15-minute time interval.

No significant differences were observed for the amphipod test in the C18, filtered porewater, and EDTA treatments, with 100% mortality in each treatment. The C18 solid-phase extraction test did not improve survival, a sign that organic contaminants were not a significant contributor to toxicity. Similarly, filtration had no effect, indicating the cause of toxicity was not bound to particles, i.e. free metal ions. The two concentrations of EDTA used did not reduce toxicity. However, the EDTA preparations did not appear to fully dissolve making it difficult to evaluate the binding potential of these treatments.

4.4.3.2 Porewater Chemistry

Cadmium and lead were not detected in the untreated porewater, indicating that while cadmium was observed in whole sediment at concentrations above the CSL, it was not present in the more readily available form. Both manganese and zinc were observed in the untreated WETSED-1 porewater at concentrations of 4.5 mg/L and 28.3 mg/L, respectively. These results are consistent with the AVS binding affinity of the different metals (SEM_{Pb}>SEM_{Cd}>SEM_{Zn}), and suggest that the AVS is sufficient to bind both lead and cadmium, but are not sufficient to completely bind zinc.

Treatment with the SIR-300 cation resin reduced manganese and zinc concentrations by two orders of magnitude, with resulting concentrations of 0.05 mg/L Mn and 0.13 mg/L Zn. EDTA treatments did not

alter the concentrations of manganese and zinc. This may be due to insufficient dissolved EDTA in an effort to avoid EDTA toxicity. There were no changes in metals concentrations with filtration, indicating that the manganese and zinc in the WETSED-1 porewater were not associated with particulates.

Table 27. Results of Porewater Chemistry and Porewater Toxicity Tests, Agri-Tech/YSF 2013.

Treatment	Cadmium (mg/L)	Lead (mg/L)	Manganese (mg/L)	Zinc (mg/L)	*Hyalella* 96-Hour Survival (%)	Microtox light output	
						5 min.	15 min.
WETSED-1	0.002 U	0.02 U	4.49	28.3	0.0	0.88	**<u>0.63</u>**
SIR-300	0.002 U	0.02 U	0.053	0.13	50.0	1.04	1.04
EDTA-Low	0.002 U	0.02 U	4.18	26.0	0.0	--	--
EDTA-High	0.002 U	0.02 U	4.36	26.9	0.0	--	--
C18 SPE	0.002 U	0.02 U	4.25	26.0	0.0	--	--
Filtered	0.002 U	0.02 U	4.37	25.8	0.0	--	--

U= analyte undetected at given reporting limit
Bold: Fails SCO
<u>Underline</u>: Fails SCO and CSL

4.4.4 The Role of Metals in Toxicity

As indicated above, cadmium and lead were not observed in porewater at concentrations above the limits of detection (Cd: 2 ppb; Pb: 20 ppb). This is well below effects levels for *Hyalella azteca*, as well as for *Chironomus dilutus*. Furthermore, the preferential binding of AVS predicted that cadmium and lead would be present as metal-sulfide precipitates and would not be in the more readily available dissolved form. The potential for toxicity associated with particulate cadmium and lead was ruled out in the tests with filtered porewater samples, with no change in toxicity with the removal of particulates.

Zinc and manganese were predicted to be available in the freely dissolved phase and were present in the porewater samples that were associated with toxicity. A toxic-unit approach was used to further evaluate the role of zinc and manganese in porewater toxicity and to better understand the toxicity remaining following SIR-300 treatment. The toxic unit (TU) approach compares the chemical concentration in a sample to a standard measure of toxicity. Typically the toxic unit is defined as the median-lethal concentration, or LC_{50}. For the purpose of this study, the zinc and manganese toxic units were defined as the respective LC_{50} values based toxicity data for *Hyalella azteca* available in the literature.

For zinc, previous laboratory studies with *Hyalella azteca* have found the zinc LC_{50} to be between 0.049 mg/L and 0.245mg/L Zn (Phipps et al 1995, Borgmann et al 2005). These studies were performed using differing water characteristics (e.g. hardness) as well as varying exposure durations (7-10 days), providing a good approximation for the sensitivity of *H. azteca* to zinc. The average LC_{50} was 0.147mg/L and was used as the TU_{Zn} for this analysis.

The untreated porewater had a zinc concentration equivalent to 192 toxic units. This indicated that the untreated porewater had concentrations of zinc that were nearly 200 times higher than the LC_{50} and would be expected to cause the observed amphipod toxicity. The SIR-300 treated porewater had a zinc concentration equivalent to 0.9 toxic units, or a concentration of zinc that was very near to the median lethal concentration. Indeed, the 96-hour control-normalized mean percent mortality in the treated porewater was 44%. This analysis indicated that the concentrations of zinc in the WETSED-1 porewater effectively predicted the level of toxicity observed for both the untreated and treated porewater, indicating that zinc was a driver of toxicity in the WETSED-1 porewater.For manganese, previous laboratory studies with *Hyalella azteca* reported a mean LC_{50} of 2.77 mg/L Mn (Borgmann et al 2005) which was used as the TU_{Mn} for this analysis. The untreated porewater had a manganese concentration equivalent to 1.6 toxic units. This indicated that the untreated porewater had concentrations of manganese that were similar to the LC_{50}. While manganese cannot be ruled out as a contributor to toxicity, it would not be expected to cause the level of amphipod toxicity observed in the untreated sample. The SIR-300 treated porewater had a manganese concentration equivalent to 0.02 toxic units, or a concentration of zinc that was two one-hundredths of the LC_{50}. This analysis indicated that the concentrations of manganese in the WETSED-1 porewater were not sufficient to predict toxicity in either the untreated and treated porewater.

As discussed in this section, sediment processes act to sequester cationic metal either through precipitation as metal sulfide phases or through adsorption onto organic carbon, greatly reducing their bioavailability and toxicity (Gambrell 1994). However, the extent to which cationic metal elements are bound and made unavailable are affected by environmental conditions.

AVS concentrations vary seasonally, but are generally considered to decrease in the cold winter months, presumably due to a decrease in the generation of sulfide by sulfide-reducing bacteria at cooler temperatures (Ankley et al. 1996). Conversely higher AVS and an increased binding capacity may occur during warmer months due to increased production of organic matter and increased activity of sulfate-reducing bacterial (Herlihy and Mills 1985). Decreases in AVS would predict an increase freely dissolved cationic metals. Based on the preferential binding of sulfides, zinc would continue to be the driver in toxicity prior to cadmium and lead.

Hydrogen ion activity (pH) is also an important factor in determining metals availability. As surface sediments become oxidized in the spring and summer months, pH decreases resulting in the release of adsorbed metal ions into the dissolved phase (John and Leventhal 1995). This release of metal ions can occur for Zn at moderately low pHs and may result in an increase in toxicity. These two seasonal influences did not appear to alter the presence of toxicity in WETSED-1 or the relatively low toxicity in sediment from WETSED-2, with similar results being observed in 2011 and 2013 for the benthic tests with *Hyalella* and *Chironomus*. The Microtox® test results in 2011 appear to have been influenced by extended holding times. Differences in Chironomus toxicity tests for WETSED-3 in 2011 and 2013 may be due to refinements in test methods or seasonal influences.

5. Summary of Findings

As part of the remedial investigation of the Agri-Tech/Yakima Steel Fabricators site in Yakima, Washington, ENVIRON conducted a supplemental investigation of sediments from a small wetland located at the south end of the site. The purpose of this investigation were as follows:

- Verify toxicity in the WETSED samples from each of the three stations;
- If toxicity is confirmed, determine whether cadmium or other metals present in the wetland site are the likely cause;
- If toxicity is confirmed and related to metals, determine whether a site-specific clean-up level would be appropriate.

Physical and Chemical Characteristics of Wetland Sediments:

The physical characteristics of the sediments collected in 2013 were similar to those collected in 2011. Sediment at two stations, WETSED-2 and WETSED-3 was predominantly fine-grained, with approximately 4% TOC. Sediment from Station WETSED-1 was sandier in nature, with approximately 50% fines and 5% TOC. The area sampled was a cattail marsh, with a high amount of fine and coarse plant material present in the sediments. Organic carbon was likely influenced by the presence of the plant material, creating elevated levels relative to grain size.

Sediment pH based on porewater samples collected from homogenized sediment samples ranged from 7.14 to 7.28. However, after sediments had been held in anaerobic conditions, pH in the WETSED -1, 2, and 3 treatments dropped to pH 5.6, 7.0, and 6.8, respectively. This may provide an indication that the organically enriched sediments at WETSED-1 may alter pH and thereby affect availability of metals in this portion of the wetland.

Concentrations of total metals were similar in sediment from the three stations and were similar to values observed during previous investigation. Concentrations of cadmium ranged from 6.6 to 9.9 mg/kg, exceeding the CSL of 5.4 mg/kg for cadmium. As in the initial investigation, concentrations of lead and zinc were below CSL levels. The concentration of zinc at WETSED-3 (3,810 mg/kg Zn) was above the SCO (3,200 mg/kg Zn).

Whole-Sediment Toxicity:

WETSED-1 was the only test treatment that exceeded the CSL thresholds for benthic toxicity, based on the responses in the *Hyalella azteca* and Microtox® tests conducted in 2013. Both WETSED-2 and WETSED-3 exceeded the SCO threshold for mortality in the *Chironomus* test. However, the level of response observed in WETSED-2 and WETSED-3 was near the SCO threshold,was similar to that of the reference sediment, and was within the control performance criteria for this test. The findings from the whole-sediment toxicity tests were as follows:

- For the amphipod test with *Hyalella azteca*, acute toxicity was observed in sediment from Station WETSED-1, with 100% mortality; no toxicity was observed in the WETSED-2 or 3 test treatments. These results were similar to those observed during the 2011 investigation.

- For the *Chironomus* test, all test sediment met the CSL criteria for mortality and growth; all test treatments also met the SCO criteria for the more sensitive growth endpoint. The SCO criteria for *Chironomus* mortality was exceeded by 2% and 5% in sediment from WETSED-2 and WETSED-3, respectively. The mortality observed in both treatments was similar to or less than the mortality observed in the reference sediment used in the dilution series test and was within the control performance criteria for mortality (>68% survival). With the exception of WETSED-3, the responses observed in the *Chironomus* test in 2013 were generally similar to those of 2011. Mortality and growth responses were greater in the 2011 tests for WETSED-3. This may be due to the control of sources of test variability or seasonal differences in sediment characteristics.
- For the Microtox® test, no toxicity was observed in the WETSED-2 and WETSED-3 test treatments. Toxicity exceeding the CSL screening level was observed for the WETSED-1 treatment. Tests conducted in 2011 showed toxicity in all Microtox® tests; however, this was likely due to longer holding times prior to analysis, which have been shown to correlate with increased false-positive results (NewFields 2009). Tests conducted in 2013 were initiated less than two days from sample collection in order to avoid this source of variability.
- Total metals concentrations were not predictive to toxicity responses observed in 2013. The responses did not correspond to whole sediment total metals concentrations in the three WETSED treatments or in the dilution series test.

Sources of Toxicity:

Toxicity identification evaluations conducted with treatment WETSED-1 indicated that metals, specifically freely dissolved cationic metals, were associated with the observed toxicity. The primary findings of the TIE evaluations were as follows:

- The AVS:SEM and organic carbon normalized SEM-AVS indicated that simultaneously extractable metals were present at concentrations exceeding the AVS binding capacity of the sediment and predicted that freely-dissolved cationic metals in the sample were a potential cause of toxicity.
- WETSED-1 sediment treated with the cation exchange resin SIR-300, showed a significant decrease in amphipod mortality and Microtox® response, suggesting that cationic metals were associated with the observed toxicity. Relative to the control, the SIR-300-treated sediment passed CSL criteria. Sediment treated with PCC did not show a change in toxicity, suggesting that organic COPCs were not associated with toxicity.
- Porewater from WETSED-1 sediment treated with the cation exchange resin SIR-300, showed a significant decrease in amphipod mortality and Microtox® response, further suggesting that dissolved cationic metals were associated with the observed toxicity.
- Porewater from WETSED-1 sediment treated with filtration and with C-18 solid-phase extraction showed no change in amphipod mortality, indicating that particulates and organic COPCs, respectively were not related to toxicity. EDTA-treated porewater also showed no change in amphipod mortality. However, the analytical chemistry demonstrated that metals concentrations were unaffected by the EDTA treatment; therefore, this TIE manipulation could not be used to formulate conclusions regarding porewater toxicity.

The Role of Metals in Observed Toxicity

Toxicity observed during the 2013 tests was primarily due to zinc and potentially manganese. Cadmium and lead did not appear to be related to the observed toxicity. The primary findings related to the role of metals in the observed toxicity were as follows:

- TIE results indicated that freely dissolved metals were mostly likely associated with toxicity (as stated above).
- The AVS:SEM preferential binding affinities of the cationic metals predicted that cadmium and lead would be entirely bound to AVS and would not be present in the more toxic dissolved form. Both zinc and manganese were predicted to be present in the more bioavailable, dissolved phase.
- Cadmium and lead were not detected in the porewater samples; zinc and manganese were detected in porewater samples.
- Treatment of the porewater with the cation resin SIR-300 effectively removed both zinc and manganese, decreasing the concentrations by two orders of magnitude. Toxicity was also reduced in the SIR-300 treated porewater as a direct result of the SIR-300.
- The concentration of zinc in the SIR-300 treated porewater predicted the magnitude of toxicity observed in the treated porewater (0.9 TU). Zinc is likely to be a primary driver in toxicity.
- Manganese concentrations were also decreased with SIR-300 treatment, but remaining Mn concentrations were well below those that would predict biological effects (0.02 TU). Manganese was not likely to have been primary driver in toxicity.
- Seasonal site conditions may alter the concentrations of dissolved cationic metals. However, zinc is the most likely driver of toxicity based on the corresponding binding affinities and the SEM concentrations of zinc.

Based on the findings of the investigation work herein, no CSL exceedances for biological criteria were observed at Stations WETSED-2 and WETSED-3. Acute toxicity exceeding the CSL criteria was observed in sediment from Station WETSED-1. TIE evaluations of both sediment and porewater indicate that metals, specifically cationic metals were associated with the observed responses. Concentrations of metals observed in the WETSED-1 porewater and correlation analysis using a toxic unit approach indicate that zinc is the likely contributor to toxicity. The adjacent Bay Chemical Site is a known source of zinc in soil and groundwater resulting from former operations at that site. A source of a release of zinc has not been identified on the Agri-Tech/Yakima Steel Fabricators site.

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Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix A

2011 Toxicity Report

Nautilus Environmental

Test America
Sediment Characterization – Toxicological Results

Draft Report

Report date: July 12, 2011

Submitted to:

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Cat Curran, M.S.
Washington Laboratory Manager

This report has been prepared based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party.

1.0 INTRODUCTION

On May 23rd, 2011 Test America collected freshwater sediments for biological testing. Test America contracted with Nautilus Environmental to provide toxicity-testing services for the project. The three sediment samples selected for testing included samples E-WetSed-1-052311 (WETSED-1), E-WetSed-2-052311 (WETSED-2), and E-WetSed-3-052311 (WETSED-3). No reference sample was collected in conjunction with this project. The freshwater sediment samples were tested for toxicity using the *Chironomus dilutus* (aka *tentans*) 20-day survival and growth bioassay (USEPA 2000 and ASTM 2000), the *Hyalella azteca* 10-day survival bioassay (USEPA 2000 and ASTM 2000), and the 15-minute 100 percent porewater Microtox® bacteria bioluminescence test. All tests met negative and positive control criteria.

Results were evaluated by comparing test data to the criteria in the Sediment Evaluation Framework for the Pacific Northwest (RSET 2009) guidance document. *C. dilutus*, *H. azteca*, and Microtox results were compared to control results, and examined for statistically significant effects ($\alpha = 0.05$). Acceptability criteria from the literature are summarized in Table 1.

Table 1 Acceptability criteria for bioassays

Test Type	***C. dilutus* 20-Day**	***H. azteca* 10-Day**	**Microtox**
Endpoint	Survival and Growth	Survival	Luminescence
Source	RSET 2009	RSET 2009	RSET 2009
Test Criteria	One-hit failure is mortality > control mortality + 25% and/or biomass <60% of control biomass and significant difference Two-hit failure is mortality > control mortality + 15% and/or biomass <75% of control biomass and significant difference	One-hit failure is mortality > control mortality + 25% and significant difference Two-hit failure is mortality > control mortality + 10% and significant difference	One-hit failure is Luminescence <75% of control luminescence and significant difference Two-hit failure is Luminescence <85% of control luminescence and significant difference
Control Criteria	Negative control ≤32% mortality and growth ≥0.48 mg/ind. ash-free dry weight	Negative control ≤20% mortality	Negative control final light output > 72% of initial output

2.0 SAMPLES

Upon receipt of samples from Test America, samples were matched with the chain-of-custody form and inspected. Samples were stored at 4 ± 2°C in the dark prior to test initiation. Toxicity tests were initiated within 2 weeks of collection (Table 2). Total ammonia levels in the porewater ranged from <1.0 to 2.7 milligrams per liter (mg/L). Both overlying ammonia and sulfides were also measured during testing, and the results are reported in the QA/QC sections for each test.

Table 2 Summary of sample collection and test initiation dates

Sample ID	Collection Date	Microtox Test Initiation Date	*H. azteca* Test Initiation Date	*C. dilutus* Test Initiation Date
E-WetSed-1-052311	May 23, 2011	June 6, 2011	June 7, 2011	June 9, 2011
E-WetSed-2-052311				
E-WetSed-3-052311				

3.0 *CHIRONOMUS DILUTUS* TEST

3.1 Methods

C. dilutus were exposed to test sediments for 20 days to determine the effects of site sediment on survival and growth. These tests were conducted according to methods presented in USEPA (2000) and ASTM (2000), and are summarized in Table 3.

C. dilutus egg cases were obtained from Aquatic BioSystems (Fort Collins, Colorado) and arrived at the laboratory on June 8, 2011. The egg cases were transported in insulated containers in oxygen-saturated water contained in 500-mL plastic bottles. Upon arrival at the laboratory, water quality parameters were measured and observations of organism condition were made. The egg cases were 20°C at receipt, and were cultured at 23°C. The organisms emerged from the egg cases on June 9th and tests were initiated the same day.

One day prior to test initiation (Day –1), the sediment samples were homogenized, 100-ml of sediment was distributed to each of eight labeled test chambers for each of the samples, and

175-ml diluted mineral water (prepared by diluting two parts Perrier® into eight parts deionized water) was added to each container. Control sediment consisted of clean, rinsed silica sand (50/50 mix of #30 and #70) mixed with peat moss (1/2 Tbsp) that was rinsed overnight in diluted mineral water. Eight test chambers were also prepared for the control sediment. An additional replicate was included for each sediment sample and the control sediment as a sacrificial test chamber for routine water quality measurements.

The test chambers were randomized and the sediments were left to settle overnight. On Day 0, overlying ammonia, sulfide, hardness, alkalinity, dissolved oxygen (DO), pH, conductivity, and temperature were measured. Twelve organisms were directly added to each test chamber, in random order.

Each test chamber was provided 1.5 mL of food daily (after the second renewal) starting on Day -1. The food consisted of a mixture of 4 g ground Tetrafin® flakes mixed with 1 L diluted mineral water. The feeding regime was reduced if the presence of excess food was observed on the sediment surface in several test chambers, which occurred on Day 8 only. Abnormal conditions or unusual animal behavior, if observed, were noted daily.

Temperature, DO, pH, and conductivity were monitored daily in the water quality replicate for each sample, while alkalinity, hardness, ammonia and sulfides were measured on Days 5, 10, and 15. Water was renewed twice daily.

At test termination, subsamples of overlying water were collected from each water quality replicate for ammonia, hardness, alkalinity, and sulfide analyses. The contents of each test chamber were gently mixed to suspend the sediment and poured through a 0.5-mm Nitex screen. The sediment was rinsed through the screen using dechlorinated tap water. Animals were removed from the screen and the number of survivors counted and recorded. Presence of pupae, flies, or exuviae (molts) were noted. The larvae were rinsed with deionized water and placed into pre-ashed, pre-weighed weigh boats. The weigh boats were placed in an oven at 60°C for at least 24-hours, then placed in a dessicator until dry weight could be measured. The weigh boats were then placed in a muffle furnace at 550°C for two hours, placed in a dessicator to cool, then weighed again to determine the ash weight. The ash weight was subtracted from the dry weight to determine the ash-free dry weight (AFDW). The number and AFDW of surviving chironomids were evaluated statistically by one-tailed t-test, or one-tailed Mann-Whitney U-test, as appropriate, to determine whether the samples exhibited a significant

decrease in survival or growth relative to the control ($p<0.05$). Survival data were arcsine transformed, while growth data was either square root or log transformed as needed to stabilize the variances and improve normality of the data prior to performing the t-test. Data that failed to meet parametric assumptions even after transformations were analyzed with the non-parametric Mann-Whitney U-test. Site performance was evaluated against the sediment acceptability criteria outlined in RSET 2009 (Table 1). The criteria for acceptable test performance were an average of ≤32 percent mortality of control organisms, and an average of at least 0.48 mg/individual AFDW per surviving control organism.

A 96-hour reference toxicant test using copper chloride ($CuCl_2$) was conducted concurrently with the tests on the sediments to determine whether the sensitivity of the test organisms was appropriate. This test was run with four replicates, ten animals per replicate, in diluted mineral water at 23°C, with a small amount of clean control sand as a substrate. Tetrafin® slurry (1.25 mL of 4 g/L Tetrafin) was added to each chamber on days 0 and 2.

Table 3 Summary of methods for the 20-day test with *Chironomus dilutus*

Test initiation date	June 9, 2011
Test termination date	June 29, 2011
Test organism source	Aquatic BioSystems; Fort Collins, Colorado
Organism age at test initiation	< 4 hours post-emergence from egg case
Feeding	1.5 mL of 4.0 g/L Tetrafin mixture every day; frequency reduced if excess food observed
Test chamber	475-mL glass beaker
Test sediment volume	100 mL
Dilution water type & volume	175 mL diluted mineral water
Water renewal	Twice daily
Control sediment	Sand mixed with peat (1/2 Tbsp)
Number of organisms/replicate	12
Number of replicates/sample	8 plus water quality surrogates
Test temperature	23± 1°C
Illumination	16 hours light : 8 hours dark
Aeration	Started on Day 13
Reference toxicant	Copper chloride
Acceptability Criteria	≤32% mortality, 0.48 mg/individual AFDW

3.2 Results

The results of toxicity tests conducted using *C. dilutus* are provided in Table 4. Statistics were conducted using Biostat software, which follows the flowchart recommended by RSET. Comparisons are shown to the control. A detailed summary of results is provided in Appendix A. Summary and detailed statistical analyses for endpoint measurements are provided in Appendix B. Summaries of water quality data are provided in Appendix C. Benchsheets are provided in Appendix D.

Table 4 Results of *Chironomus dilutus* tests. Samples with statistically reduced survival or growth are underlined, and values failing two-hit RSET criteria are shaded gray, while samples failing one-hit RSET criteria are bold.[1, 2]

Sample	Percent Mortality (Mean ± SD)	Mortality Percent Difference From	Ash-Free Dry Weight per Org (mg)	Ash-Free Dry Weight Percent of Control
Control	6.3 ± 7.4	--	0.91 ± 0.11	--
WETSED-1	20.8 ± 21.4	14.6	1.11 ± 0.46	123
WETSED-2	24.0 ± 12.9	17.7	0.87 ± 0.22	96
WETSED-3	**63.5 ± 31.2**	**57.3**	0.60 ± 0.57	66

[1]Criteria for one-hit failure is significant decrease in mortality ($p<0.05$), **and** mortality greater than 25% of control (RSET 2009), [2]Criteria for two-hit failure is significant decrease in mortality ($p<0.05$), **and** mortality greater than 15% of control (RSET 2009)

3.3 QA/QC

The *C. dilutus* were received in good condition for the June 9, 2011 test. All water quality parameters remained within acceptable ranges throughout the tests. A summary of the water quality parameters is presented in Table 5. Dissolved oxygen levels were decreased to a level on concern on day 13, and all replicates were aerated from that point forward. There were no deviations from the protocols. The toxicity test for mortality with this species met the control acceptability criterion (<32 percent mortality; >0.48 mg/ind AFDW).

Table 5 Summary of water quality parameters for *C. dilutus* tests (means and ranges). Required values are shown in brackets.

Analyte	Control	WETSED-1	WETSED-2	WETSED-3
	Mean (Min-Max)			
Temp. (°C) [23 ± 1°C]	22.0 (21.7-22.2)	22.0 (21.8-22.2)	21.9 (21.7-22.1)	21.9 (21.7-22.1)
DO (mg/L) [>2.5 mg/L]	6.7 (3.3-9.0)	6.7 (3.5-9.0)	7.1 (5.2-9.1)	7.0 (5.2-9.0)
pH [6-9]	7.34 (6.58-7.99)	7.18 (6.43-7.89)	7.13 (6.46-7.80)	7.35 (6.80-7.99)
Cond. (µS/cm) [NA]	208 (127-296)	180 (149-227)	249 (158-413)	251 (192-382)
Alkalinity (mg/L $CaCO_3$) [<50% variable]	58 (48-72)	65 (60-68)	69 (64-72)	85 (80-88)
Hardness (mg/L $CaCO_3$) [<50% variable]	83 (80-88)	98 (80-108)	195 (84-228)	122 (100-140)
Total Overlying NH3 (mg/L) [<50% variable]	1.6 (1.1-1.7)	1.2[a] (<1.0-1.3)	1.3[a] (<1.0-1.3)	<1.0 (<1.0-<1.0)
Total Overlying Sulfides (mg/L) [NA]	0.035[a] (<0.010-0.058)	0.028[a] (<0.010-0.054)	0.044[a] (<0.010-0.044)	0.020[a] (<0.010-0.021)

[a] estimated value

The result of the reference toxicant test conducted in conjunction with this testing program is provided in Table 6. Bench sheets and control charts are provided in Appendix E. This test was run with the same batch of organisms used in the testing program. The result of this test fell within the range of mean ± two standard deviations of historical results, indicating that the sensitivity of the test organisms was appropriate.

Table 6 *C. dilutus* reference toxicant test results.

Species	Test date	Toxicant	LC50	Acceptable Range	CV (%)
Chironomus dilutus	June 23, 2011	Cu	571 µg/L	401 – 1070 µg/L	22.7

3.4 Discussion

Mortality in the samples ranged from 20.8 to 63.5 percent, compared with 6.3 percent in the control. Sediment samples WETSED-2 and WETSED-3 were significantly different from control and were more than 15 percent higher than the control, failing the two-hit criterion for survival. WETSED-3 was also more than 25 percent higher than the control, failing the one-hit criterion for survival. Survival in WETSED-1 was not significantly different from the control, due to high

variability in the sample. Growth in the samples ranged from 0.60 to 1.11 mg/individual AFDW, compared with 0.91 mg/individual AFDW in the control. Growth in sample WETSED-1 was greater than the control. Growth in WETSED-2 and WETSED-3 was not significantly different from the control. Therefore none of the sites fail either the one- or two-hit failure requirements.

The total ammonia level reached 1.3 mg/L in the test sediments, which was well below the reported 4-day lethal concentration for 50% of test organisms (LC_{50}) range for *C. dilutus* of 82 to 370 mg/L (USEPA 2000). While sulfide toxicity thresholds are not available for this species, they were measured as part of the Ecology reference site study (Nautilus 2008), and samples with porewater sulfide values similar (0.226 to >0.600 mg/L) to the values found in the current study (0.010 to 0.054 mg/L) did not result in measurable effects. Therefore, it is unlikely that ammonia or sulfide levels caused the observed increases in mortality in the test sediments.

4.0 *HYALELLA AZTECA* TEST

4.1 Methods

H. azteca were exposed to test sediments for 10 days to determine the effects of site sediments on survival. These tests were conducted according to methods presented in USEPA (2000) and ASTM (2000), and are summarized in Table 7.

H. azteca were obtained from Aquatic Indicators (St. Augustine, Florida) and arrived at the laboratory on June 2, 2011. The organisms were transported in insulated boxes in oxygen-saturated water contained in plastic bags with fine screens as a substrate. Upon arrival at the laboratory, water quality parameters were measured and observations of animal condition were made. The organisms were acclimated to test conditions prior to test initiation over a 96-hour time period. During the acclimation period, the animals were observed for any indication of stress or significant mortality and any observations were recorded.

One day prior to test initiation (Day –1), the sediment samples were homogenized, 100-ml sediment was distributed to each of eight labeled test chambers for each of the samples, and 175-ml diluted mineral water (prepared by diluting two parts Perrier® into eight parts deionized water) was added to each container. Control sediment consisted of clean, rinsed silica sand (50/50 mix of #30 and #70) mixed with peat moss (1/2 Tbsp) that was rinsed

overnight in diluted mineral water. Eight test chambers were also prepared for the control sediment. An additional replicate was included for each sediment sample and the control sediment as a sacrificial test chamber for routine water quality measurements.

The test chambers were randomized and the sediments were left to settle overnight. On Day 0, overlying ammonia, sulfide, hardness, alkalinity, dissolved oxygen (DO), pH, conductivity, and temperature were measured. Organisms were carefully separated into groups of 10 amphipods in 30 mL cups containing diluted mineral water. The number of organisms was then recounted and any animals exhibiting signs of stress were replaced. The organisms were then gently added to the test chambers, two cups for each test chamber for a total of 20 organisms per chamber.

Temperature, DO, pH, and conductivity were monitored daily in the water quality replicate for each sample, while overlying ammonia, sulfide, hardness, and alkalinity were monitored on Day 5. Water was renewed twice daily in all chambers. Abnormal conditions or unusual animal behavior, if observed, were also noted daily. Each test chamber was fed 1 ml of Yeast Trout Chow (YTC) daily after the second renewal.

At test termination, subsamples of overlying water were collected for ammonia, hardness, alkalinity, and sulfides analyses, from each water quality replicate. The contents of each test chamber were gently mixed to suspend the sediment and poured through a 0.5-mm Nitex screen. The sediment was rinsed through the screen using dechlorinated tap water. The screen was then placed in diluted mineral water and the number of survivors counted and recorded. The number of surviving amphipods was evaluated statistically by one-tailed t-test, or one-tailed Mann-Whitey U-test, as appropriate, to determine whether the samples exhibited a significant decrease in survival relative to the control ($p<0.05$). Survival data was arcsin transformed as needed to stabilize the variances and improve normality of the data. Site performance was evaluated against sediment acceptability criteria outlined by the Northwest Regional Sediment Evaluation Framework (RSET 2009), as presented in Table 1.

A 96-hour reference toxicant test using copper chloride ($CuCl_2$) was conducted concurrently with the sediment tests to determine whether the sensitivity of the test organisms was within the range typically observed. The test was run with four replicates, ten animals per replicate, in diluted mineral water with a square of nitex screen as a substrate.

Table 7 Summary of methods for the 10-day test with *Hyalella azteca*.

Test initiation date	June 7, 2011
Test termination date	June 17, 2011
Test organism source	Aquatic Indicators, St. Augustine, Florida
Organism age at test initiation	8 days
Feeding	1 ml of YTC daily
Test chamber	475-ml glass beaker
Test sediment volume	100 ml
Dilution water type & volume	175 ml diluted mineral water
Water renewal	Twice daily
Control sediment	Sand mixed with peat (1/2 Tbsp)
Number of organisms/replicate	10
Number of replicates/sample	8 plus water quality surrogate
Test temperature	23 ± 1°C
Illumination	16 hours light: 8 hours dark
Aeration	None
Reference toxicant	Copper chloride
Acceptability criterion for control	≥80% survival

4.2 Results

The results of toxicity tests conducted using *H. azteca* are provided in Table 8. Statistics were conducted using Biostat software, which follows the flowchart recommended by RSET. Comparisons are shown to the control. A detailed summary of results is provided in Appendix A. Summary and detailed statistical analyses for endpoint measurements are provided in Appendix B. Summaries of water quality data are provided in Appendix C. Benchsheets are provided in Appendix D.

Table 8 Results of *Hyalella azteca* tests. Samples with statistically reduced survival or are underlined, and values failing two-hit RSET criteria are shaded gray, while samples failing one-hit RSET criteria are bold.[1, 2]

Sample	Percent Mortality (Mean ± SD)	Mortality Percent Difference from Control
Control	1.3 ± 2.3	--
WETSED-1	**100 ± 0.0**	98.7
WETSED-2	13.8 ± 11.6	12.5
WETSED-3	3.8 ± 4.4	2.5

[1]Criteria for one-hit failure is significant decrease in mortality (p<0.05), **and** mortality greater than 25% of control (RSET 2009), [2]Criteria for two-hit failure is significant decrease in mortality (p<0.05), **and** mortality greater than 10% of control (RSET 2009)

4.3 QA/QC

The *H. azteca* were received in good condition and the toxicity tests with this species met the control acceptability criterion (<20 percent mortality). A summary of the water quality parameters is provided in Table 10. All water quality parameters remained within acceptable ranges throughout the tests. Instead of the 10 animals per replicate required by the protocol, 20 animals were added to each replicate. As the controls still met acceptability criteria and water quality stayed within ranges for the test, this deviation is not expected to have affected the results. There were no other deviations from the protocol.

Table 9 Summary of water quality parameters for *H. azteca* analyses (means and ranges). Required values are shown in brackets.

Analyte	Control	WETSED-1	WETSED-2	WETSED-3
		Mean (Min-Max)		
Temp. (°C)	22.3	22.2	22.2	22.2
[23 ± 1°C]	(21.9-23.4)	(21.9-23.3)	(21.9-23.3)	(21.8-23.2)
DO (mg/L)	7.0	6.3	6.4	6.5
[>2.5 mg/L]	(5.8-8.4)	(5.4-7.3)	(5.4-7.2)	(5.6-7.3)
pH	7.26	6.83	6.83	7.01
[6-9]	(6.50-7.79)	(6.22-7.20)	(6.35-7.18)	(6.63-7.37)
Cond. (µS/cm)	172	188	283	223
[NA]	(145-189)	(164-262)	(190-418)	(159-343)
Alkalinity (mg/L $CaCO_3$)	52	67	75	72
[<50% variable]	(44-60)	(60-72)	(64-80)	(68-76)
Hardness (mg/L $CaCO_3$)	69	129	199	180
[<50% variable]	(60-76)	(124-132)	(192-204)	(172-188)
Total Overlying NH3	1.0[a]	1.0[a]	1.0[a]	1.0[a]
(mg/L) [<50% variable]	(<1.0-<1.0)	(<1.0-1.0)	(<1.0-<1.0)	(<1.0-<1.0)
Total Overlying Sulfides	0.091[a]	0.114	0.058	0.091[a]
(mg/L) [<50% variable]	(<0.010-0.125)	(0.014-0.293)	(0.012-0.126)	(<0.010-0.107)

[a]estimated value

The result of the reference toxicant test conducted in conjunction with this testing program is provided in Table 10. Bench sheets and control charts are provided in Appendix E. This test was run with the same batch of organisms used in the testing program. The result of this test fell within the range of mean ± two standard deviations of historical results, indicating that the sensitivity of the test organisms was appropriate.

Table 10 H. Azteca reference toxicant test results.

Species	Test date	Toxicant	LC50	Acceptable Range	CV (%)
Hyalella azteca	June 2, 2011	Cu	188 µg/L	0 – 1360 µg/L	74.6

4.4 Discussion

Mortality in the samples ranged from 3.8 to 100 percent, compared with 1.3 percent in the control. Sediment samples WETSED-1 and WETSED-2 were significantly different from control and were more than 10 percent higher than the control, failing the two-hit criterion for survival. WETSED-1 was more than 25 percent higher than the control, failing the one-hit criterion for survival.

5.0 MICROTOX® TEST

5.1 Methods

The luminescent marine bacterium *Vibrio fischeri* was used as the test organism for the Microtox test. The bacteria were exposed to porewater extracted from sediment samples and light readings were measured after 5 and 15 minutes of exposure. Test equipment included the Microtox Model 500 Analyzer, which measures light output and is equipped with a 15°C chamber to maintain test temperature in the samples and a 4°C chamber to keep the rehydrated bacteria chilled.

Vials of freeze-dried bacteria (Microtox® Acute Reagent Lot #s 10K1032, expiration date 10/2012) were obtained from Strategic Diagnostics, Inc. and stored at -20°C until use. On the day of the test, a vial was rehydrated with 1.0 ml of Microtox Reconstitution Solution, mixed thoroughly, and allowed to equilibrate for 30 minutes at 4°C. The bacteria were used within 2 hours of rehydration.

The tests were conducted in accordance with Ecology (2008) test protocol; these methods are summarized in Table 11. Approximately 50 ml of porewater was extracted from each sample by centrifuging for 30 minutes at 4500 G. Each porewater extract was adjusted to a salinity of 20 parts per thousand (ppt) with Crystal Sea Marine Mix artificial seasalt. The DO ranged from 7.2 to 8.2 mg/L in the adjusted samples. Since the DO in each sample was between 50 and 100 percent saturation (5.0 to 10.2 mg/L), the samples did not require aeration. The pH was adjusted to 7.8 to 8.2 using NaOH or HCl. None of the porewater samples were diluted below 90 percent. The control was deionized water adjusted to 20 ppt with artificial seasalt. Each porewater was tested within 3 hours of extraction.

Tests were conducted using five replicates. Disposable glass cuvettes were placed in the Microtox test wells and 1 ml of salinity-adjusted porewater was added. The rehydrated bacteria (reagent) were thoroughly mixed and 10 µl was added to each test cuvette, with mixing after each addition. After an initial incubation period of 5 minutes, the control cuvette was placed in the read chamber of the Microtox Analyzer to set the instrument. Initial light readings (I_0) were then taken by placing each cuvette in the read chamber of the Microtox Analyzer and measurements were recorded on a data sheet. Light output was measured at 5 minutes (I_5) and 15 minutes (I_{15}) of exposure after the initial light reading (I_0).

Test acceptability criteria were final mean control light output greater than or equal to 72 percent of initial control mean output, and test mean output not greater than 110 percent of control mean output. The data were evaluated statistically by conducting one-tailed t-tests or Mann-Whitney U-tests on the change in output over time for test sediment porewaters compared to the control porewater (where light output was lower than the control). Sediment performance was evaluated against sediment acceptability criteria outlined by the Northwest Regional Sediment Evaluation Framework (RSET 2009), as presented in Table 1.

A reference toxicant test using phenol was conducted in conjunction with the sediment tests to ensure that the sensitivity of the test was within the acceptable range of historical values determined in this laboratory.

Table 11 Summary of methods for the Microtox test.

Test dates	June 6, 2011
Test organism source	Strategic Diagnostics
Batch number and expiration date	Lot#10K1032, Expiration 10/2012
Control	Saltwater (20 ppt) prepared with Crystal Sea artificial seasalt
Sample preparation	Centrifugation at 4500 G for 30 minutes; salinity adjustment to 20 ppt using Crystal Sea salt; pH adjustment to 7.8-8.2 ppt; DO 5.0 to 10.2 mg/L
Test chamber	Glass cuvette
Test volume	1 mL
Volume of inoculum/replicate	10 µL
Number of replicates/sample	5
Test temperature	15 ± 1°C
Aeration	None
Reference toxicant	Phenol
Acceptability criteria	Final control light output ≥72% initial; test output ≤110% control

5.2 Results

The results of toxicity tests conducted using Microtox are provided in Table 12. Statistics were conducted using Biostat software, which follows the flowchart recommended by RSET. Comparisons are shown to the control. A detailed summary of results is provided in Appendix A. Summary and detailed statistical analyses for endpoint measurements are provided in Appendix B. Summaries of water quality data are provided in Appendix C. Benchsheets are provided in Appendix D.

Table 12 Results of Microtox tests. Samples with statistically reduced luminescence are underlined, and values failing two-hit RSET criteria are shaded gray, while samples failing one-hit RSET criteria are bold.[1, 2]

Sample	5 minute reading		15 minute reading	
	Mean % of initial light output	Significantly different relative to the control	Mean % of initial light output	Significantly different relative to the control
Control	96 ± 3	--	84 ± 3	--
WETSED-1	**68 ± 4**	Yes	**17 ± 1**	Yes
WETSED-2	**72 ± 1**	Yes	**25 ± 1**	Yes
WETSED-3	81 ± 1	Yes	**35 ± 2**	Yes

[1]Criteria for one-hit failure is luminescence less than 75% of control luminescence **and** significant difference (RSET 2009); [2]Criteria for two-hit failure is luminescence less than 85% of control luminescence **and** significant difference (RSET 2009)

5.3 QA/QC

A summary of the water quality parameters for the Microtox tests is provided in Table 13. The Microtox tests met control acceptance criteria and there were no deviations from protocol.

Table 13 Summary of sites water quality parameters for Microtox analyses

Analyte	Mean (st.dev)	Minimum	Maximum	Number of Readings	Met Requirements
Initial Salinity (ppt)	1.1 (0.3)	0.8	1.3	3	N/A
Final Salinity (ppt)	19.9 (0.4)	19.5	20.2	3	Y
Initial DO (mg/L)	7.3 (0.2)	7.2	7.5	3	N/A
Final DO (mg/L)	7.3 (0.2)	7.2	7.5	3	Y
Initial pH	7.5 (0.4)	7.2	7.9	3	N/A
Final pH	7.9 (0.02)	7.9	7.9	3	Y
Final Concentration (%)	99.9 (0.0)	99.0	100	3	Y
Total NH3 (mg/L)	2.0 (1.0)[1]	<1.0	2.7	3	N/A

[1]estimated value

Results of the reference toxicant test conducted in conjunction with this testing program are provided in Table 14. Bench sheets and control charts are provided in Appendix E. The test was run with the same batch of organisms used in the testing program. The results of this test fell within the range of mean ± two standard deviations of historical results, indicating that the sensitivity of the test organisms was appropriate.

Table 14 Microtox reference toxicant test results.

Species	Test date	Toxicant	EC50	Acceptable Range (mean ± 2 S.D.)	CV (%)
Microtox	June 6, 2011	Phenol	5 min: 19.6 mg/L 15 min: 40.9 mg/L	5 min: 24.2 – 55.1 15 min: 31.0 – 92.2	19.5 24.8

5.4 Discussion

Change in light output in the samples at 15 minutes ranged from 17 to 35 percent, compared with 84 percent in the controls. Samples WETSED1, WETSED2, and WETSED3 were all significantly different from the controls and had luminescence less than 75% of controls, failing the one-hit criteria for luminescence.

6.0 CONCLUSIONS

WETSED-1 failed the one-hit criterion for *H. azteca* survival and the one-hit criterion for Microtox luminescence, but did not have a hit in the *C. dilutus* survival or growth criterion (RSET 2009). WETSED-2 failed the two-hit criterion for *C. dilutus* and *H. azteca* survival, and failed the one-hit criterion for Microtox luminescence (RSET 2009). WETSED-3 failed the one-hit criterion for *C. dilutus* survival and Microtox luminescence (RSET 2009).

Table 15 One-hit/Two-hit criteria summary results table

Site	*C. dilutus* Survival	*C. dilutus* Growth	*H. azteca* Survival	Microtox Luminescence
WETSED-1	None	None	One-hit	One-hit
WETSED-2	Two-hit	None	Two-hit	One-hit
WETSED-3	One-hit	None	None	One-hit

7.0 REFERENCES

American Society of Testing and Materials (ASTM). 2000. Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates. ASTM Designation E 1706-00.

Nautilus Environmental. 2008. Evaluation of Candidate Freshwater Sediment Reference Sites-Toxicological Results. Final Report.

Regional Sediment Evaluation Team (RSET). 2009. Sediment Evaluation Framework for the Pacific Northwest. May 2009.

U.S. Environmental Protection Agency (USEPA). 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064.

Washington Department of Ecology. 2008. Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards Publication No. 03-09-043. Revised February 2008.

Washington Department of Ecology. 2009. Baseline Characterization of Nine Proposed Freshwater Sediment Reference Sites, 2008. Publication Number 09-03-032.

APPENDIX A – Results Summaries

Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix B

Microtox Report
Baseline and Dilution Series

Rainier ENVIRONMENTAL

Toxicological Evaluation of Freshwater Sediments

Microtox

Report date: March 28, 2013

Submitted to:

NEWFIELDS NORTHWEST
P.O. Box 216
Port Gamble, WA 98364

5013 Pacific Hwy East
Suite 20
Tacoma, WA 98424

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SIGNATURE PAGE

Eric Tollefson
Project Manager

This report has been prepared based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party.

1.0 INTRODUCTION

Freshwater sediment samples were collected and evaluated for toxicity as part of a project being conducted by NewFields Northwest. Freshwater sediment samples were tested for toxicity using Microtox® tests.

2.0 METHODS

2.1 Sample Collection and Transportation

NewFields personnel collected three freshwater sediment porewater subsamples on March 18, 2014. Samples were shipped by Fed Ex and received by Rainier Environmental on March 19, 2014. Sample containers were inspected upon receipt and the contents verified against information on the chain-of-custody form. The samples were stored at 4°C in the dark until used for testing.

2.2 Test Procedures

The luminescent marine bacterium *Vibrio fischeri* was used as the test organism for the Microtox® tests. The bacteria were exposed to porewater extracted from the sediment samples and light readings were measured after a 5 minute incubation period and then after an additional 5 minutes and 10 minutes of exposure. Testing was performed using the Microtox® Model 500 Analyzer which measures light output and is equipped with a 15°C chamber to maintain test temperature in the samples and a 4°C chamber to keep the rehydrated bacteria chilled.

Vials of freeze-dried bacteria (Microtox® Acute Reagent Lot # 12B4010, Expiration date 2/15) were obtained from Strategic Diagnostics, Inc. and stored at -20°C until use. On the day of the test, a vial was rehydrated with 1.0 ml of Microtox® Reconstitution Solution, mixed thoroughly, and allowed to equilibrate for 30 minutes at 4°C. The bacteria were used within 2 hours of rehydration.

The tests were conducted in accordance with Washington Department of Ecology (WDOE, 2008) test protocol, which are summarized in Table 1. Approximately 25 milliliters (mL) of porewater was extracted from each sample by centrifugation for 30 minutes at 4500 G (Porewater extracted at Newfields). Each porewater extract was adjusted to a salinity of 20 parts per thousand (ppt) with Crystal Sea artificial sea salt. The dissolved oxygen (DO) in each sample was between 50 and 100 percent saturation (5.0 to 10.2 mg/L) and did not require aeration. The pH was adjusted to 7.9 to 8.2, as necessary, using NaOH or HCl. The laboratory control consisted of deionized water adjusted to 20 ppt with artificial seasalt.

Tests were conducted using five replicates. Disposable glass cuvettes were placed in the Microtox® test wells and 1 mL of salinity-adjusted porewater was added. The rehydrated bacteria (reagent) were thoroughly mixed and 10 microliters (µL) were added to each test cuvette. After an initial incubation period of 5 minutes, the first control cuvette was placed in the read chamber of the Microtox® Analyzer to set the instrument. Initial light readings (I_o) were then taken by placing each cuvette in the read chamber of the Microtox® Analyzer and measurements were recorded on a data sheet. Light output was measured in each cuvette after an additional 5 minutes (I_5) and 10 minutes (I_{15}) of exposure. Test acceptability criteria is a mean control final light output greater than 72 percent of initial output and a test mean output not greater than 110 percent of the control mean output.

The data were evaluated statistically by conducting one-tailed t-tests on the change in light output over time for the test sediment porewaters compared to the control

A reference toxicant test using copper chloride was conducted in conjunction with the sediment porewater test to ensure that the sensitivity of the test was within the acceptable range of historical values determined in this laboratory.

Table 1. Summary of methods for the Microtox test.

Test date	March 19, 2014
Test organism source	Strategic Diagnostics
Batch number and expiration date	Lot#12B4010, Expiry 2/15
Control	Saltwater (20 ppt) prepared with Crystal Sea Marine Mix
Sample preparation	Centrifugation at 4500 G for 30 minutes; salinity adjustment to 20 ppt using Crystal Sea Marine Mix; pH adjustment to 7.9-8.2
Test chamber	Glass cuvette
Test volume	1 mL
Volume of inoculum/replicate	10 µL
Number of replicates/sample	5
Test temperature	15 ± 1°C
Aeration	None
Reference toxicant	Copper Chloride

3.0 RESULTS

The results of toxicity tests conducted using Microtox® are provided in Tables 2 and 3. Sample WETSED 1 had a test mean output of less than 75 percent of the control mean output, at 15 minutes, indicating a Washington State Department of Ecology Sediment Quality Standard (SQS) failure and a Cleanup Screening Level (CSL) failure for freshwater Sediments. The other samples did not exceed sediment quality standards for the State of Washington (WDOE 2008).

Table 2. Results of Microtox® tests.

Sample ID	Change in light output as a % of Control (5 minutes)	Change in light output as a % of Control (15 minutes)
WETSED-1	88	63
SIR-300	104	104
SIR-300 Control	109	111

Table 3. Statistical analyses of Microtox results.

Sample ID	5-minute reading		15 minute reading	
	Mean % change in light output	Significantly different relative to the control	Mean % change in light output	Significantly different relative to the control
Control	85 ± 2	---	77 ± 3	---
WETSED-1	75 ± 2	No	49 ± 3	Yes
SIR-300	89 ± 3	No	81 ± 3	No
SIR-300 Control	93± 4	No	86 ± 3	No

4.0 QA/QC

The Microtox tests met control acceptance criteria and there were no deviations from protocol.

Results of reference toxicant test used to monitor laboratory performance and test organism sensitivity are provided in Table 4. The results for the reference toxicant test fell within the range of mean ± two standard deviations of historical results, indicating that test organisms were of an appropriate degree of sensitivity.

Table 4. Reference toxicant test results.

Exposure Duration	Test date	Toxicant	EC50	Acceptable Range	CV (%)
5 Minutes	March 19, 2014	Copper	1352µg/L	978-1614	12.3
15 Minutes			414 µg /L	375-615	12.1

5.0 REFERENCES

American Society of Testing and Materials (ASTM). 2000. Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates. ASTM Designation E 1706-00.

U.S. Environmental Protection Agency (USEPA). 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064.

Washington Department of Ecology (WDOE). 2008. Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards Publication No. 03-09-043. Revised February 2008.

APPENDIX A – Results Summaries

Appendix Table A. Microtox 100 Percent Sediment Porewater Test
Sites WESTSED1, SIR-300, SIR-300 Con
Client NewFields
Test Date: 3/19/2014

Site	Reading	Light Reading Replicate 1	2	3	4	5	Mean	St.Dev.	$T_{(mean)}$/ $C_{(mean)}$	Quality Control Steps: Change in control light readings compared to initial control $F_{c(mean)}/I_{c(mean)}$	Quality Control Steps: Evaluation of initial light output in site sediments $I_{(0)T(mean)}/I_{(0)C(mean)}$
CON	$I_{(0)}$	91	96	108	104	107	101				
	$I_{(5)}$	77	81	90	88	94	86			0.85	
	$I_{(15)}$	70	77	78	81	85	78			0.77	
	$C_{(5)}$	0.85	0.84	0.83	0.85	0.88	0.85	0.02			
	$C_{(15)}$	0.77	0.80	0.72	0.78	0.79	0.77	0.03			
WETSED1	$I_{(0)}$	81	76	78	80	79	79				0.78
	$I_{(5)}$	60	56	59	62	59	59				
	$I_{(15)}$	39	35	37	42	40	39				
	$T_{(5)}$	0.74	0.74	0.76	0.78	0.75	0.75	0.02	0.88		
	$T_{(15)}$	0.48	0.46	0.47	0.53	0.51	0.49	0.03	0.63		
SIR-300	$I_{(0)}$	92	94	90	93	93	92				0.91
	$I_{(5)}$	79	86	83	81	80	82				
	$I_{(15)}$	71	77	75	76	73	74				
	$T_{(5)}$	0.86	0.91	0.92	0.87	0.86	0.89	0.03	1.04		
	$T_{(15)}$	0.77	0.82	0.83	0.82	0.78	0.81	0.03	1.04		
SIR-300 Con	$I_{(0)}$	93	105	103	92	93	97				0.96
	$I_{(5)}$	88	90	98	85	90	90				
	$I_{(15)}$	81	85	92	78	80	83				
	$T_{(5)}$	0.95	0.86	0.95	0.92	0.97	0.93	0.04	1.09		
	$T_{(15)}$	0.87	0.81	0.89	0.85	0.86	0.86	0.03	1.11		
	$I_{(0)}$						#DIV/0!				#DIV/0!
	$I_{(5)}$						#DIV/0!				
	$I_{(15)}$						#DIV/0!				
	$T_{(5)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
	$T_{(15)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
	$I_{(0)}$						#DIV/0!				#DIV/0!
	$I_{(5)}$						#DIV/0!				
	$I_{(15)}$						#DIV/0!				
	$T_{(5)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
	$T_{(15)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		

$I_{(0)}$ is the light reading after the initial five minute incubation period

$I_{(5)}$ is the light reading five minutes after $I_{(0)}$

$I_{(15)}$ is the light reading fifteen minutes after $I_{(0)}$

$C_{(t)}$, $R_{(t)}$, and $T_{(t)}$ are the changes in light readings from the intial reading in each sample container for the control, reference sediment

Quality Control Steps:

1. Is control final mean output greater than or equal to 72% control initial mean output?

$I_{(5)}$:$F_{c(mean)}/I_{c(mean)}$: **85%** **YES**

$I_{(15)}$:$F_{c(mean)}/I_{c(mean)}$: **77%** **YES**

YES: Control results are acceptable and can be used for statistical analyses.
NO: Control results are unacceptable (use reference sediment for statistical analysis if available).

2. Are test initial mean values greater than or equal to 80% of control initial mean values?

S1 $I_{T(mean)}/I_{C(mean)}$: **78%** **NO**

S2 $I_{T(mean)}/I_{C(mean)}$: **91%** **YES**

S3 $I_{T(mean)}/I_{C(mean)}$: **96%** **YES**

S4 $I_{T(mean)}/I_{C(mean)}$: **#DIV/0!** **#DIV/0!**

S5 $I_{T(mean)}/I_{C(mean)}$: **#DIV/0!** **#DIV/0!**

INVALD: If the test sediment is greater than 110%, the results in uninterpretable
YES: If test sediment is reference, reference is acceptable

APPENDIX B – Laboratory Bench Sheets

Rainier Environmental
5013 Pacific Hwy. E., Suite 20
Tacoma,WA 98424

Raw Data Sheet
Microtox
100% Sediment Porewater Toxicity

Client Name: NEWFIELDS **Test Date:** 3/19/2014

Sample ID: WET SED-1, SIR-300, SIR-300 CONTROL **Test No.:** 1403-029, 1403-030, 1403-031

Site	Light Reading	Time	Replicate 1	2	3	4	5
CON	$I_{(0)}$	5 min	91	96	108	104	107
	$I_{(5)}$	10min	77	81	90	88	94
	$I_{(15)}$	20 min	70	77	78	81	85
WET SED-1	$I_{(0)}$	5 min	81	76	78	80	79
	$I_{(5)}$	10min	60	56	59	62	59
	$I_{(15)}$	20 min	39	35	37	42	40
SIR-300	$I_{(0)}$	5 min	92	94	90	93	93
	$I_{(5)}$	10min	79	86	83	81	80
	$I_{(15)}$	20 min	71	77	75	76	73
SIR-300 CON	$I_{(0)}$	5 min	93	105	103	92	93
	$I_{(5)}$	10min	88	90	98	85	90
	$I_{(15)}$	20 min	81	85	92	78	80
	$I_{(0)}$	5 min					
	$I_{(5)}$	10min					
	$I_{(15)}$	20 min					
	$I_{(0)}$	5 min					
	$I_{(5)}$	10min					
	$I_{(15)}$	20 min					

Comments:

APPENDIX C – Water Quality Results

Nautilus Environmental
Washington Laboratory
5009 Pacific Hwy. E., Suite 2
Tacoma, WA 98424

Physical and Chemical
Measurements of Porewaters
Sediment Bioassays

Analyst: QT

Client : NEWFIELDS

Test Date: 3/19/14

Test Type: Microtox 100% Porewater Toxicity Test

Test No: 1403-029, 1403-030, 1403-031 Test Species: *Vibrio fischeri*

Site	Initial Salinity (ppt)	Final Salinity (ppt)	Initial D.O. (mg/L)	Final D.O. (mg/L)	Initial pH	Adjusted pH	NaOH or HCl Vol. Used	Final Porewater Conc.	Ammonia
CON	19.3	19.3	8.1	—	7.53	8.13	20µL 0.1N NaOH	99.9%	<1.0
WETSED1	1.3	20.6	7.8	—	7.21	8.03	1100µL 0.1N NaOH	95.6% ~~99.6%~~	<1.0
SIR-300	1.4	19.4	7.8	—	8.28	8.17	110µL 0.1N NaOH	99.6	<1.0
SIR-300 CON	0.1	20.5	8.0	—	8.04	—	—	100%	<1.0

Sample Description: _____

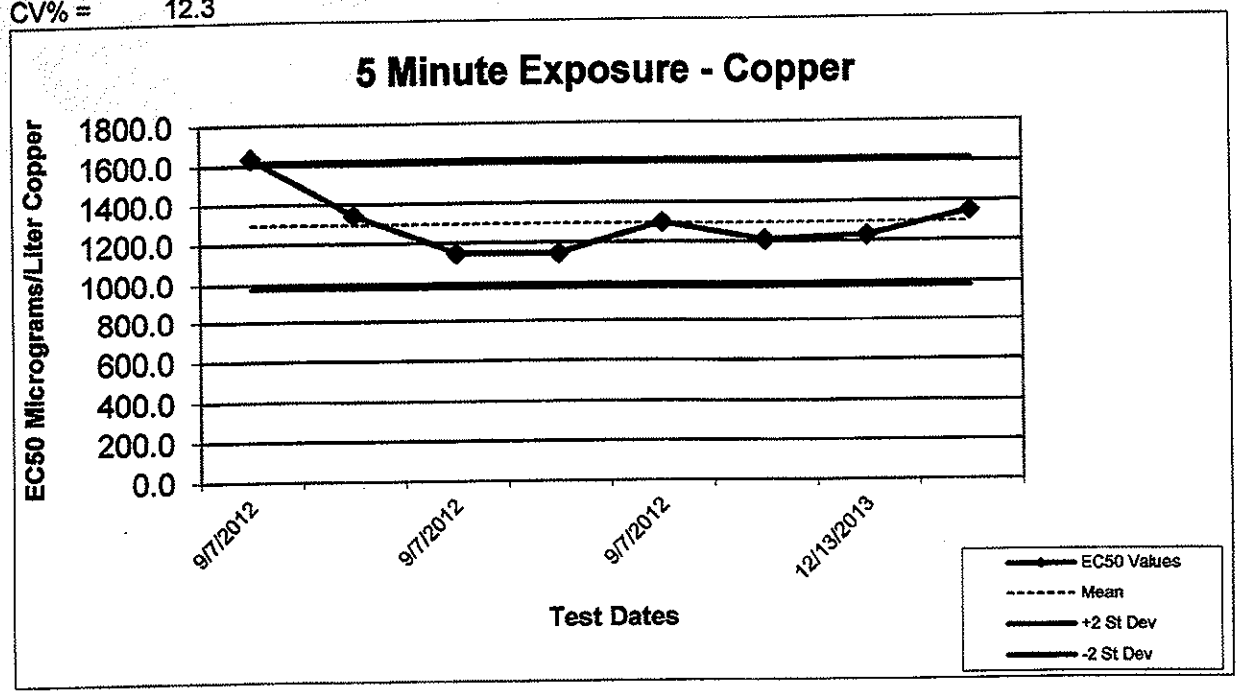
Comments: _____

QA Check: QT

APPENDIX D – Reference Toxicant Tests

Reference Toxicant Control Chart
Microtox 5-Minute Exposure

CV% = 12.3

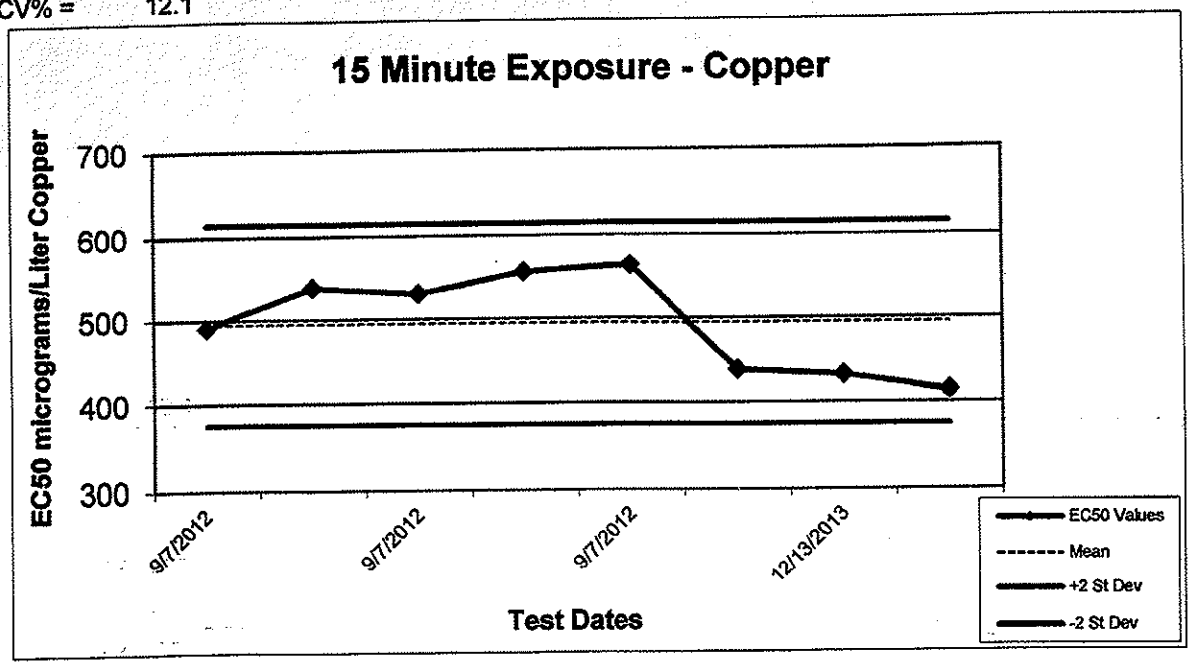


Date	Time	EC50 %	EC50 µ/L Copper [a]	Mean	StDev	-2 SD	+2 SD
9/7/2012	8:53	81.8	1636.0	1295.6	159.1	977.5	1613.7
9/7/2012	9:36	67.2	1344.0	1295.6	159.1	977.5	1613.7
9/7/2012	10:00	57.4	1148.0	1295.6	159.1	977.5	1613.7
9/7/2012	10:28	57.4	1148.0	1295.6	159.1	977.5	1613.7
9/7/2012	10:54	65.0	1300.0	1295.6	159.1	977.5	1613.7
12/5/2013	17:17	60.4	1208.8	1295.6	159.1	977.5	1613.7
12/13/2013	13:22	61.4	1228.0	1295.6	159.1	977.5	1613.7
3/19/2014	13:15	67.6	1352.0	1295.6	159.1	977.5	1613.7

a - Highest concentration of Copper is 2000 micro grams/Liter

Reference Toxicant Control Chart
Microtox 15-Minute Exposure

CV% = 12.1



Date	Time	EC50 %	EC50 µg/L Copper [a,µ]	Mean	StDev	-2 SD	+2 SD
9/7/2012	853	24.6	491.0	495.2	59.9	375.3	615.0
9/7/2012	937	26.9	537.8	495.2	59.9	375.3	615.0
9/7/2012	1001	26.5	530.2	495.2	59.9	375.3	615.0
9/7/2012	1028	27.8	555.4	495.2	59.9	375.3	615.0
9/7/2012	1055	28.2	563.0	495.2	59.9	375.3	615.0
12/5/2013	1717	21.9	438.0	495.2	59.9	375.3	615.0
12/13/2013	1322	21.6	432.0	495.2	59.9	375.3	615.0
3/19/2014	1315	20.7	414.0	495.2	59.9	375.3	615.0

a - Highest concentration of copper is 2000 micro grams/Liter

MicrotoxOmni Sample Results Report

Result Name: RT031914VF

Test Date/Time: 3/19/2014 1:15:00PM

Sample Name: Sample 1

Test Name: Basic Test

Description: RT031914VF

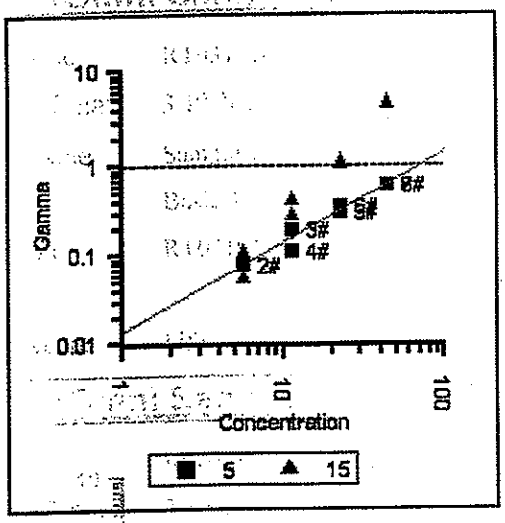
Toxicant:

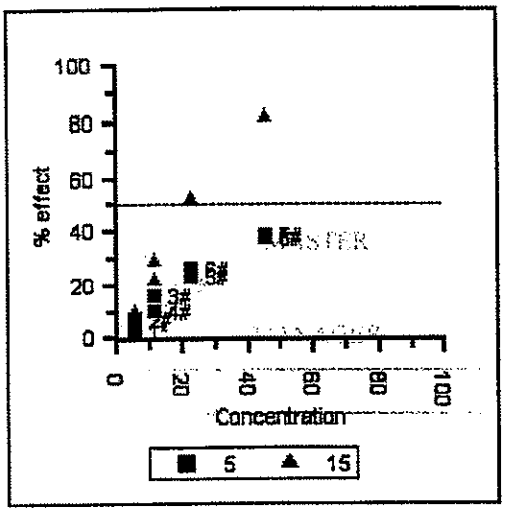
Test Location: Fife

Instrument ID: _MASTER

Reagent Lot #:

User ID: MANAGER





Time	Sample	Conc	I0	It	Gamma	%Effect
5 Mins						
	Control	0.00	105	{94}	0.8943#	
	Control	0.00	101	93	0.9216#	
	1	5.63	101	89	0.0266*	2.59%
	2	5.63	103	87	0.0797#	7.38%
	3	11.25	103	79	0.1918#	16.10%
	4	11.25	100	81	0.1112#	10.01%
	5	22.50	89	62	0.3034#	23.28%
	6	22.50	106	71	0.3554#	26.22%
	7	45.00	106	59	0.6185#	38.22%
	8	45.00	113	64	0.6028#	37.61%

Result Name:	RT031914VF		
Test Date/Time:	3/19/2014 1:15:00PM		
Sample Name:	Sample 1		
Test Name:	Basic Test		
Description:	RT031914VF	Instrument ID:	_MASTER
Toxicant:		Reagent Lot #:	
Test Location:	Fife	User ID:	MANAGER

15 Mins

Control	0.00	105	72	0.6836#	
Control	0.00	101	73	0.7203#	
1	5.63	101	67	0.0546#	5.18%
2	5.63	103	65	0.1051#	9.51%
3	11.25	103	51	0.4149#	29.32%
4	11.25	100	55	0.2743#	21.52%
5	22.50	89	30	1.058#	51.42%
6	22.50	106	35	1.094#	52.24%
7	45.00	106	13	4.570#	82.05%
8	45.00	113	14	4.528#	81.91%

- included, * - invalid

Statistics:

Data: 5 Mins

EC50 Concentration: 67.63%
(95% Confidence Range: 46.51 to 98.33)
EC50 value was calculated from extrapolated data.
95% Confidence Factor: 1.454
Estimating Equation:
LOG C = 0.9478 x LOG G +1.830
Correction Factor: 0.9080
Slope: 1.006
Coeff of Determination (R^2): 0.9535

Data: 15 Mins

Result Name:	RT031914VF		
Test Date/Time:	3/19/2014 1:15:00PM		
Sample Name:	Sample 1		
Test Name:	Basic Test		
Description:	RT031914VF	Instrument ID:	_MASTER
Toxicant:		Reagent Lot #:	
Test Location:	Fife	User ID:	MANAGER

EC50 Concentration: 20.69%
(95% Confidence Range: 18.52 to 23.13)
95% Confidence Factor: 1.118
Estimating Equation:
LOG C = 0.5061 x LOG G +1.316
Correction Factor: 0.7019
Slope: 1.940
Coeff of Determination (R^2): 0.9816

The contents of this report are private and confidential.

Printed: 3/20/2014 8:43:12AM **Signature:**

APPENDIX E - Chain-of Custody Forms

CHAIN OF CUSTODY

NewFields

Shipping: 4770 NE View Dr. Mailing: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6045, Fax: (360)297-6901

Destination Lab: Rainier Environmental	**Sample Originator:** Port Gamble Environmental Sciences	**Report Results To:**	**Phone:**
Destination Contact: Eric Tollefson	**Contact Name:** Bill Gardiner	**Contact Name:**	**Fax:**
Date: 3/18/14	**Address:**	**Address:**	**Email:**
Turn-Around-Time			
Project Name Yakima Steel	**Phone:** 360-297-6080	**Analysis**	**Invoicing To:**
	Fax:		**Comments or Special Instructions:**
Contract/PO:	**E-mail**		

No.	Sample ID	Matrix	No. & Type of Container	Date & Time	Microtox						Preservation	Sample Temp Upon Receipt	LAB ID
1	WETSED-1	FW	1 glass	3/18/14 1125	X						On Ice	4.7	14-034
2	SIR-300	FW	1 glass	3/18/14 1140	X						↓	4.5	14-035
3	SIR-300 Control	FW	1 glass	3/18/14 1115	X						↓	4.5	14-036
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: Collin Ray	Print Name: ERIC TOLLEFSON	Print Name:	Print Name:
Signature:	Signature: Eric Tollefson	Signature:	Signature:
Affiliation: PGES	Affiliation: Rainier Environmental	Affiliation:	Affiliation:
Date/Time: 12/18/14 1350	Date/Time: 3/19/14 1000	Date/Time:	Date/Time:
Print Name:	Print Name:	Print Name:	Print Name:
Signature:	Signature:	Signature:	Signature:
Affiliation:	Affiliation:	Affiliation:	Affiliation:
Date/Time:	Date/Time:	Date/Time:	Date/Time:

Matrix Codes

FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment
TS = plant & Animal Tissue
OT = Other

WHITE—return to originator • YELLOW—lab • PINK—retained by originator

Rainier ENVIRONMENTAL

Toxicological Evaluation of Freshwater Sediments

Microtox

Report date: December 28, 2013

Submitted to:

NEWFIELDS NORTHWEST
P.O. Box 216
Port Gamble, WA 98364

5013 Pacific Hwy East
Suite 20
Tacoma, WA 98424

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LIST OF TABLES

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SIGNATURE PAGE

Eric Tollefson

Eric Tollefson
Project Manager

This report has been prepared based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party.

1.0 INTRODUCTION

Freshwater sediment samples were collected and evaluated for toxicity as part of a project being conducted by NewFields Northwest. Freshwater sediment samples were tested for toxicity using Microtox® tests.

2.0 METHODS

2.1 Sample Collection and Transportation

NewFields personnel collected three freshwater sediment subsamples on December 4, 2013. Samples were shipped by Fed Ex and received by Rainier Environmental on December 5, 2013. Sample containers were inspected upon receipt and the contents verified against information on the chain-of-custody form. The samples were stored at 4°C in the dark until used for testing.

2.2 Test Procedures

The luminescent marine bacterium *Vibrio fischeri* was used as the test organism for the Microtox® tests. The bacteria were exposed to porewater extracted from the sediment samples and light readings were measured after a 5 minute incubation period and then after an additional 5 minutes and 10 minutes of exposure. Testing was performed using the Microtox® Model 500 Analyzer which measures light output and is equipped with a 15°C chamber to maintain test temperature in the samples and a 4°C chamber to keep the rehydrated bacteria chilled.

Vials of freeze-dried bacteria (Microtox® Acute Reagent Lot # 12B4010, Expiration date 2/15) were obtained from Strategic Diagnostics, Inc. and stored at -20°C until use. On the day of the test, a vial was rehydrated with 1.0 ml of Microtox® Reconstitution Solution, mixed thoroughly, and allowed to equilibrate for 30 minutes at 4°C. The bacteria were used within 2 hours of rehydration.

The tests were conducted in accordance with Washington Department of Ecology (WDOE, 2008) test protocol, which are summarized in Table 1. Approximately 25 milliliters (mL) of porewater was extracted from each sample by centrifugation for 30 minutes at 4500 G. Each porewater extract was adjusted to a salinity of 20 parts per thousand (ppt) with Crystal Sea artificial sea salt. The dissolved oxygen (DO) in each sample was between 50 and 100 percent saturation (5.0 to 10.2 mg/L) and did not require aeration. The pH was adjusted to 7.9 to 8.2, as necessary, using NaOH or HCl. The laboratory control consisted of deionized water adjusted to 20 ppt with artificial seasalt. Each porewater was tested within 3 hours of extraction.

Tests were conducted using five replicates. Disposable glass cuvettes were placed in the Microtox® test wells and 1 mL of salinity-adjusted porewater was added. The rehydrated bacteria (reagent) were thoroughly mixed and 10 microliters (µL) were added to each test cuvette. After an initial incubation period of 5 minutes, the first control cuvette was placed in the read chamber of the Microtox® Analyzer to set the instrument. Initial light readings (I_o) were then taken by placing each cuvette in the read chamber of the Microtox® Analyzer and measurements were recorded on a data sheet. Light output was measured in each cuvette after an additional 5 minutes (I_5) and 10 minutes (I_{15}) of exposure. Test acceptability criteria is a mean control final light output greater than 72 percent of initial output and a test mean output not greater than 110 percent of the control mean output.

The data were evaluated statistically by conducting one-tailed t-tests on the change in light output over time for the test sediment porewaters compared to the control

A reference toxicant test using copper chloride was conducted in conjunction with the sediment porewater test to ensure that the sensitivity of the test was within the acceptable range of historical values determined in this laboratory.

Table 1. Summary of methods for the Microtox test.

Test date	December 5, 2013
Test organism source	Strategic Diagnostics
Batch number and expiration date	Lot#12B4010, Expiry 2/15
Control	Saltwater (20 ppt) prepared with Crystal Sea Marine Mix
Sample preparation	Centrifugation at 4500 G for 30 minutes; salinity adjustment to 20 ppt using Crystal Sea Marine Mix; pH adjustment to 7.9-8.2
Test chamber	Glass cuvette
Test volume	1 mL
Volume of inoculum/replicate	10 µL
Number of replicates/sample	5
Test temperature	15 ± 1°C
Aeration	None
Reference toxicant	Copper Chloride

3.0 RESULTS

The results of toxicity tests conducted using Microtox® are provided in Tables 2 and 3. Sample WETSED 1 had a test mean output of less than 75 percent of the control mean output indicating a Washington State Department of Ecology Sediment Quality Standard (SQS) failure and a Cleanup Screening Level (CSL) failure for freshwater Sediments. The other samples did not exceed sediment quality standards for the State of Washington (WDOE 2008).

Table 2. Results of Microtox® tests.

Sample ID	Change in light output as a % of Control (5 minutes)	Change in light output as a % of Control (15 minutes)
WETSED 1	65	14
WETSED 2	103	98
WETSED 3	107	100

Table 3. Statistical analyses of Microtox results.

Sample ID	5-minute reading		15 minute reading	
	Mean % change in light output	Significantly different relative to the control	Mean % change in light output	Significantly different relative to the control
Control	91 ± 4	---	80 ± 4	---
WETSED 1	59 ± 3	Yes	11 ± 1	Yes
WETSED 2	94 ± 3	No	78 ± 4	No
WETSED 3	97± 2	No	80 ± 2	No

4.0 QA/QC

The Microtox tests met control acceptance criteria and there were no deviations from protocol.

Results of reference toxicant test used to monitor laboratory performance and test organism sensitivity are provided in Table 4. The results for the reference toxicant test fell within the range of mean ± two standard deviations of historical results, indicating that test organisms were of an appropriate degree of sensitivity.

Table 4. Reference toxicant test results.

Exposure Duration	Test date	Toxicant	EC50	Acceptable Range	CV (%)
5 Minutes	December 5, 2013	Copper	1209µg/L	929-1666	14.2
15 Minutes			438 µg /L	425-613	9.1

5.0 REFERENCES

American Society of Testing and Materials (ASTM). 2000. Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates. ASTM Designation E 1706-00.

U.S. Environmental Protection Agency (USEPA). 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064.

Washington Department of Ecology (WDOE). 2008. Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards Publication No. 03-09-043. Revised February 2008.

APPENDIX A – Results Summaries

Appendix Table A. Microtox 100 Percent Sediment Porewater Test
Sites WESTSED1, WETSED2, WETSED3
Client NewFields
Test Date: 12/5/13

Site	Light Reading								$T_{(mean)}$/ $C_{(mean)}$	Quality Control Steps: Change in control light readings compared to initial control	Quality Control Steps: Evaluation of initial light output in site sediments
	Reading	Replicate 1	2	3	4	5	Mean	St.Dev.		$F_{c(mean)}/I_{c(mean)}$	$I_{(0)T(mean)}/I_{(0)C(mean)}$
CON	$I_{(0)}$	91	92	87	79	90	88				
	$I_{(5)}$	87	82	77	75	78	80			0.91	
	$I_{(15)}$	76	75	66	66	67	70			0.80	
	$C_{(5)}$	0.96	0.89	0.89	0.95	0.87	0.91	0.04			
	$C_{(15)}$	0.84	0.82	0.76	0.84	0.74	0.80	0.04			
WETSED1	$I_{(0)}$	63	62	63	66	59	63				0.71
	$I_{(5)}$	36	35	38	40	37	37				
	$I_{(15)}$	7	6	7	8	7	7				
	$T_{(5)}$	0.57	0.56	0.60	0.61	0.63	0.59	0.03	0.65		
	$T_{(15)}$	0.11	0.10	0.11	0.12	0.12	0.11	0.01	0.14		
WETSED2	$I_{(0)}$	80	86	77	75	67	77				0.88
	$I_{(5)}$	72	81	71	71	66	72				
	$I_{(15)}$	62	66	58	57	57	60				
	$T_{(5)}$	0.90	0.94	0.92	0.95	0.99	0.94	0.03	1.03		
	$T_{(15)}$	0.78	0.77	0.75	0.76	0.85	0.78	0.04	0.98		
WETSED3	$I_{(0)}$	77	78	70	68	67	72				0.82
	$I_{(5)}$	73	73	68	69	67	70				
	$I_{(15)}$	60	61	56	56	55	58				
	$T_{(5)}$	0.95	0.94	0.97	1.01	1.00	0.97	0.03	1.07		
	$T_{(15)}$	0.78	0.78	0.80	0.82	0.82	0.80	0.02	1.00		
	$I_{(0)}$						#DIV/0!				#DIV/0!
	$I_{(5)}$						#DIV/0!				
	$I_{(15)}$						#DIV/0!				
	$T_{(5)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
	$T_{(15)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
	$I_{(0)}$						#DIV/0!				#DIV/0!
	$I_{(5)}$						#DIV/0!				
	$I_{(15)}$						#DIV/0!				
	$T_{(5)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		
	$T_{(15)}$	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!		

$I_{(0)}$ is the light reading after the initial five minute incubation period

$I_{(5)}$ is the light reading five minutes after $I_{(0)}$

$I_{(15)}$ is the light reading fifteen minutes after $I_{(0)}$

$C_{(t)}$, $R_{(t)}$, and $T_{(t)}$ are the changes in light readings from the intial reading in each sample container for the control, reference sediment

Quality Control Steps:

1. is control final mean output greater than or equal to 72% control initial mean output?

$I_{(5)}$:$F_{c(mean)}/I_{c(mean)}$: **91%** **YES**

$I_{(15)}$:$F_{c(mean)}/I_{c(mean)}$: **80%** **YES**

YES: Control results are acceptable and can be used for statistical analyses.
NO: Control results are unacceptable (use reference sediment for statistical analysis if available).

2. Are test initial mean values greater than or equal to 80% of control initial mean values?

S1 $I_{T(mean)}/I_{C(mean)}$: **71%** **NO**

S2 $I_{T(mean)}/I_{C(mean)}$: **88%** **YES**

S3 $I_{T(mean)}/I_{C(mean)}$: **82%** **YES**

S4 $I_{T(mean)}/I_{C(mean)}$: **#DIV/0!** **#DIV/0!**

S5 $I_{T(mean)}/I_{C(mean)}$: **#DIV/0!** **#DIV/0!**

INVALD: If the test sediment is greater than 110%, the results in uninterpretable
YES: If test sediment is reference, reference is acceptable

APPENDIX B – Laboratory Bench Sheets

Rainier Environmental
5013 Pacific Hwy. E., Suite 20
Tacoma,WA 98424

Raw Data Sheet
Microtox
100% Sediment Porewater Toxicity

Client Name: New Fields **Test Date:** 12/5/13

Sample ID: WETSED1, WETSED2, WETSED3 **Test No.:** 1312-027, 1312-028, 1312-029

Site	Light Reading	Time	Replicate 1	2	3	4	5
CON	$I_{(0)}$	5 min	91	92	87	79	90
	$I_{(5)}$	10min	87	82	77	75	78
	$I_{(15)}$	20 min	76	75	66	66	67
WET SED1	$I_{(0)}$	5 min	63	62	63	66	59
	$I_{(5)}$	10min	36	35	38	40	37
	$I_{(15)}$	20 min	07	06	07	08	07
WET SED2	$I_{(0)}$	5 min	80	86	77	75	67
	$I_{(5)}$	10min	72	81	71	71	66
	$I_{(15)}$	20 min	62	66	58	57	57
WET SED3	$I_{(0)}$	5 min	77	78	70	68	67
	$I_{(5)}$	10min	73	73	68	69	67
	$I_{(15)}$	20 min	60	61	56	56	55
	$I_{(0)}$	5 min					
	$I_{(5)}$	10min					
	$I_{(15)}$	20 min					
	$I_{(0)}$	5 min					
	$I_{(5)}$	10min					
	$I_{(15)}$	20 min					

Comments:

APPENDIX C - Water Quality Results

Rainier Environmental
5013 Pacific Hwy. E. Suite 20
Tacoma, WA 98424

Physical and Chemical
Measurements of Porewaters
Sediment Bioassays

Analyst: QT

Client : NewFields

Test Date: 12/5/13

Test Type: Microtox 100% Porewater Toxicity Test

Test No: 1312-027, 1312-028
1312-029

Test Species: *Vibrio fischeri*

Site	Initial Salinity (ppt)	Final Salinity (ppt)	Initial D.O. (mg/L)	Final D.O (mg/L)	Initial pH	Adjusted pH	NaOH or HCl Vol. Used	Final Porewater Conc.	Ammonia
CON	20.3	20.3	6.7	6.7	8.07	—	—	100%	0.0
WETSED1	0.7	19.7	6.2	6.2	7.14	7.93	120µL NaOH	99.5%	<1.0
WETSED2	0.2	20.3	6.3	6.3	7.25	7.97	80µL NaOH	99.7%	<1.0
WETSED3	0.2	19.5	6.3	6.3	7.28	8.01	100µL NaOH	99.6	1.7

Sample Description: _____

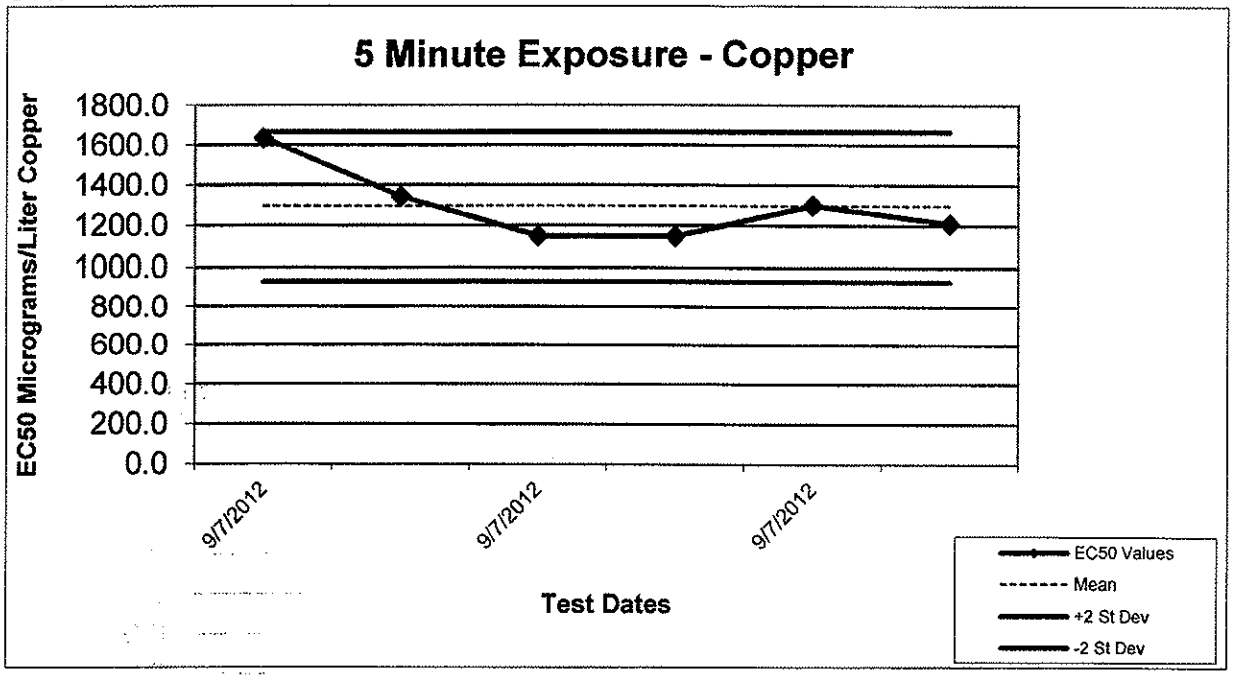
Comments: _____

QA Check: QT

APPENDIX D – Reference Toxicant Tests

Reference Toxicant Control Chart
Microtox 5-Minute Exposure

CV% = 14.2

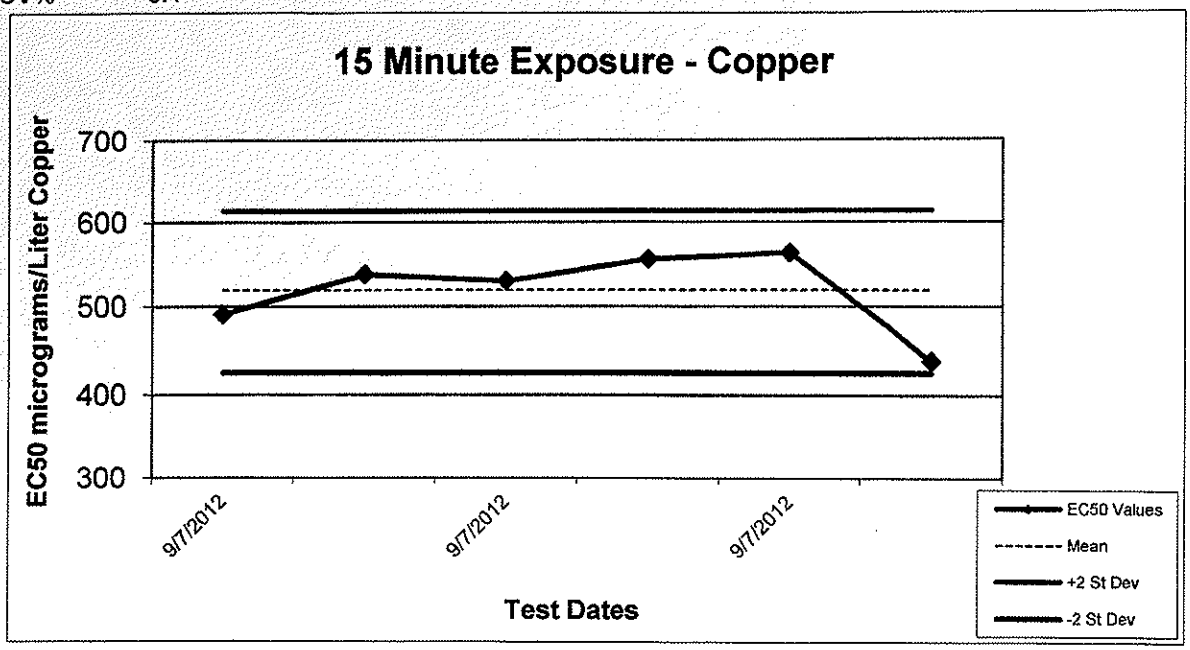


Date	Time	EC50 %	EC50 mg/L Copper [a]	Mean	StDev	-2 SD	+2 SD
9/7/2012	8:53	81.8	1636.0	1297.5	184.0	929.4	1665.5
9/7/2012	9:36	67.2	1344.0	1297.5	184.0	929.4	1665.5
9/7/2012	10:00	57.4	1148.0	1297.5	184.0	929.4	1665.5
9/7/2012	10:28	57.4	1148.0	1297.5	184.0	929.4	1665.5
9/7/2012	10:54	65.0	1300.0	1297.5	184.0	929.4	1665.5
12/5/2013	17:17	60.4	1208.8	1297.5	184.0	929.4	1665.5

a - Highest concentration of Copper is 2000 micro grams/Liter

Reference Toxicant Control Chart
Microtox 15-Minute Exposure

CV% = 9.1



Date	Time	EC50 %	EC50 mg/L Copper [a]	Mean	StDev	-2 SD	+2 SD
9/7/2012	853	24.6	491.0	519.2	47.1	425.1	613.4
9/7/2012	937	26.9	537.8	519.2	47.1	425.1	613.4
9/7/2012	1001	26.5	530.2	519.2	47.1	425.1	613.4
9/7/2012	1028	27.8	555.4	519.2	47.1	425.1	613.4
9/7/2012	1055	28.2	563.0	519.2	47.1	425.1	613.4
12/5/2013	1717	21.9	438.0	519.2	47.1	425.1	613.4

a - Highest concentration of copper is 2000 micro grams/Liter

MicrotoxOmni Sample Results Report

Result Name: RT120513VF

Test Date/Time: 12/5/2013 5:17:11PM

Sample Name: Sample 1

Test Name: Basic Test

Description:

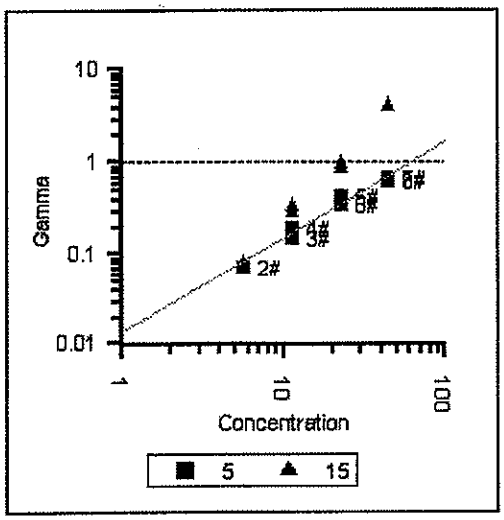
Toxicant:

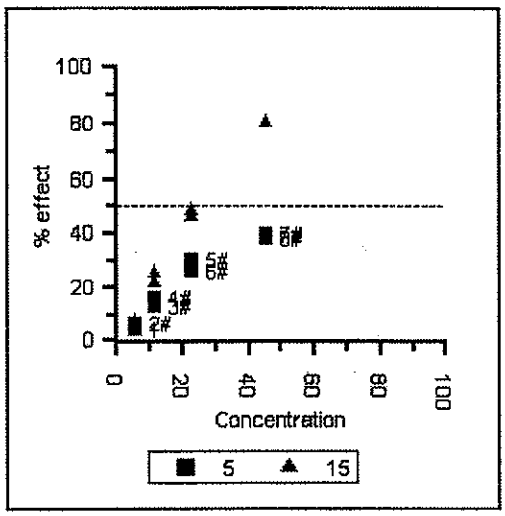
Test Location: rainier

Instrument ID: _MASTER

Reagent Lot #:

User ID: MANAGER





Time	Sample	Conc	I0	It	Gamma	%Effect
5 Mins						
	Control	0.00	92	110	1.187#	
	Control	0.00	98	110	1.130#	
	1	5.63	101	112	0.0490*	4.67%
	2	5.63	101	109	0.0722#	6.73%
	3	11.25	105	105	0.1504#	13.07%
	4	11.25	102	99	0.1921#	16.12%
	5	22.50	101	82	0.4342#	30.28%
	6	22.50	102	88	0.3524#	26.06%
	7	45.00	105	74	0.6583#	39.70%
	8	45.00	96	68	0.6318#	38.72%

Result Name:	RT120513VF		
Test Date/Time:	12/5/2013 5:17:11PM		
Sample Name:	Sample 1		
Test Name:	Basic Test		
Description:		Instrument ID:	_MASTER
Toxicant:		Reagent Lot #:	
Test Location:	rainier	User ID:	MANAGER

15 Mins

Control	0.00	92	82	0.8903#	
Control	0.00	98	84	0.8608#	
1	5.63	101	82	0.0797#	7.38%
2	5.63	101	82	0.0777#	7.21%
3	11.25	105	71	0.2811#	21.94%
4	11.25	102	67	0.3382#	25.27%
5	22.50	101	45	0.9571#	48.90%
6	22.50	102	48	0.8749#	46.66%
7	45.00	105	18	4.128#	80.50%
8	45.00	96	17	4.069#	80.27%

- included, * - invalid

Statistics:

Data: 5 Mins

EC50 Concentration: 60.44%
(95% Confidence Range: 45.87 to 79.63)
EC50 value was calculated from extrapolated data.
95% Confidence Factor: 1.318
Estimating Equation:
LOG C = 0.9300 x LOG G +1.781
Correction Factor: 1.159
Slope: 1.044
Coeff of Determination (R^2): 0.9706

Data: 15 Mins

Result Name:	RT120513VF		
Test Date/Time:	12/5/2013 5:17:11PM		
Sample Name:	Sample 1		
Test Name:	Basic Test		
Description:		Instrument ID:	_MASTER
Toxicant:		Reagent Lot #:	
Test Location:	rainier	User ID:	MANAGER

EC50 Concentration: 21.90%
(95% Confidence Range: 20.68 to 23.18)
95% Confidence Factor: 1.059
Estimating Equation:
LOG C = 0.5329 x LOG G +1.340
Correction Factor: 0.8756
Slope: 1.868
Coeff of Determination (R^2): 0.9954

The contents of this report are private and confidential.

Printed: 12/30/2013 9:12:29AM **Signature:**

APPENDIX E – Chain-of Custody Forms

NEWFIELDS

NewFields Northwest, LLC.
Shipping: 4729 NE View Dr.
Mailing: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6040, Fax: (360)297-7268

CHAIN OF CUSTODY

13998

Destination Lab: Rainier Environmental	Sample Originator: BNewFields	Report Results To:	Phone:
Destination Contact: Eric Tollefson	Contact Name: Bill Gardiner	Contact Name:	Fax:
Date: 12/4/13	Address: See Above	Address:	Email:
Turn-Around-Time: Standard	Phone:		
Project Name: AT/YS	Fax:		
Contract/PO:	E-mail: bgardiner@newfields.com		

Invoicing To:

Comments or Special Instructions:

No.	Sample ID	Matrix	No. & Type of Container	Date & Time	Analysis: Mercury	Preservation	Sample Temp Upon Receipt	LAB ID
1	WETSED 1	SS	1 glass	12/4/13 1420	X		4.9	13-149
2	WETSED 2	"	"	"	X		4.2	13-150
3	WETSED 3	"	"	"	X		4.5	13-151
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: Collin Ray	Print Name: Eric Tollefson	Print Name:	Print Name:
Signature:	Signature: ERIC TOLLEFSON	Signature:	Signature:
Affiliation: NewFields	Affiliation: RAINIER	Affiliation:	Affiliation:
Date/Time: 12/4/13 1425	Date/Time: 12/5/13 935	Date/Time:	Date/Time:

Matrix Codes
FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment
TS = plant & Animal Tissue
OT = Other

WHITE – return to originator • YELLOW – lab • PINK – retained by originator

Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix C

Amphipod and Chironomus Data Sheets
Baseline and Dilution Series

Appendix C.1

10-Day Solid-Phase Test with Hyalella azteca

NewFields

10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA		*Hyallela*	

ENDPOINT DATA & OBSERVATIONS

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/14 TECHNICIAN JC OBSERVNS.	DATE 12/15 TECHNICIAN JC OBSERVNS.	DATE 12/16 TECHNICIAN MMB OBSERVNS.	DATE 12/17 TECHNICIAN JC OBSERVNS.	DATE 12/18 TECHNICIAN MMB OBSERVNS.	DATE 12/19 TECHNICIAN MMB OBSERVNS.	DATE * TECHNICIAN OBSERVNS.	DATE 12/21 TECHNICIAN JC OBSERVNS.	DATE 12/22 TECHNICIAN JC OBSERVNS.	DATE 12/23 TECHNICIAN CR OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
Control / .	1			N	N	N	N	N	N	N	N	N	N	9	1	209.33	209.67	
	2													10①	2	207.22	207.50	
	3													10	3	208.51	208.93	
	4													10	4	206.81	207.23	
	5													9	5	210.62	211.00	
	6													8	6	206.59	~~206.86~~	206.86
	7													9	7	209.67	~~208.28~~	210.04
	8													8	8	207.83	~~209.40~~	208.26
TNWR / .	1													10	9	209.21	209.80	
	2													10	10	207.21	207.98	
	3													10	11	209.06	208.77	
	4													10	12	208.44	209.16	
	5													8	13	207.26	207.86	
	6													10	14	209.58	205.29	
	7													10	15	206.50	207.08	
	8													10	16	210.31	211.01	
WETSED1 / .	1													0	17	201.23		
	2													0	18	207.43		
	3													0	19	210.55		
	4													0	20	210.54		
	5													0	21	209.62		
	6													0	22	210.00		
	7													0	23	207.88		
	8													0	24	206.98		

Zero times

	Tare wt.	Dry wt.
1	206.52 mg	206.72 mg
2	206.74 mg	206.92 mg
3	207.71 mg	207.89 mg

① 6 in boat

② ~~6.JC 1/02/13.JC~~ 1E. JC 1/02/14.

NewFields

10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA		*Hyallela*	

ENDPOINT DATA & OBSERVATIONS

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/14 TECHNICIAN JL OBSERVNS.	DATE 12/15 TECHNICIAN JL OBSERVNS.	DATE 12/16 TECHNICIAN MMB OBSERVNS.	DATE 12/17 TECHNICIAN JL OBSERVNS.	DATE 12/18 TECHNICIAN MMB OBSERVNS.	DATE 12/19 TECHNICIAN MMB OBSERVNS.	DATE 12/20 TECHNICIAN OBSERVNS.	DATE 12/21 TECHNICIAN JL OBSERVNS.	DATE 12/22 TECHNICIAN JL OBSERVNS.	DATE 12/23 TECHNICIAN MMB OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
WETSED2 / .	1			N	N	N	N	N	N	N	N	N	N	9	25	208.82	209.16	
	2													9	26	205.46	206.05	
	3													10	27	209.05	209.77	
	4													10	28	212.97	213.55	
	5													10	29	209.57	210.00	
	6													9	30	208.66	209.17	
	7													10	31	207.83	208.51	
	8												↓	9	32	204.77	205.25	
9 ppm Cd / .	1												N	8	33	203.81	204.27	
	2													10	34	207.52	208.06	
	3													9	35	207.61	208.15	
	4													10	36	205.87	206.50	
	5													10	37	208.79	209.40	
	6													9	38	207.33	207.86	
	7													10	39	209.61	210.08	
	8												↓	10	40	206.91	207.35	
6 ppm Cd / .	1												N	10	41	205.75	206.33	
	2													9	42	208.79	209.30	
	3													10	43	207.94	208.55	
	4													10	44	210.01	210.73	
	5													9	45	209.03	209.44	
	6													10	46	207.09	207.67	
	7													9	47	207.71	208.22	
	8			↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	9	48	203.59	204.13	

① 8 in weighboat

NewFields

10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA		*Hyallela*	

ENDPOINT DATA & OBSERVATIONS

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/14 TECHNICIAN JL OBSERVNS.	DATE 12/15 TECHNICIAN JL OBSERVNS.	DATE 12/16 TECHNICIAN MMB OBSERVNS.	DATE 12/17 TECHNICIAN JL OBSERVNS.	DATE 12/18 TECHNICIAN MMB OBSERVNS.	DATE 12/19 TECHNICIAN MMB OBSERVNS.	DATE 12/20 TECHNICIAN HE OBSERVNS.	DATE 12/21 TECHNICIAN JL OBSERVNS.	DATE 12/22 TECHNICIAN JL OBSERVNS.	DATE 12/23 TECHNICIAN GR OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
3 ppm Cd / .	1			N	N	N	N	N	N	N	N	N	N	8	49	207.75	208.44	
	2													9	50	209.64	210.56	
	3													9	51	210.17	210.89	
	4													9	52	206.89	207.56	
	5													8	53	208.08	208.76	
	6													9	54	207.47	208.00	
	7													9	55	211.05	211.66	
	8													10	56	206.42	207.17	
1 ppm Cd / .	1													9	57	209.24	209.77	
	2													9	58	204.10	204.52	
	3													10	59	208.39	209.05	
	4													8	60	208.18	208.71	
	5													9	61	207.67	208.26	
	6													10	62	207.62	208.40	
	7													10	63	207.31	207.99	
	8													10	64	208.40	209.06	

NewFields 10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	13Dec13 / 1445	23Dec13	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
Control / .	0	WQ	22	7	8.6	7	22.5	2	183	5		5	8.1	MMB	MMB	X	JL
Control / .	1	WQ	22	7	7.7	7	22.3	2	184			5	7.3	JL	JL	→	→
Control / .	2	WQ	22	7	7.2	7	22.4	2	186			5	7.4	JL	JL	→	→
Control / .	3	WQ	22	7	7.0	7	22.6	2	202			5	7.3	JL	JL	HE	MMB
Control / .	4	WQ	22	7	6.2	7	22.4	2	202			5	7.3	JL	JL	HE	HE
Control / .	5	WQ	22	7	①4.85.7	7	22.2	2	202			5	8.0	HE	HE	→	→
Control / .	6	WQ	22	7	6.5	7	22.3	2	202			5	7.4	MMB	MMB	CR	CR
Control / .	7	WQ	22	7	5.6	7	22.3	2	201			5	7.3	HE	→	→	→
Control / .	8	WQ	22	7	6.4	7	22.8	2	200			5	7.3	JL	JL	→	
Control / .	9	WQ	22	7	6.1	7	22.8	2	201			5	7.4	JL	JL	→	
Control / .	10	WQ	22	7	5.4	7	20.3	2	203			5	7.3	CR			
TNWR / .	0	WQ	5	7	6.6	7	23.7	2	202			5	7.3	CR	MMB	X	JL
TNWR / .	1	WQ	5	7	5.9	7	22.0	2	221			5	7.3	JL	JL	→	→
TNWR / .	2	WQ	5	7	5.8	7	22.1	2	214			5	7.4	JL	JL	→	→
TNWR / .	3	WQ	5	7	5.8	7	22.0	2	225			5	7.3	JL	JL	HE	MMB
TNWR / .	4	WQ	5	7	4.9	7	22.0	2	219			5	7.2	JL	JL	HE	HE
TNWR / .	5	WQ	5	7	4.6	7	21.0	2	223			5	7.3	HE	HE	→	→
TNWR / .	6	WQ	5	7	4.7	7	21.7	2	216			5	7.4	MMB	MMB	CR	CR
TNWR / .	7	WQ	5	7	5.3	7	②20.0	2	212			③7.7-7.4		HE	→	→	→
TNWR / .	8	WQ	5	7	8.5	7	22.5	2	208			5	8.1	JL	JL	→	
TNWR / .	9	WQ	5	7	8.5	7	22.2	2	217			5	8.0	JL	JL	→	
TNWR / .	10	WQ	5	7	8.1	7	20.1	2	219			5	7.9				

① Meter on salt water settings ② 21.8 HE MR 12/20 ③ MR HE 12/20

NewFields 10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	13Dec13	23Dec13	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1 / .	0	WQ	19	7	7.5	7	22.7	2	277	5		5	7.1	MMB	MMB	X	JL
WETSED1 / .	1	WQ	19	7	6.7	7	22.3	2	320	5		5	①~~7.3~~ 7.0	JL	JL	→	→
WETSED1 / .	2	WQ	19	7	6.0	7	22.9	2	256			5	6.8	JL	JL	→	→
WETSED1 / .	3	WQ	19	7	6.2	7	22.8	2	294			5	6.9	JL	JL	~~HE~~ →	MMB
WETSED1 / .	4	WQ	19	7	5.7	7	22.4	2	228			5	7.2	JL	JL	HE	HE
WETSED1 / .	5	WQ	19	7	5.8	7	22.6	2	220			5	7.3	HE	→	HE	→
WETSED1 / .	6	WQ	19	7	5.8	7	22.3	2	213			5	7.1	MMB	MMB	CR	CR
WETSED1 / .	7	WQ	19	7	4.5	7	22.7	7	②~~205~~ 206			5	7.0	HE			→
WETSED1 / .	8	WQ	19	7	4.7	7	22.8	2	201			5	7.1	JL	JL	→	
WETSED1 / .	9	WQ	19	7	5.2	7	23.2	2	199			5	7.2	JL	JL	→	
WETSED1 / .	10	WQ	19	7	4.8	7	20.4	2	201			5	7.1	CR			
WETSED2 / .	0	WQ	46	7	7.2	7	22.5	2	259	5	~~3.4~~	5	7.4	MMB	MMB	X	JL
WETSED2 / .	1	WQ	46	7	6.5	7	22.4	2	307			5	7.4	JL	JL	→	→
WETSED2 / .	2	WQ	46	7	6.3	7	22.3	2	265			5	7.4	JL	JL	→	→
WETSED2 / .	3	WQ	46	7	5.7	7	22.6	2	261			5	7.3	JL	JL	HE	MMB
WETSED2 / .	4	WQ	46	7	5.4	7	22.4	2	297	5		5	7.5	JL	JL	HE	HE
WETSED2 / .	5	WQ	46	7	5.4	7	22.3	2	258			5	7.3	HE	→	HE	→
WETSED2 / .	6	WQ	46	7	6.2	7	22.3	2	246			5	7.5	MMB	MMB	CR	CR
WETSED2 / .	7	WQ	46	7	5.1	7	22.6	2	235			5	7.5	HE	HE	→	
WETSED2 / .	8	WQ	46	7	5.9	7	23.2	2	235			5	7.5	JL	JL	→	
WETSED2 / .	9	WQ	46	7	5.2	7	22.8	2	231			5	7.5	JL	JL	→	
WETSED2 / .	10	WQ	46	7	4.7	7	20.3	2	231			5	7.4	CR			

① MR. JL 12/14/13.

② 206 HE 12/20

NewFields 10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	13Dec13	23Dec13	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
9 ppm Cd / .	0	WQ	66	7	7.9	7	23.9	2	284	5		5	7.7	CR	MMB	X	JL
9 ppm Cd / .	1	WQ	66	7	6.7	7	22.5	2	354			5	7.5	JL	JL	→	
9 ppm Cd / .	2	WQ	66	7	6.2	7	22.5	2	290			5	7.4	JL	JL	→	
9 ppm Cd / .	3	WQ	66	7	6.1	7	22.7	2	280			5	7.3	JL	JL	HE	MMB
9 ppm Cd / .	4	WQ	66	7	5.4	7	22.4	2	267			5	7.5	JL	JL	HE	HE
9 ppm Cd / .	5	WQ	66	7	5.3	7	22.5	2	259			5	~~7.4~~ 7.4	HE	→	HE	→
9 ppm Cd / .	6	WQ	66	7	5.3	7	22.2	2	254			5	7.7	MMB	MMB	CR	CR
9 ppm Cd / .	7	WQ	66	7	5.9	7	22.7	2	250			5	7.5	HE	HE	→	
9 ppm Cd / .	8	WQ	66	7	5.8	7	22.9	2	240			5	7.4	JL	JL	→	
9 ppm Cd / .	9	WQ	66	7	6.1	7	22.6	2	229			5	7.5	JL	JL	→	
9 ppm Cd / .	10	WQ	66	7	5.2	7	20.4	2	236			5	7.8	CR			
6 ppm Cd / .	0	WQ	61	7	6.9	7	22.5	2	291			5	7.6	MMB	MMB	X	JL
6 ppm Cd / .	1	WQ	61	7	6.2	7	22.4	2	343			5	7.4	JL	JL	→	
6 ppm Cd / .	2	WQ	61	7	6.2	7	22.2	2	282			5	7.3	JL	JL	→	
6 ppm Cd / .	3	WQ	61	7	6.1	7	22.4	2	274			5	7.3	JL	JL	HE	MMB
6 ppm Cd / .	4	WQ	61	7	5.6	7	22.3	2	271			5	7.4	JL	JL	HE	HE
6 ppm Cd / .	5	WQ	61	7	5.1	7	22.3	2	258			5	7.3	HE	→	HE	→
6 ppm Cd / .	6	WQ	61	7	5.3	7	22.3	2	248			5	7.3	MMB	MMB	CR	CR
6 ppm Cd / .	7	WQ	61	7	5.8	7	22.4	2	237			5	7.4	HE	HE	→	
6 ppm Cd / .	8	WQ	61	7	5.2	7	22.9	2	229			5	7.3	JL	JL	→	
6 ppm Cd / .	9	WQ	61	7	5.3	7	23.5	2	234			5	7.4	JL	JL	→	
6 ppm Cd / .	10	WQ	61	7	3.8	7	20.2	2	229			5	7.3	CR			

① Illegible HE 12/18

NewFields 10 DAY SOLID PHASE TEST DATA SHEET - FRESHWATER

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	13Dec13	23Dec13	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
Acceptable Range	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
3 ppm Cd / .	0	WQ	40	7	6.9	7	22.7	2	241			5	7.6	MMB	MMB	X	JL
3 ppm Cd / .	1	WQ	40	7	6.3	7	22.5	2	283			5	7.4	JL	JL	→	
3 ppm Cd / .	2	WQ	40	7	6.4	7	22.4	2	253			5	7.3	JL	JL	→	
3 ppm Cd / .	3	WQ	40	7	5.8	7	22.7	2	249			5	7.1	JL	JL	HE	MMB
3 ppm Cd / .	4	WQ	40	7	4.8	7	22.7	2	257			5	7.4	JL	JL	HE	HE
3 ppm Cd / .	5	WQ	40	7	5.1	7	22.5	2	236			5	7.2	HE	→	HE	→
3 ppm Cd / .	6	WQ	40	7	5.6	7	22.3	2	231			5	7.4	MMB	MMB	CR	CR
3 ppm Cd / .	7	WQ	40	7	4.8	7	22.8	2	224				7.3	HE	→		
3 ppm Cd / .	8	WQ	40	7	5.7	7	23.4	2	222			5	7.3	JL	JL	→	
3 ppm Cd / .	9	WQ	40	7	6.1	7	23.0	2	217	5		5	7.4	JL	JL	→	
3 ppm Cd / .	10	WQ	40	7	4.1	7	20.4	2	221			5	7.4	CR			
1 ppm Cd /	0	WQ	60	7	6.6	7	22.5	2	232			5	7.5	MMB	MMB	X	JL
1 ppm Cd / .	1	WQ	60	7	5.1	7	22.3	2	269			5	7.3	JL	JL	→	
1 ppm Cd / .	2	WQ	60	7	5.2	7	22.2	2	245			5	7.3	JL	JL	→	
1 ppm Cd / .	3	WQ	60	7	4.4	7	22.5	2	241			5	7.0	JL	JL	HE	MMB
1 ppm Cd / .	4	WQ	60	7	3.9	7	22.5	2	237			5	7.2	JL	JL	HE	HE
1 ppm Cd / .	5	WQ	60	7	3.6	7	22.3	2	228			5	7.3	HE	→	HE	→
1 ppm Cd / .	6	WQ	60	7	2.9	7	22.3	2	230			5	7.2	MMB	MMB	CR	CR
1 ppm Cd / .	7	WQ	60	7	3.0	7	22.6	2	218			5	7.1	HE	→		
1 ppm Cd / .	8	WQ	60	7	7.9	7	22.7	2	204			5	7.7	JL	JL	→	
1 ppm Cd / .	9	WQ	60	7	8.0	7	22.1	2	216			5	7.8	JL	JL	→	
1 ppm Cd / .	10	WQ	60	7	8.0	7	20.3	2	222			5	8.0	CR			

NewFields

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Farallon/Yakima Steel	Hyalella	10

PRETEST / ~~INITIAL~~ / FINAL / ~~OTHER (circle one)~~ DAY of TEST: 0
~~OVERLYING (OV)~~ / POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 12/13/13	Temperature: 20.1 °C	

	Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	pH	Cond. (µS/cm)	Hardness	Alkalinity
OV	Control	Surr	12/13/13 MMB	0.158	20.6	12/13/13 JE			88	72
	TNWR	Surr		0.141					90	84
	WETSED1	Surr		0.179					106	68
	WETSED2	Surr		0.146					110	86
	WETSED3	Surr		0.163					110	77
	6 ppm Cd	Surr		0.193					104	86
	3 ppm Cd	Surr		0.144					86	74
	1 ppm Cd	Surr		0.164					88	76
PW	Control	Surr.	①							
	TNWR		12/13/13 MMB	1.15	20.1	12/13/13 MMB	6.9	522		
	WETSED1			0.903			6.1	1011		
	WETSED2			0.362			7.0	734		
	WETSED3			1.14			6.8	880		
	6 ppm Cd			1.02			6.8	744		
	3 ppm Cd			0.967			6.9	675		
	1 ppm Cd			1.42			6.9	524		

① Insufficient PW collected for analysis, MMB 12/13/13

NewFields

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Favallon / Yakima Steel	Hyalella	10

PRETEST / INITIAL / FINAL / OTHER (circle one) **DAY of TEST:** 10

OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: _____

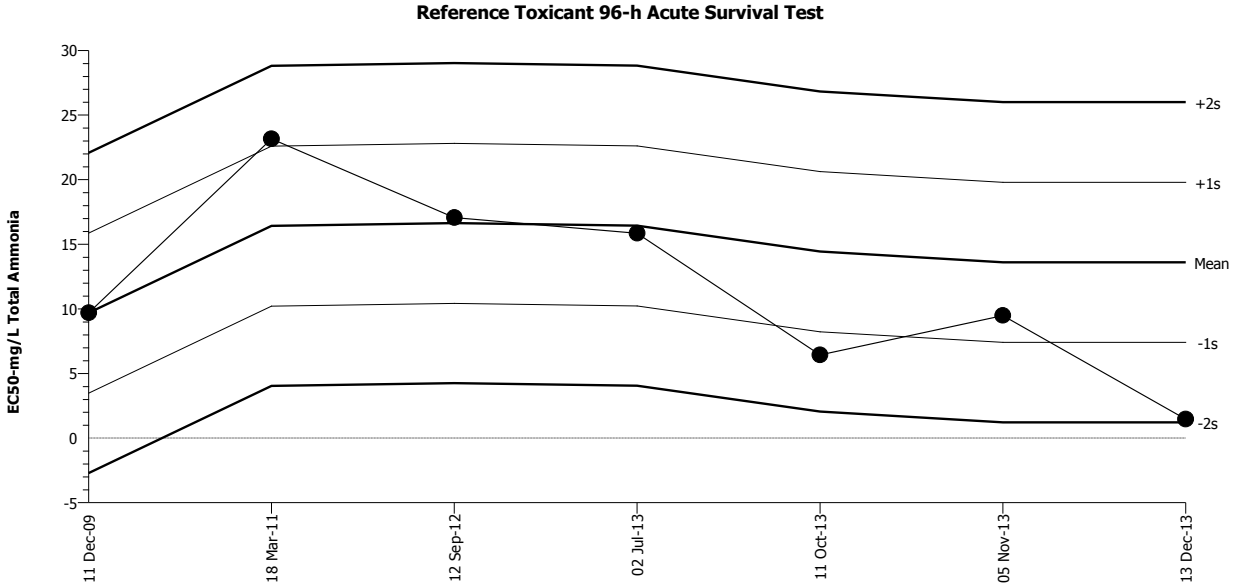
Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 1/02/~~13~~ 14 JC	**Temperature:** 22.8°C	

	Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	pH	Cond. (µS/cm)	Hardness	Alkalinity
OV	Control	Surr	12/23/13 BH	0.598	22.0	1/02/14 JC			83	88
	TNWR	Surr		0.197					89	89
	WETSED1	Surr		0.323					81	73
	WETSED2	Surr		0.452					101	100
	WETSED3	Surr		0.937					106	98 ~~89~~ 90 ①
	6 ppm Cd	Surr		0.361					96	98 ~~91~~ 90 ①
	3 ppm Cd	Surr		0.406					94	91
	1 ppm Cd	Surr		0.603					90	89
PW	Control	Surr.	12/23/13 BH	1.08	22.2	1/02/14 JC				
	TNWR			0.474						
	WETSED 1			0.382						
	WETSED2			0.240						
	WETSED3			0.459						
	6 ppm Cd			0.554						
	3 ppm Cd			0.443						
	1 ppm Cd			0.668						

① WC. JC 1/02/14.

Reference Toxicant 96-h Acute Survival Test **All Matching Labs**

Test Type:	Survival	**Organism:**	Hyalella azteca (Freshwater Amphip	**Material:**	Total Ammonia
Protocol:	EPA/600/R-99/064 (2000)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	13.61	**Count:**	6	**-1s Warning Limit:**	7.417	**-2s Action Limit:**	1.222
Sigma:	6.195	**CV:**	45.50%	**+1s Warning Limit:**	19.81	**+2s Action Limit:**	26

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID	Laboratory
1	2009	Dec	11	16:05	9.69	-3.92	-0.6328			06-0392-7981	04-0353-3462	NewFields
2	2011	Mar	18	17:40	23.15	9.544	1.541	(+)		14-6934-6989	08-7287-0236	NewFields
3	2012	Sep	12	15:30	17.06	3.451	0.5571			15-6980-0340	09-8032-3348	NewFields
4	2013	Jul	2	16:54	15.85	2.238	0.3612			14-0245-1637	17-3940-1363	NewFields
5		Oct	11	16:30	6.435	-7.175	-1.158	(-)		02-6747-8290	14-5731-2244	NewFields
6		Nov	5	14:15	9.487	-4.123	-0.6656			00-2973-8704	14-7798-0524	NewFields
7		Dec	13	16:00	1.461	-12.15	-1.961	(-)		18-8979-3951	13-5696-3347	NewFields

Reference Toxicant 96-h Acute Survival Test **NewFields**

Analysis ID:	01-5892-6385	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.6
Analyzed:	03 Jan-14 10:59	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes
Batch ID:	09-4030-4577	**Test Type:**	Survival	**Analyst:**	
Start Date:	13 Dec-13 16:00	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Diluted Mineral Water
Ending Date:	17 Dec-13 14:05	**Species:**	Hyalella azteca	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	17-4447-7814	**Code:**	67FA9E76	**Client:**	Internal Lab
Sample Date:	27 Sep-11	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	27 Sep-11	**Source:**	Reference Toxicant		
Sample Age:	808d 16h	**Station:**	p110927.179		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	Test Result
Angular (Corrected)	NA	C > T	NA	NA	18.8%	Fails proportion survived

Dunnett T3 Multiple Comparison Test

Control	vs	C-mg/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		4.35*	9.523	2.335	0.269	3	0.0011	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	1.806068	1.806068	1	90.68	0.0007	Significant Effect
Error	0.07966898	0.01991724	4			
Total	1.885737		5			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Variance Ratio F	3.499	199	0.4445	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.836	0.43	0.1207	Normal Distribution

Proportion Survived Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	3	0.9667	0.8232	1	1	0.9	1	0.03333	5.97%	0.0%
4.35		3	0.06667	0	0.3535	0	0	0.2	0.06667	173.2%	93.1%
9.36		3	0	0	0	0	0	0	0		100.0%
19.4		3	0	0	0	0	0	0	0		100.0%
38.2		3	0	0	0	0	0	0	0		100.0%
76.8		3	0	0	0	0	0	0	0		100.0%

Angular (Corrected) Transformed Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	3	1.358	1.124	1.591	1.412	1.249	1.412	0.05432	6.93%	0.0%
4.35		3	0.2604	-0.1768	0.6976	0.1588	0.1588	0.4636	0.1016	67.59%	80.82%
9.36		3	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.31%
19.4		3	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.31%
38.2		3	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.31%
76.8		3	0.1588	0.1588	0.1588	0.1588	0.1588	0.1588	0	0.0%	88.31%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	0.9	1
4.35		0.2	0	0
9.36		0	0	0
19.4		0	0	0
38.2		0	0	0
76.8		0	0	0

Reference Toxicant 96-h Acute Survival Test **NewFields**

Analysis ID:	01-5892-6385	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.6
Analyzed:	03 Jan-14 10:59	**Analysis:**	Parametric-Multiple Comparison	**Official Results:**	Yes

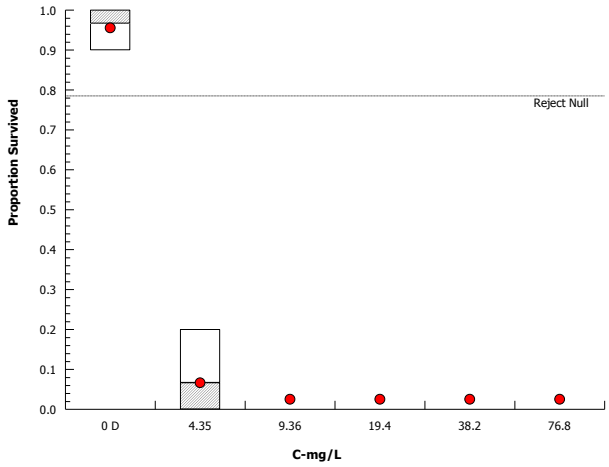
Angular (Corrected) Transformed Detail

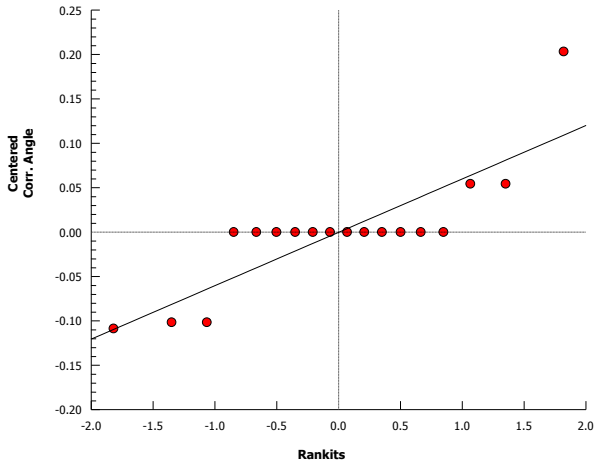
C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1.412	1.249	1.412
4.35		0.4636	0.1588	0.1588
9.36		0.1588	0.1588	0.1588
19.4		0.1588	0.1588	0.1588
38.2		0.1588	0.1588	0.1588
76.8		0.1588	0.1588	0.1588

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	9/10	10/10
4.35		2/10	0/10	0/10
9.36		0/10	0/10	0/10
19.4		0/10	0/10	0/10
38.2		0/10	0/10	0/10
76.8		0/10	0/10	0/10

Graphics





Reference Toxicant 96-h Acute Survival Test **NewFields**

Batch ID:	09-4030-4577	**Test Type:**	Survival	**Analyst:**	
Start Date:	13 Dec-13 16:00	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Diluted Mineral Water
Ending Date:	17 Dec-13 14:05	**Species:**	Hyalella azteca	**Brine:**	Not Applicable
Duration:	94h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	17-4447-7814	**Code:**	67FA9E76	**Client:**	Internal Lab
Sample Date:	27 Sep-11	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	27 Sep-11	**Source:**	Reference Toxicant		
Sample Age:	808d 16h	**Station:**	p110927.179		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
01-5892-6385	Proportion Survived	<4.35	4.35	NA	18.8%		Dunnett T3 Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
13-5696-3347	Proportion Survived	EC5	0.09425	0.08002	0.1305		Linear Interpolation (ICPIN)
		EC10	0.1974	0.1663	0.2774		
		EC15	0.3102	0.2594	0.4426		
		EC20	0.4337	0.3598	0.6284		
		EC25	0.5688	0.4681	0.8372		
		EC40	1.056	0.8463	1.632		
		EC50	1.461	1.15	2.338		

Proportion Survived Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9667	0.8232	1	0.9	1	0.03333	0.05774	5.97%	0.0%
4.35		3	0.06667	0	0.3535	0	0.2	0.06667	0.1155	173.2%	93.1%
9.36		3	0	0	0	0	0	0	0		100.0%
19.4		3	0	0	0	0	0	0	0		100.0%
38.2		3	0	0	0	0	0	0	0		100.0%
76.8		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	0.9	1
4.35		0.2	0	0
9.36		0	0	0
19.4		0	0	0
38.2		0	0	0
76.8		0	0	0

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	9/10	10/10
4.35		2/10	0/10	0/10
9.36		0/10	0/10	0/10
19.4		0/10	0/10	0/10
38.2		0/10	0/10	0/10
76.8		0/10	0/10	0/10

Appendix C.2

10-Day Solid-Phase Test with Chironomus dilutus

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MAN.	NEWFIELDS LABORATORY	PROTOCOL	SPECIES
Farallon	Yakima Steel	0	Bill Gardiner	Port Gamble Bath 4	[illegible]	*Chironomus tentans*

ENDPOINT DATA & OBSERVATIONS

OBSERVATIONS KEY

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/14 TECHNICIAN JL OBSERVNS.	DATE 12/15 TECHNICIAN JL OBSERVNS.	DATE 12/16 TECHNICIAN MMB OBSERVNS.	DATE 12/17 TECHNICIAN JL OBSERVNS.	DATE 12/18 TECHNICIAN MMB OBSERVNS.	DATE 12/19 TECHNICIAN MMB OBSERVNS.	DATE [illegible]/20 TECHNICIAN HE OBSERVNS.	DATE 12/21 TECHNICIAN JL OBSERVNS.	DATE 12/22 TECHNICIAN JL OBSERVNS.	DATE 12/23 TECHNICIAN [illegible] OBSERVNS.
Sand Control /	1			N	N	N	N	N	N	N	N	N	N
	2												
	3												
	4												
	5												
	6												
	7												
	8												
TNWR / .	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												
WETSED1 / .	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MAN.	NEWFIELDS LABORATOR	PROTOCOL	SPECIES
Farallon	Yakima Steel	0	Bill Gardiner	Port Gamble Bath 4	EPA 2000 Method 100.1 Mod.	*Chironomus tentans*

ENDPOINT DATA & OBSERVATIONS

OBSERVATIONS KEY

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/14 TECHNICIAN JL OBSERVNS.	DATE 12/15 TECHNICIAN JL OBSERVNS.	DATE 12/16 TECHNICIAN MMB OBSERVNS.	DATE 12/17 TECHNICIAN JL OBSERVNS.	DATE 12/18 TECHNICIAN MMB OBSERVNS.	DATE 12/19 TECHNICIAN MMB OBSERVNS.	DATE 12/20 TECHNICIAN OBSERVNS.	DATE 12/21 TECHNICIAN JL OBSERVNS.	DATE 12/22 TECHNICIAN JL OBSERVNS.	DATE 12/23 TECHNICIAN OBSERVNS.
WETSED2 / .	1			N	N	N	N	N	N	N	N	N	N
	2												
	3												
	4												
	5												
	6												
	7												
	8												
WETSED3 / .	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												
6 ppm Cd / .	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MAN.	NEWFIELDS LABORATOR	PROTOCOL	SPECIES
Farallon	Yakima Steel	0	Bill Gardiner	Port Gamble Bath 4	[illegible]	*Chironomus tentans*

ENDPOINT DATA & OBSERVATIONS

OBSERVATIONS KEY

N = normal
B= no burrows
M= dead on surface
A= avoidance
L = anoxic surface
F= fungal patches
D= no air flow (DO?)
U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/14 TECHNICIAN JL OBSERVNS.	DATE 12/15 TECHNICIAN JL OBSERVNS.	DATE 12/16 TECHNICIAN MMB OBSERVNS.	DATE 12/17 TECHNICIAN JL OBSERVNS.	DATE 12/18 TECHNICIAN MMB OBSERVNS.	DATE 12/19 TECHNICIAN MMB OBSERVNS.	DATE 12/20 TECHNICIAN HE OBSERVNS.	DATE 12/21 TECHNICIAN JL OBSERVNS.	DATE 12/22 TECHNICIAN JL OBSERVNS.	DATE 12/23 TECHNICIAN [illegible] OBSERVNS.
3 ppm Cd / .	1			N	N	N	N	N	N	N	N	N	N
	2												
	3												
	4												
	5												
	6												
	7												
	8												
1 ppm Cd / .	1												
	2												
	3												
	4												
	5												
	6												
	7												
	8												

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MAN.	NEWFIELDS LABORATOR	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel	0	Bill Gardiner	Port Gamble Bath 4	[illegible]	*Chironomus tentans*	

ENDPOINT DATA & OBSERVATIONS

OBSERVATIONS KEY
N = normal; L = anoxic surface; B= no burrows; F= fungal patches; M= dead on surface; D= no air flow (DO?); A= avoidance; U= excess food; S= on sediment surface

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/24 TECHNICIAN JL OBSERVNS.	DATE 12/25 TECHNICIAN JL OBSERVNS.	DATE 12/26 TECHNICIAN JL OBSERVNS.	DATE 12/27 TECHNICIAN JL OBSERVNS.	DATE 12/28 TECHNICIAN JL OBSERVNS.	DATE 12/29 TECHNICIAN JL OBSERVNS.	DATE 12/30 TECHNICIAN JL OBSERVNS.	DATE 12/31 TECHNICIAN MMB OBSERVNS.	DATE 1/1/14 TECHNICIAN JL OBSERVNS.	DATE TECHNICIAN OBSERVNS.	NUMBER REMAINING	Tare Weight	Dry Weight	AFDW
Sand Control /	1			N	N	N	15	15	N	15	N	N		1	51.44		
	2					15	25	N	15	N		1P			51.65		
	3					15	15	15	35						51.47		
	4					N	N	N	N						51.60		
	5						15								51.38		
	6						N			1S					50.88		
	7					15	15			N					51.43		
	8					N	15	15	25						51.92		
TNWR / .	1						N	N	N	N	N				51.47		
	2														51.37		
	3														51.64		
	4														50.91		
	5														50.84		
	6										1 fly				51.28		
	7														51.63		
	8										N				51.46		
WETSED1 / .	1														51.57		
	2														51.58		
	3														51.58		
	4														51.58		
	5														51.58		
	6														51.58		
	7														51.58		
	8														51.42		

P = Pupal

Weighboat	Tare wt. (mg)
17	51.59
18	51.60
19	51.44
20	51.62
21	51.44

Page 1 of 3

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MAN.	NEWFIELDS LABORATOR	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel	0	Bill Gardiner	Port Gamble Bath 4		*Chironomus tentans*	

ENDPOINT DATA & OBSERVATIONS

OBSERVATIONS KEY
N = normal; L = anoxic surface; B= no burrows; F= fungal patches; M= dead on surface; D= no air flow (DO?); A= avoidance; O= excess food; SW: Surface of water

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/24 TECHNICIAN JK OBSERVNS.	DATE 12/25 TECHNICIAN JL OBSERVNS.	DATE 12/26 TECHNICIAN JL OBSERVNS.	DATE 12/27 TECHNICIAN JL OBSERVNS.	DATE 12/28 TECHNICIAN JL OBSERVNS.	DATE 12/29 TECHNICIAN JL OBSERVNS.	DATE 12/30 TECHNICIAN JK OBSERVNS.	DATE 12/31 TECHNICIAN MMB OBSERVNS.	DATE 1/1/19 TECHNICIAN BH OBSERVNS.	DATE TECHNICIAN OBSERVNS.	NUMBER REMAINING	Tare Weight	Dry Weight	AFDW	Wet Weight
WETSED2 / .	1			N	N	N	N	N	N	N	N	N			51.47			25
	2														51.58			26
	3														51.33			27
	4														51.69			28
	5										1 SW				51.10			29
	6										N				51.36			30
	7														51.64			31
	8														51.30			32
WETSED3 / .	1										N				51.41			33
	2										N				51.34			34
	3										1 SW				51.44			35
	4										N				51.44			36
	5														51.64			37
	6														51.50			38
	7														51.56			39
	8														51.57			40
6 ppm Cd / .	1										N				51.21			41
	2														51.68			42
	3														51.21			43
	4														51.51			44
	5														51.55			45
	6														51.62			46
	7														51.57			47
	8														51.40			48

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	NEWFIELDS JOB NO.	PROJECT MAN.	NEWFIELDS LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel	0	Bill Gardiner	Port Gamble Bath 4		*Chironomus tentans*	

ENDPOINT DATA & OBSERVATIONS

OBSERVATIONS KEY

N = normal; L = anoxic surface; B= no burrows; F= fungal patches; M= dead on surface; D= no air flow (DO?); A= avoidance; U= excess food; SW: Surface of water

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 12/24 TECHNICIAN JK OBSERVNS.	DATE 12/25 TECHNICIAN JL OBSERVNS.	DATE 12/26 TECHNICIAN JL OBSERVNS.	DATE 12/27 TECHNICIAN JL OBSERVNS.	DATE 12/28 TECHNICIAN JL OBSERVNS.	DATE 12/29 TECHNICIAN JL OBSERVNS.	DATE 12/30 TECHNICIAN JK OBSERVNS.	DATE 12/31 TECHNICIAN MMB OBSERVNS.	DATE 1/1/14 TECHNICIAN BH OBSERVNS.	DATE TECHNICIAN OBSERVNS.	NUMBER REMAINING	Tare Weight	Dry Weight	AFDW	Weighboat
3 ppm Cd / .	1			N	N	N	N	N	N	N	N	N			51.26			49
	2														51.34			50
	3														51.53			51
	4											1Fly			51.51			52
	5														51.75			53
	6														51.50			54
	7														51.14			55
	8											1Fly			51.04			56
1 ppm Cd / .	1										1 SW				51.32			57
	2										2				51.46			58
	3											1Fly			51.45			59
	4														51.07			60
	5														50.95			61
	6										3 SW				51.57			62
	7										2				51.09			63
	8										2				51.94			64

Yakima Steel
Endpoint Summary for the 20-Day SP Test with *C. dilutus*.

Sample	Rep	Initial Number	# Larvae Remaining	# of Pupae	Total # of Survivors	Percent Survival (%)	Mean Survival TOTAL (%)	SD	# of Adult Flys	Total # of Survivors (with flys)	Percent Survival (%) (with flys)	Mean Survival TOTAL (%) (with flys)	Tare Weight (mg)	Total Dry Weight (mg)	Total Ashed Weight (mg)	AFDW (mg)	AFDW per Survivor (mg)	Mean AFDW per Survivor (mg)	SD	AFDW per Original Number [ON] (mg)	Mean AFDW per ON (mg)	SD
Sand Control	1	12	9	0	9				Ø				51.44	73.61	54.52							
	2	12	8	3	11				Ø				51.65	66.52	53.17							
	3	12	10	0	10				Ø				51.47	73.99	56.14							
	4	12	9	3	12				Ø				51.60	71.88	56.67							
	5	12	6	5	11				Ø				51.38	66.52	54.46							
	6	12	10	~~20~~ 0	~~12~~ 10				Ø				50.85	74.44	55.52							
	7	12	10	2	12				Ø				51.43	70.32	53.80							
	8	12	12	0	12				Ø				51.42	79.45	58.08							
TNWR	1	12	3	1					Ø				51.47	64.64	54.06							
	2	12	5	3					Ø				51.37	65.85	54.95							
	3	12	6	1					5				51.62	71.48	56.03							
	4	12	3	2					3				50.91	61.36	53.22							
	5	12	0 ②	0	0				0				50.84	69.28	54.85							
	6	12	1	5					3				51.28	55.49	52.30							
	7	12	4	3					3				51.63	66.07	55.18							
	8	12	2	2					2				51.46	61.01	53.83							
WETSED1	1	12	~~7~~	~~0~~					~~0~~				51.59	67.11	54.77							
	2	12	12	0					Ø				51.60	74.38	57.24							
	3	12	12	~~0~~					Ø				51.44	71.32	56.02							
	4	12	6	0					Ø				51.62	61.30	53.30							
	5	12	10	~~0~~					Ø				51.44	~~77.34~~	57.83							
	6	12	11	~~0~~					~~0~~				51.53	73.00	57.79							
	7	12	8	~~0~~					Ø				51.58	71.00	55.41							
	8	12	5	~~0~~					0				51.42	69.96	55.71							
WETSED2	1	12	6	2					1				51.47	72.81	57.03							
	2	12	8	3					0				51.53	72.59	57.08							
	3	12	6	3					Ø				51.33	63.54	53.59							
	4	12	4	4					Ø				51.69	68.73	54.93							
	5	12	6	3					1				51.10	69.44	56.16							
	6	12	6	1					1				51.36	70.94	56.50							
	7	12	4	3					2				51.64	67.01	55.01							
	8	12	4	2					1				51.70	66.43	54.26							

① WC.
② no "X" on jar - possibly no animals added at initiation; # larvae = 6, # pupae = 2, # flys = Ø in SWR.
weighboat 13.MMB

Endpoint Summary for the 20-Day SP Test with *C. dilutus*.

Sample	Rep	Initial Number	# Larvae Remaining	# of Pupae	Total # of Survivors	Percent Survival (%)	Mean Survival TOTAL (%)	SD	# of Adult Flys	Total # of Survivors (with flys)	Percent Survival (%) (with flys)	Mean Survival TOTAL (%) (with flys)	Tare Weight (mg)	Total Dry Weight (mg)	Total Ashed Weight (mg)	AFDW (mg)	AFDW per Survivor (mg)	Mean AFDW per Survivor (mg)	SD	AFDW per Original Number [ON] (mg)	Mean AFDW per ON (mg)	SD
WETSED3	1	12	6	3					0				51.41	65.14	55.01							
	2	12	7	0					0				51.34	67.18	55.16							
	3	12	8	0					1				51.44	69.90	57.29							
	4	12	8	0					0				51.44	74.32	58.54							
	5	12	5	1					0 (2)				51.64	62.76	54.03							
	6	12	10	0					0				51.50	77.30	59.83							
	7	12	8	0					1				51.56	74.38	57.17							
	8	12	6	1					0 (3)				51.37	68.22	55.25							
6 ppm Cd	1	12	3	2					0				51.71	63.30	54.58							
	2	12	8	2					1				51.68	71.16	56.46							
	3	12	11	0					1				51.71	84.08	63.10							
	4	12	10	0					0				51.54	76.09	57.96							
	5	12	7	2					1				51.65	73.15	56.97							
	6	12	5	4					0				51.62	68.83	56.59							
	7	12	3	3					0				51.57	63.35	53.14							
	8	12	6	0					1				51.40	69.79	54.24							
3 ppm Cd	1	12	9	2					0				51.26	73.59	56.06							
	2	12	7	1					1				51.36	67.88	55.12							
	3	12	5	2					1				51.53	69.02	56.49							
	4	12	5	3					2				51.51	66.98	55.46							
	5	12	0 (1)	0					1				51.75	59.55	53.23							
	6	12	13	0					0				51.50	82.15	60.90							
	7	12	11	1					0				51.14	81.12	60.01							
	8	12	6	2					0				51.04	67.86	54.58							
1 ppm Cd	1	12	7	0					0				51.32	70.56	54.94							
	2	12	7	3					0				51.40	71.89	57.45							
	3	12	+	0					3				51.45									
	4	12	1	2					1				51.07	55.70	51.80							
	5	12	1	4					0				50.95	54.70	51.11							
	6	12	6	1					4				51.57	66.81	55.52							
	7	12	8	2					2				51.09	68.16	55.77							
	8	12	2	3					(1) 3				51.54	58.40	52.23							

(1) surv. = # larvae: 3, # pupae: 3, # flies: 0 in weighboat 58.

(2) WC 1.2.14 BH 0 Larvae, 0 Pupae, 4 exuvae

(3) IE GR 1/2/14

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT
Farallon	Yakima Steel
NEWFIELDS JOB NUMBER	**PROJECT MANAGER**
0	Bill Gardiner

SPECIES		NEWFIELDS LABORATORY	PROTOCOL
Chironomus tentans		Port Gamble Bath 4	
TEST START DATE	**TIME**	**TEST END DATE**	**TIME**
13Dec13	1340	02Jan14	

WATER QUALITY DATA

DO (mg/L): > 2.5 mg/L | TEMP (C): ~~22~~ 23±1 | COND (mS/cm): N/A | pH: 6-9 | NH3 (mg/L): < 4.0 | DILUTION WATER BATCH: 0 | TEMP.RECDR./HOBO#: NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY mS/cm	pH meter	pH unit	Hardness Techn.	Hardness mg/L	Alkalinity Techn.	Alkalinity mg/L	INTER. Ammonia Techn.	INTER. Ammonia mg/L	TECH	Date	RENEWAL AM	RENEWAL PM	Feeding
Sand Control /	0	WQ	22	7	8.6	7	23.9	2	178	5	7.3							CR	12/13	M	X	CR
Sand Control /	1	WQ	22	7	7.2	7	22.5	2	170	5	7.2							JL	12/14	JL	→	
Sand Control /	2	WQ	22	7	6.7	7	22.5	2	190	5	7.2							JL	12/15	JL	→	
Sand Control /	3	WQ	22	7	6.1	7	22.7	2	204	5	7.2							JL	12/16	JL	HE	MMB
Sand Control /	4	WQ	22	7	6.0	7	22.6	2	204	5	7.4							JL	12/17	JL	HE	HE
Sand Control /	5	WQ	22	7	5.5	7	~~22.3~~ 22.9	2	204	5	7.4							HE	12/18	HE	→	
Sand Control /	6	WQ	22	7	5.2	7	22.5	2	207	5	7.4							MMB	12/19	MMB		
Sand Control /	7	WQ	22	7	4.5	7	23.0	2	202	5	7.4							HE	12/20	HE	→	
Sand Control /	8	WQ	22	7	5.2	7	22.9	2	203	5	7.2							JL	12/21	JL	→	
Sand Control /	9	WQ	22	7	4.8	7	22.9	2	203	5	7.2							JL	12/22	JL	→	
Sand Control /	10	WQ	22	7	3.7	7	20.0	2	206	5	7.3							HE	12/23	HE	→	
Sand Control /	11	WQ	22	7	4.0	7	23.2	2	209	5	7.1							HE	12/24	HE	→	
Sand Control /	12	WQ	22	7	3.5	7	23.2	2	213	5	7.1							JL	12/25	JL	→	
Sand Control /	13	WQ	22	7	4.3	7	23.0	2	210	5	7.5							JL	12/26	JL	→	CR
Sand Control /	14	WQ	22	7	4.5	7	22.5	2	203	5	7.5							HE	12/27	JL	HE	JL
Sand Control /	15	WQ	22	7	5.5	7	23.2	2	203	5	7.1							JL	12/28	JL	→	
Sand Control /	16	WQ	22	7	5.7	7	23.3	2	205	5	7.0							JL	12/29	JL	→	
Sand Control /	17	WQ	22	7	5.2	7	23.5	2	203	5	7.6							HE	12/30	HE	CR	CR
Sand Control /	18	WQ	22	7	5.1	7	23.3	2	202	5	7.3							MMB	12/31	M	HE	HE
Sand Control /	19	WQ	22	7	2.3③	7	22.2	2	204	5	7.2							BH	1/1	BH	→	
Sand Control /	20	WQ	22	7	8.7	7	21.3	2	205	5	7.8							CR	1/2			

DWC CR 12/13 ② Illegible HE 12/18 ③ Aeration initiated

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	
NEWFIELDS JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
0	Bill Gardiner	13Dec13	02Jan14	

WATER QUALITY DATA

DO (mg/L): > 2.5 mg/L | TEMP (C): 23±1 | COND (mS/cm): N/A | pH: 6-9 | NH3 (mg/L): < 4.0 | DILUTION WATER BATCH: 0 | TEMP.RECDR./HOBO#: NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY mS/cm	pH meter	pH unit	Hardness Techn.	Hardness mg/L	Alkalinity Techn.	Alkalinity mg/L	INTER. Ammonia Techn.	INTER. Ammonia mg/L	TECH	Date	RENEWAL AM	RENEWAL PM	Feeding
TNWR / .	0	WQ	5	7	7.3	7	24.0	2	183	5	7.5							CR	12/13	M	X	CR
TNWR / .	1	WQ	5	7	5.6	7	22.2	2	220	5	7.3							JL	12/14	JL	→	
TNWR / .	2	WQ	5	7	5.3	7	22.2	2	209	5	7.2							JL	12/15	JL	→	
TNWR / .	3	WQ	5	7	5.4	7	22.3	2	215	5	7.3							JL	12/16	JL	HE	MMB
TNWR / .	4	WQ	5	7	5.1	7	22.3	2	213	5	7.4							JL	12/17	JL	HE	HE
TNWR / .	5	WQ	5	7	4.7	7	22.1	2	215	5	7.4							HE	12/18	HE	→	
TNWR / .	6	WQ	5	7	4.1	7	22.3	2	218	5	7.5							MMB	12/19	MMB		
TNWR / .	7	WQ	5	7	3.6 (3)	7	22.4	2	219	5	7.2							HE	12/20	←	→	
TNWR / .	8	WQ	5	7	7.7	7	22.9	2	222	5	7.7							JL	12/21	JL	→	
TNWR / .	9	WQ	5	7	8.1	7	22.6	2	226	5	7.9							JL	12/22	JL	→	
TNWR / .	10	WQ	5	7	8.3	7	23.0 (1)	2	233	5	8.0							HE	12/23	HE	→	
TNWR / .	11	WQ	5	7	2.7 (2)	7	23.1	2	242	5	7.3							HE	12/24	HE	→	
TNWR / .	12	WQ	5	7	8.8	7	22.0	2	238	5	8.0							JL	12/25	JL	→	
TNWR / .	13	WQ	5	7	8.8	7	21.7	2	230	5	8.3							JL	12/26	JL	→	CR
TNWR / .	14	WQ	5	7	9.3	7	21.1	2	230	5	8.5							HE	12/27	JL	HE	JL
TNWR / .	15	WQ	5	7	8.8	7	22.1	2	226	5	8.0							JL	12/28	JL	→	
TNWR / .	16	WQ	5	7	8.6	7	22.3	2	219	5	7.9							JL	12/29	JL	→	
TNWR / .	17	WQ	5	7	8.8	7	21.9	2	212	5	8.4							HE	12/30	HE	CR	CR
TNWR / .	18	WQ	5	7	8.4	7	22.2	2	211	5	7.9							MMB	12/31	M	HE	HE
TNWR / .	19	WQ	5	7	9.1	7	22.0	2	210	5	8.0							BM	1/1	BM	→	
TNWR / .	20	WQ	5	7	8.8	7	21.4	2	207	5	7.9							CR	1/2			

(3) Aeration initiated

(1) Flow restored to bath controlling temperature

(2) airflow restored to chamber

12/23

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	

NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
0	Bill Gardiner	13Dec13		02Jan14	

WATER QUALITY DATA

	DO (mg/L)	TEMP (C)	COND (mS/cm)	pH	NH3 (mg/L)		DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5 mg/L	20±1	N/A	6-9	< 4.0		0	NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY mS/cm	pH meter	pH unit	Hardness Techn.	Hardness mg/L	Alkalinity Techn.	Alkalinity mg/L	INTER. Ammonia Techn.	INTER. Ammonia mg/L	TECH	Date	RENEWAL AM	RENEWAL PM	Feeding
WETSED1 / .	0	WQ	19	7	8.0	7	24.0	2	274	5	7.2							CR	12/13	M	X	CR
WETSED1 / .	1	WQ	19	7	6.1	7	22.6	2	318	5	6.9							JL	12/14	JL	→	
WETSED1 / .	2	WQ	19	7	5.8	7	22.4	2	236	5	6.9							JL	12/15	JL	→	
WETSED1 / .	3	WQ	19	7	5.6	7	22.6	2	230	5	7.0							JL	12/16	JL	THE	MMB
WETSED1 / .	4	WQ	19	7	5.6	7	22.4	2	218	5	7.2							JL	12/17	JL	THE	THE
WETSED1 / .	5	WQ	19	7	5.8	7	22.3	2	208	5	7.3							THE	12/18	THE	→	
WETSED1 / .	6	WQ	19	7	5.8	7	22.4	2	206	5	7.2							MMB	12/19	MMB		
WETSED1 / .	7	WQ	19	7	5.4	7	22.9	2	199	5	7.2							THE	12/20	THE	←	
WETSED1 / .	8	WQ	19	7	4.8	7	23.3	2	199	5	7.0							JL	12/21	JL	→	
WETSED1 / .	9	WQ	19	7	5.2	7	22.9	2	196	5	7.1							THE	12/22	THE	→	
WETSED1 / .	10	WQ	19	7	5.0	7	20.0	2	202	5	7.2							THE	12/23	THE	→	
WETSED1 / .	11	WQ	19	7	5.1	7	23.0	2	204	5	7.0							THE	12/24	THE	→	
WETSED1 / .	12	WQ	19	7	4.6	7	23.0	2	212	5	7.1							JL	12/25	JL	→	
WETSED1 / .	13	WQ	19	7	4.5	7	22.5	2	209	5	7.4							JL	12/26	JL	→	CR
WETSED1 / .	14	WQ	19	7	5.3	7	22.2	2	212	5	7.4							THE	12/27	JL	THE	JL
WETSED1 / .	15	WQ	19	7	4.2	7	23.0	2	203	5	6.9							JL	12/28	JL	→	
WETSED1 / .	16	WQ	19	7	3.9	7	23.1	2	196	5	6.8							JL	12/29	JL	→	
WETSED1 / .	17	WQ	19	7	3.5	7	23.4	2	192	5	7.3							THE	12/30	THE	CR	CR
WETSED1 / .	18	WQ	19	7	3.2	7	23.3	2	188	5	7.0							MMB	12/31	MMB	THE	THE
WETSED1 / .	19	WQ	19	7	2.0	7	22.0	2	189	5	7.1							BH	1/1	THE	→	
WETSED1 / .	20	WQ	19	7	8.6	7	21.1	2	183	5	7.8							CR	1/2			

① Aeration initiated

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	

NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
0	Bill Gardiner	13Dec13		02Jan14	

WATER QUALITY DATA

TEST CONDITIONS	DO (mg/L)	TEMP (C)	COND (mS/cm)	pH	NH3 (mg/L)		DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5 mg/L	23±1	N/A	6-9	< 4.0		0	NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O.		TEMP		CONDUCTIVITY		pH		Hardness		Alkalinity		INTER. Ammonia		TECH	Date	RENEWAL		Feeding
				meter	mg/L	meter	°C	meter	mS/cm	meter	unit	Techn.	mg/L	Techn.	mg/L	Techn.	mg/L			AM	PM	
WETSED2 / .	0	WQ	46	7	7.6	7	23.0	2	250	5	7.6							CR	12/13	M	X	CR
WETSED2 / .	1	WQ	46	7	6.6	7	22.3	2	306	5	7.4							JL	12/14	JL	→	
WETSED2 / .	2	WQ	46	7	6.2	7	22.4	2	272	5	7.4							JL	12/15	JL	→	
WETSED2 / .	3	WQ	46	7	6.2	7	22.2	2	271	5	7.4							JL	12/16	JL	HE	MMB
WETSED2 / .	4	WQ	46	7	6.0	7	22.0	2	259	5	7.5							JL	12/17	JL	HE	
WETSED2 / .	5	WQ	46	7	5.8	7	22.0	2	251	5	7.4							HE	12/18	HE	→	
WETSED2 / .	6	WQ	46	7	5.5	7	22.0	2	248	5	7.4							MMB	12/19	MMB		
WETSED2 / .	7	WQ	46	7	5.4	7	22.3	2	241	5	7.4							HE	12/20	HE	→	
WETSED2 / .	8	WQ	46	7	5.8	7	22.4	2	240	5	7.5							JL	12/21	JL	→	
WETSED2 / .	9	WQ	46	7	5.0	7	22.5	2	239	5	7.3							JL	12/22	JL	→	
WETSED2 / .	10	WQ	46	7	4.2	7	20.1	2	236	5	7.4							HE	12/23	HE	→	
WETSED2 / .	11	WQ	46	7	4.2	7	22.4	2	234	5	7.1							HE	12/24	HE	→	
WETSED2 / .	12	WQ	46	7	3.0	7	22.5	2	242	5	7.2							JL	12/25	JL	→	
WETSED2 / .	13	WQ	46	7	3.1	7	22.3	2	237	5	7.4							JL	12/26	JL	→	CR
WETSED2 / .	14	WQ	46	7	3.8	7	22.0	2	237	5	7.6							HE	12/27	JL	HE	JL
WETSED2 / .	15	WQ	46	7	4.5	7	22.7	2	239	5	7.3							JL	12/28	JL	→	
WETSED2 / .	16	WQ	46	7	4.1	7	22.8	2	239	5	7.1							JL	12/29	JL	→	
WETSED2 / .	17	WQ	46	7	3.8	7	22.9	2	235	5	7.6							HE	12/30	HE	CR	CR
WETSED2 / .	18	WQ	46	7	3.8	7	22.8	2	236	5	7.3							MMB	12/31	M	HE	HE
WETSED2 / .	19	WQ	46	7	3.3	7	22.6	2	219	5	7.6							BH	1/1	BH	→	
WETSED2 / .	20	WQ	46	7	1.8	7	21.6	2	231	5	7.1							CR	1/2			

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	

NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
0	Bill Gardiner	13Dec13		02Jan14	

WATER QUALITY DATA

TEMP (C)	DO (mg/L)	TEMP (C)	COND (mS/cm)	pH	NH3 (mg/L)			DILUTION WATER BATCH	TEMP RECDR/HOBO#
23±1	> 2.5 mg/L	23±1	N/A	6-9	< 4.0			0	NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O.		TEMP		CONDUCTIVITY		pH		Hardness		Alkalinity		INTER. Ammonia		TECH	Date	RENEWAL		Feeding
				meter	mg/L	meter	°C	meter	mS/cm	meter	unit	Techn.	mg/L	Techn.	mg/L	Techn.	mg/L			AM	PM	
WETSED3 / .	0	WQ	66	7	7.8	7	23.6	2	256	5	7.6							CR	12/13	M	X	CR
WETSED3 / .	1	WQ	66	7	5.9	7	22.3	2	341	5	7.5							JL	12/14	JL	→	
WETSED3 / .	2	WQ	66	7	5.9	7	22.2	2	290	5	7.5							JL	12/15	JL	→	
WETSED3 / .	3	WQ	66	7	5.9	7	22.2	2	279	5	7.4							JL	12/16	JL	HE	MMB
WETSED3 / .	4	WQ	66	7	5.7	7	22.2	2	262	5	7.5							JL	12/17	JL	HE	
WETSED3 / .	5	WQ	66	7	5.5	7	22.0	2	250	5	7.5							HE	12/18	HE	→	
WETSED3 / .	6	WQ	66	7	5.8	7	22.0	2	244	5	7.5							MMB	12/19	MMB		
WETSED3 / .	7	WQ	66	7	4.6	7	21.5	2	236	5	7.3							HE	12/20	HE	→	
WETSED3 / .	8	WQ	66	7	5.3	7	22.7	2	229	5	7.5							JL	12/21	JL	→	
WETSED3 / .	9	WQ	66	7	4.8	7	22.7	2	232	5	7.4							JL	12/22	JL	→	
WETSED3 / .	10	WQ	66	7	3.7	7	20.0	2	231	5	7.4							HE	12/23	HE	→	
WETSED3 / .	11	WQ	66	7	4.0	7	23.0	2	232	5	7.2							HE	12/24	HE	→	
WETSED3 / .	12	WQ	66	7	4.0	7	23.1	2	241	5	7.4							JL	12/25	JL	→	
WETSED3 / .	13	WQ	66	7	① →													~~HE~~ ①	12/26	JL	JL	CR
WETSED3 / .	14	WQ	66	7	3.7	7	22.1	2	231	5	7.4							HE	12/27	JL	HE	JL
WETSED3 / .	15	WQ	66	7	4.3	7	23.1	2	238	5	7.3							JL	12/28	JL	→	
WETSED3 / .	16	WQ	66	7	3.7	7	23.0	2	239	5	7.2							JL	12/29	JL	→	
WETSED3 / .	17	WQ	66	7	4.2	7	22.9	2	228	5	7.5							HE	12/30	HE	CR	CR
WETSED3 / .	18	WQ	66	7	3.9	7	22.8	2	231	5	7.4							MMB	12/31	M	HE	
WETSED3 / .	19	WQ	66	7	3.3	7	22.1	2	229	5	7.2							CR	1/1	BH	→	
WETSED3 / .	20	WQ	66	7	2.1	7	21.5	2	236	5	7.2							CR	1/2			

① water quality not recorded. JL 12/26/13

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	[illegible]

NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
0	Bill Gardiner	13Dec13		02Jan14	

WATER QUALITY DATA

	DO (mg/L)	TEMP (C)	COND (mS/cm)	pH	NH3 (mg/L)	DILUTION WATER BATCH	TEMP RECDR/HOBO#
	> 2.5 mg/L	~~23~~ 22 ±1	N/A	6-9	< 4.0	0	NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY mS/cm	pH meter	pH unit	Hardness Techn.	Hardness mg/L	Alkalinity Techn.	Alkalinity mg/L	INTER. Ammonia Techn.	INTER. Ammonia mg/L	TECH	Date	RENEWAL AM	RENEWAL PM	Feeding
6 ppm Cd / .	0	WQ	61	7	7.7	7	23.6	2	250	5	7.7							CR	12/13	M	X	CR
6 ppm Cd / .	1	WQ	61	7	5.8	7	22.3	2	323	5	7.5							JL	12/14	JL	→	→
6 ppm Cd / .	2	WQ	61	7	6.1	7	22.3	2	282	5	7.5							JL	12/15	JL	→	→
6 ppm Cd / .	3	WQ	61	7	5.7	7	22.1	2	277	5	7.4							JL	12/16	JL	HE	MMB
6 ppm Cd / .	4	WQ	61	7	5.2	7	22.1	2	264	5	7.5							JL	12/17	JL	HE	HE
6 ppm Cd / .	5	WQ	61	7	5.6	7	22.0	2	252	5	7.4							HE	12/18	HE	→	→
6 ppm Cd / .	6	WQ	61	7	4.8	7	22.0	2	245	5	7.4							MMB	12/19	MMB		
6 ppm Cd / .	7	WQ	61	7	4.8	7	22.2	2	235	5	7.3							HE	12/20	HE	→	→
6 ppm Cd / .	8	WQ	61	7	5.0	7	22.4	2	230	5	7.4							JL	12/21	JL	→	→
6 ppm Cd / .	9	WQ	61	7	4.3	7	22.6	2	231	5	7.3							JL	12/22	JL	→	→
6 ppm Cd / .	10	WQ	61	7	3.0	7	20.4	2	230	5	7.3							HE	12/23	HE	→	→
6 ppm Cd / .	11	WQ	61	7	3.7	7	22.7	2	257	5	7.2							HE	12/24	HE	→	→
6 ppm Cd / .	12	WQ	61	7	3.5	7	22.8	2	228	5	7.3							JL	12/25	JL	→	→
6 ppm Cd / .	13	WQ	61	7	3.4	7	22.7	2	222	5	7.4							JL	12/26	JL	→	CR
6 ppm Cd / .	14	WQ	61	7	4.4	7	22.0	2	225	5	7.4							HE	12/27	HE	HE	JL
6 ppm Cd / .	15	WQ	61	7	4.1	7	22.9	2	230	5	7.2							JL	12/28	JL	→	→
6 ppm Cd / .	16	WQ	61	7	3.5	7	22.8	2	229	5	7.1							JL	12/29	JL	→	→
6 ppm Cd / .	17	WQ	61	7	4.3	7	23.0	2	226	5	7.4							HE	12/30	HE	CR	CR
6 ppm Cd / .	18	WQ	61	7	3.9	7	22.9	2	225	5	7.3							MMB	12/31	M	HE	HE
6 ppm Cd / .	19	WQ	61	7	3.3	7	22.0	2	222	5	7.5							BM	1/1	BM	→	→
6 ppm Cd / .	20	WQ	61	7	3.0	7	21.5	2	223	5	7.2							CR	1/2			

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	
NEWFIELDS JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
0	Bill Gardiner	13Dec13	02Jan14	

WATER QUALITY DATA

TEST [illegible]	DO (mg/L)	TEMP (C)	COND (mS/cm)	pH	NH3 (mg/L)		DILUTION WATER BATCH	TEMP RECDR/HOBO#
	> 2.5 mg/L	22±1	N/A	6-9	< 4.0		0	NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O.		TEMP		CONDUCTIVITY		pH		Hardness		Alkalinity		INTER. Ammonia		TECH	Date	RENEWAL		Feeding
				meter	mg/L	meter	°C	meter	mS/cm	meter	unit	Techn.	mg/L	Techn.	mg/L	Techn.	mg/L			AM	PM	
3 ppm Cd / .	0	WQ	40	7	7.9	7	22.4	2	243	5	7.8							CR	12/13	M	X	CR
3 ppm Cd / .	1	WQ	40	7	6.5	7	22.2	2	301	5	7.3							JL	12/14	JL	→	
3 ppm Cd / .	2	WQ	40	7	6.2	7	22.2	2	254	5	7.3							JL	12/15	JL	→	
3 ppm Cd / .	3	WQ	40	7	6.0	7	22.3	2	258	5	7.3							JL	12/16	JL	HE	MMB
3 ppm Cd / .	4	WQ	40	7	5.4	7	22.0	2	249	5	7.4							d	12/17	JL	HE	HE
3 ppm Cd / .	5	WQ	40	7	4.2	7	22.2	2	240	5	7.3							HE	12/18	HE	→	
3 ppm Cd / .	6	WQ	40	7	4.5	7	22.1	2	240	5	7.3							MMB	12/19	MMB		
3 ppm Cd / .	7	WQ	40	7	4.5	7	22.5	2	230	5	7.3							HE	12/20	HE	→	
3 ppm Cd / .	8	WQ	40	7	4.7	7	22.5	2	225	5	7.1							JL	12/21	JL	→	
3 ppm Cd / .	9	WQ	40	7	4.3	7	22.5	2	221	5	7.2							JL	12/22	JL	→	
3 ppm Cd / .	10	WQ	40	7	3.4	7	20.0	2	220	5	7.4							HE	12/23	HE	→	
3 ppm Cd / .	11	WQ	40	7	3.1 (1)	7	22.9	2	221	5	7.1							HE	12/24	HE	→	
3 ppm Cd / .	12	WQ	40	7	8.1	7	22.7	2	214	5	7.9							JL	12/25	JL	→	
3 ppm Cd / .	13	WQ	40	7	8.4	7	22.2	2	216	5	8.1							JL	12/26	JL	7	CR
3 ppm Cd / .	14	WQ	40	7	8.3		22.2	2	224	5	8.2							HE	12/27	JL	HE	JL
3 ppm Cd / .	15	WQ	40	7	8.4	7	22.8	2	223	5	7.8							JL	12/28	JL	→	
3 ppm Cd / .	16	WQ	40	7	8.4	7	22.8	2	228	5	7.7							JL	12/29	JL	→	
3 ppm Cd / .	17	WQ	40	7	8.4	7	22.8	2	221	5	8.2							HE	12/30	HE	CR	CR
3 ppm Cd / .	18	WQ	40	7	8.3	7	22.6	2	225	5	8.0							MMB	12/31	M	HE	HE
3 ppm Cd / .	19	WQ	40	7	9.0	7	22.4	2	228	2	8.0							BH	1/1	BH	→	
3 ppm Cd / .	20	WQ	40	7	8.7	7	21.5	2	225	5	7.9							CR	1/2			

(1) Aeration initiated

NewFields

20 DAY SOLID PHASE TEST DATA SHEET

CLIENT	PROJECT	SPECIES	NEWFIELDS LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Chironomus tentans*	Port Gamble Bath 4	

NEWFIELDS JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
0	Bill Gardiner	13Dec13		02Jan14	

WATER QUALITY DATA

DO (mg/L)	TEMP (C)	COND (mS/cm)	pH	NH3 (mg/L)		DILUTION WATER BATCH	TEMP.RECDR/HOBO#
> 2.5 mg/L	~~22~~71	N/A	6-9	< 4.0		0	NA

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY mS/cm	pH meter	pH unit	Hardness Techn.	Hardness mg/L	Alkalinity Techn.	Alkalinity mg/L	INTER. Ammonia Techn.	INTER. Ammonia mg/L	TECH	Date	RENEWAL AM	RENEWAL PM	Feeding
1 ppm Cd / .	0	WQ	60	7	7.3	7	24.0	2	216	5	7.6							CR	12/13	M	X	CR
1 ppm Cd / .	1	WQ	60	7	5.4	7	22.3	2	259	5	7.4							JL	12/14	JL	→	
1 ppm Cd / .	2	WQ	60	7	5.5	7	22.1	2	234	5	7.3							JL	12/15	JL	→	
1 ppm Cd / .	3	WQ	60	7	5.5	7	22.4	2	237	5	7.2							JL	12/16	JL	HE	MMB
1 ppm Cd / .	4	WQ	60	7	5.1	7	22.1	2	221	5	7.4							JL	12/17	JL	HE	HE
1 ppm Cd / .	5	WQ	60	7	①5.5	7	~~21.7~~	2	~~230~~	5	~~7.5~~							HE	12/18	HE	→	
1 ppm Cd / .	6	WQ	60	7	3.9	7	~~22.0~~	2	220	5	7.3							MMB	12/19	MMB		
1 ppm Cd / .	7	WQ	60	7	③~~3.4~~7.8⑥	7	22.2	2	220	5	7.2							HE	12/20	HE	→	
1 ppm Cd / .	8	WQ	60	7	7.5	7	22.8	2	210	5	7.8							JL	12/21	JL	→	
1 ppm Cd / .	9	WQ	60	7	7.7	7	22.4	2	219	5	7.7							JL	12/22	JL	→	
1 ppm Cd / .	10	WQ	60	7	8.3	7	20.1	2	③~~222~~	5	7.9							HE	12/23	HE	→	
1 ppm Cd / .	11	WQ	60	7	7.6	7	22.7	2	224	5	7.7							HE	12/24	HE	→	
1 ppm Cd / .	12	WQ	60	7	7.3	7	④~~22.7~~ 22.9	2	~~226~~ 230	5	④~~7.6~~ 7.8							JL	12/25	JL	→	
1 ppm Cd / .	13	WQ	60	7	7.1	7	23.0	2	225	5	7.9							JL	12/26	JL	→	CR
1 ppm Cd / .	14	WQ	60	7	8.1	7	22.4	2	224	5	⑤~~7.8~~ 8.0							HE	12/27	JL	HE	JL
1 ppm Cd / .	15	WQ	60	7	7.7	7	22.8	2	225	5	7.7							JL	12/28	JL	→	
1 ppm Cd / .	16	WQ	60	7	8.0	7	22.7	2	224	5	7.5							JL	12/29	JL	→	
1 ppm Cd / .	17	WQ	60	7	7.8	7	22.9	2	226	5	⑤~~7.4~~ 7.8							HE	12/30	HE	CR	CR
1 ppm Cd / .	18	WQ	60	7	7.5	7	22.6	2	221	5	7.8							MMB	12/31	MMB	HE	HE
1 ppm Cd / .	19	WQ	60	7	8.1	7	22.2	2	222	5	7.6							BM	1/1	BM	→	
1 ppm Cd / .	20	WQ	60	7	7.8	7	21.4	2	217	5	7.6							CR	1/2			

① WC HE 12/18 real data: 4.1, 22.2, 222, 7.3 ② MR ③ JL HE 12/23 ⑥ Aeration initiated

④ WC HE 12/24/13. 4 JL HE 12/27 ⑤ Wrong page HE 12/30

NewFields

Ammonia and Sulfide Analysis Record

Client/Project;	Organism:	Test Duration (days):
Favallon / Yakima Steel	Chironomus ~~tentans~~ dilutus	20

PRETEST / (INITIAL) / ~~FINAL~~ / OTHER (circle one) DAY of TEST: 0

(OVERLYING (OV)) / (POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 12/13/13	Temperature: 20.1°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	pH	Cond. (µS/cm)	Hardness	Alkalinity
OV Control	Surr	12/13/13 MMB	①~~0.158~~ 0.180	20.6	12/13/13 JE			73	62
TNWR	Surr		0.141					90	84
WETSED1	Surr		0.179					106	68
WETSED2	Surr		0.146					110	86
WETSED3	Surr		0.163					110	77
6 ppm Cd	Surr		0.193					104	86
3 ppm Cd	Surr		0.144					86	74
1 ppm Cd	Surr		0.164					88	76
PW Control	Surr.	②							
TNWR		12/13/13 MMB	1.15	20.1	12/13/13 MMB	6.9	522		
WETSED1			0.903			6.1	1011		
WETSED2			0.362			7.0	734		
WETSED3			1.14			6.8	880		
6 ppm Cd			1.02			6.8	744		
3 ppm Cd			0.967			6.9	675		
1 ppm Cd			1.42			6.9	524		

① Wrong Data Sheet. JL 12/13/13.
② Insufficient PW collected for analysis, MMB 12/13/13.

NewFields

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Farallon/ Yakima Steel	Chironomus dilutus	20

PRETEST / INITIAL / (FINAL) / OTHER (circle one) DAY of TEST: 20

(OVERLYING (OV)) / (POREWATER (PW)) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 1/02/14	Temperature: 22.8°C	

	Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	pH	Cond. (µS/cm)	Hardness	Alkalinity
OV	Control	Surr	1/02/14 JL	0.826	22.0	1/02/14 JL			83	80
	TNWR	Surr		0.166					85	81
	WETSED1	Surr		0.469					74	68
	WETSED2	Surr		0.482					99	94
	WETSED3	Surr		0.379					106	96
	6 ppm Cd	Surr		0.479					94	93
	3 ppm Cd	Surr		0.107					95	88
	1 ppm Cd	Surr		0.0749					94	86
PW	Control	Surr.	1/02/14 JL	0.892	23.1	1/02/14 JL	7.5	③		
	TNWR		①							
	WETSED1			0.984			6.5	161		
	WETSED2			0.472			7.1	258		
	WETSED3			0.586			7.1	284		
	6 ppm Cd			1.31			~~7.0~~ 6.9 ②	~~264~~ 255 ②		
	3 ppm Cd			0.330			7.1	275		
	1 ppm Cd			0.318			6.9	269		

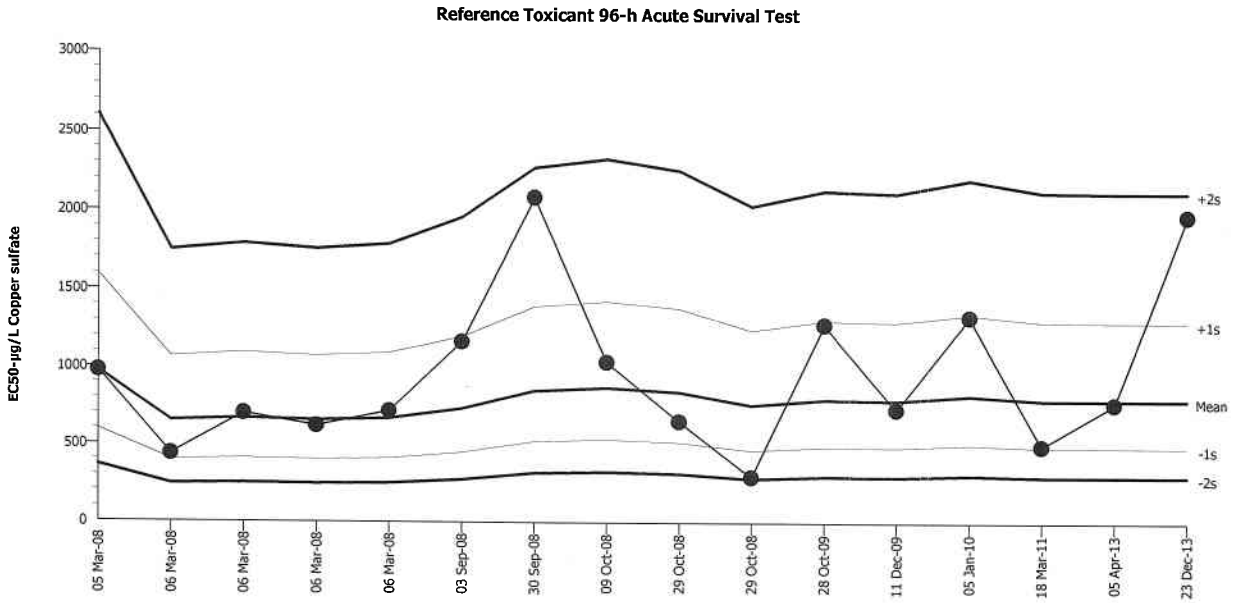
① Surrogate broken down for test endpoints. JL 1/02/14. ② WC, JL 1/02/14.
③ Insufficient volume collected. JL 1/02/14.

CETIS QC Plot

Report Date: 03 Jan-14 13:10 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Chironomus tentans (Midge)	**Material:**	Copper sulfate
Protocol:	EPA/600/R-99/064 (2000)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	791.6	**Count:**	15	**-1s Warning Limit:**	484.2	**-2s Action Limit:**	296.1
Sigma:	NA	**CV:**	63.50%	**+1s Warning Limit:**	1295	**+2s Action Limit:**	2117

Quality Control Data

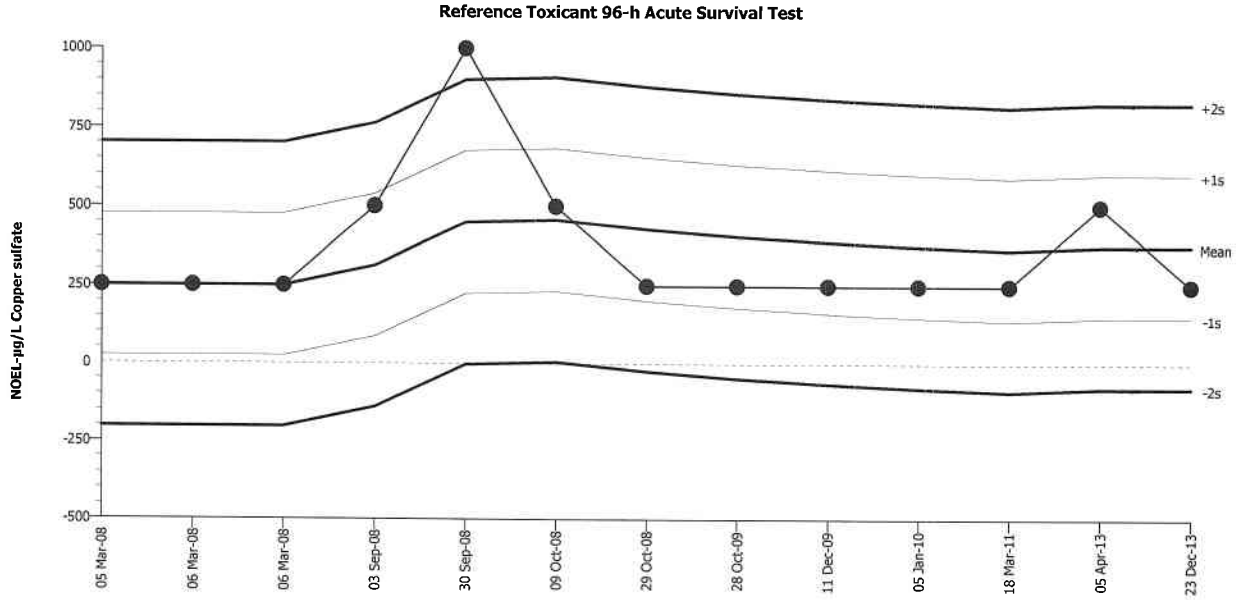
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2008	Mar	5	16:00	974.8	183.3	0.4236			17-5088-4869	11-7430-3641
2			6	14:05	437.1	-354.4	-1.208	(-)		10-4266-7095	07-8420-5733
3			6	15:05	700.2	-91.36	-0.2494			09-6742-7330	06-0683-4966
4			6	16:00	619.4	-172.1	-0.4987			02-0080-2416	15-7152-5574
5			6	16:15	715.4	-76.15	-0.2057			12-5808-8991	12-4168-5866
6		Sep	3	16:30	1165	373.2	0.7855			01-8134-6872	13-6131-9850
7			30	18:00	2084	1292	1.968	(+)		05-7665-9837	05-0478-5679
8		Oct	9	16:45	1035	243.7	0.5459			19-1052-3253	20-8060-3660
9			29	14:15	653.3	-138.2	-0.3904			02-9367-4519	13-0089-1252
10			29	14:30	293.9	-497.6	-2.015	(-)	(-)	03-9491-8836	07-7627-7935
11	2009		28	17:30	1278	486.9	0.9749			04-4419-7321	11-1661-0546
12		Dec	11	0:00	731.4	-60.12	-0.1607			07-8382-2402	16-5362-0061
13	2010	Jan	5	15:35	1329	537.7	1.054	(+)		14-8176-7957	10-7765-4505
14	2011	Mar	18	17:55	494.5	-297.1	-0.9569			02-8320-1653	15-5071-3578
15	2013	Apr	5	15:30	767.9	-23.63	-0.06162			20-0809-1169	11-3931-6693
16		Dec	23	14:20	1968	1177	1.852	(+)		05-8986-6629	12-7746-8734

CETIS QC Plot

Report Date: 03 Jan-14 13:10 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Chironomus tentans (Midge)	**Material:**	Copper sulfate
Protocol:	EPA/600/R-99/064 (2000)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	375	**Count:**	12	**-1s Warning Limit:**	148.9	**-2s Action Limit:**	-77.2
Sigma:	226.1	**CV:**	60.30%	**+1s Warning Limit:**	601.1	**+2s Action Limit:**	827.2

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2008	Mar	5	16:00	250	-125	-0.5529			17-5088-4869	07-1723-5244
2			6	16:00	250	-125	-0.5529			02-0080-2416	08-2909-0446
3			6	16:15	250	-125	-0.5529			12-5808-8991	07-2685-6747
4		Sep	3	16:30	500	125	0.5529			01-8134-6872	09-4866-9316
5			30	18:00	1000	625	2.764	(+)	(+)	05-7665-9837	13-6324-1710
6		Oct	9	16:45	500	125	0.5529			19-1052-3253	06-1542-1647
7			29	14:15	250	-125	-0.5529			02-9367-4519	04-2601-2129
8	2009		28	17:30	250	-125	-0.5529			04-4419-7321	13-1806-8962
9		Dec	11	0:00	250	-125	-0.5529			07-8382-2402	10-8260-1706
10	2010	Jan	5	15:35	250	-125	-0.5529			14-8176-7957	17-4968-8256
11	2011	Mar	18	17:55	250	-125	-0.5529			02-8320-1653	04-7138-7893
12	2013	Apr	5	15:30	500	125	0.5529			20-0809-1169	13-5361-1168
13		Dec	23	14:20	250	-125	-0.5529			05-8986-6629	20-5449-8532

CETIS Analytical Report

Reference Toxicant 96-h Acute Survival Test

NewFields

Analysis ID:	12-7746-8734	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.6
Analyzed:	03 Jan-14 13:02	**Analysis:**	Linear Regression (MLE)	**Official Results:**	Yes
Batch ID:	08-4027-1305	**Test Type:**	Survival	**Analyst:**	
Start Date:	23 Dec-13 14:20	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Diluted Mineral Water
Ending Date:	27 Dec-13 14:55	**Species:**	Chironomus tentans	**Brine:**	Not Applicable
Duration:	4d 1h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	17-8394-4451	**Code:**	6A54D503	**Client:**	Internal Lab
Sample Date:	22 May-12	**Material:**	Copper sulfate	**Project:**	Reference Toxicant
Receive Date:		**Source:**	Reference Toxicant		
Sample Age:	580d 14h	**Station:**	p120522.36		

Linear Regression Options

Model Function	Threshold Option	Threshold	Optimized	Pooled	Het Corr	Weighted
Log-Normal [NED=A+B*log(X)]	Control Threshold	1E-07	Yes	No	No	Yes

Regression Summary

Iters	LL	AICc	BIC	Mu	Sigma	Adj R2	F Stat	Critical	P-Value	Decision(α:5%)
15	-96.09	199.4	201.7	3.294	0.5081	0.8051	2.36	3.16	0.1055	Non-Significant Lack of Fit

Point Estimates

Level	µg/L	95% LCL	95% UCL
EC5	287.3	146.5	430.4
EC10	439.5	259.8	611.1
EC15	585.4	379.7	779.7
EC20	735.3	509.6	953.3
EC25	894.1	650.8	1141
EC40	1463	1146	1890
EC50	1968	1546	2669

Regression Parameters

Parameter	Estimate	Std Error	95% LCL	95% UCL	t Stat	P-Value	Decision(α:5%)
Threshold	6.66E-08	4.08E-05	-8E-05	8.00E-05	0.001632	0.9987	Non-Significant Parameter
Slope	1.968	0.2832	1.413	2.523	6.949	<0.0001	Significant Parameter
Intercept	-6.484	0.8942	-8.236	-4.731	-7.251	<0.0001	Significant Parameter

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Model	72.58878	72.58878	1	97.01	<0.0001	Significant
Lack of Fit	4.436558	1.478853	3	2.36	0.1055	Non-Significant
Pure Error	11.27713	0.626507	18			
Residual	15.71368	0.748271	21			

Residual Analysis

Attribute	Method	Test Stat	Critical	P-Value	Decision(α:5%)
Goodness-of-Fit	Pearson Chi-Sq GOF	15.71	32.67	0.7855	Non-Significant Heterogenity
	Likelihood Ratio GOF	16.86	32.67	0.7197	Non-Significant Heterogenity
Variances	Mod Levene Equality of Variance	2.245	2.773	0.0942	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9171	0.9169	0.0504	Normal Distribution
	Anderson-Darling A2 Normality	0.7498	2.492	0.0507	Normal Distribution

Proportion Survived Summary

			Calculated Variate(A/B)								
C-µg/L	Control Type	Count	Mean	Min	Max	Std Err	Std Dev	CV%	%Effect	A	B
0	Dilution Water	4	1	1	1	0	0	0.0%	0.0%	40	40
250		4	1	1	1	0	0	0.0%	0.0%	35	35
500		4	0.85	0.7	1	0.06455	0.1291	15.19%	15.0%	34	40
1000		4	0.65	0.4	0.8	0.0866	0.1732	26.65%	35.0%	26	40
2000		4	0.55	0.4	0.7	0.06455	0.1291	23.47%	45.0%	22	40
4000		4	0.275	0.2	0.4	0.04787	0.09574	34.82%	72.5%	11	40

Reference Toxicant 96-h Acute Survival Test

NewFields

Analysis ID: 12-7746-8734 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 03 Jan-14 13:02 **Analysis:** Linear Regression (MLE) **Official Results:** Yes

Proportion Survived Detail

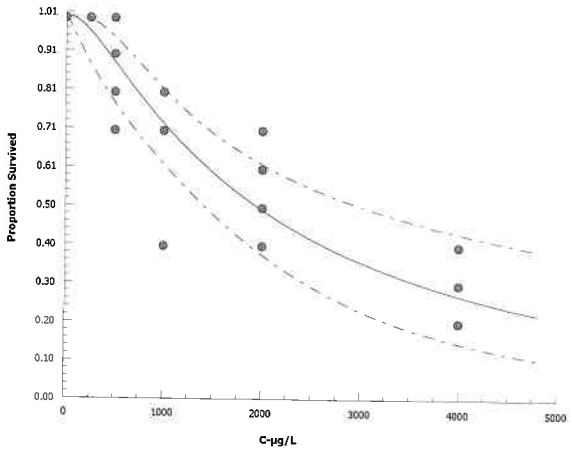
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
250		1	1	1	1
500		0.8	0.7	1	0.9
1000		0.7	0.4	0.8	0.7
2000		0.7	0.6	0.5	0.4
4000		0.3	0.2	0.4	0.2

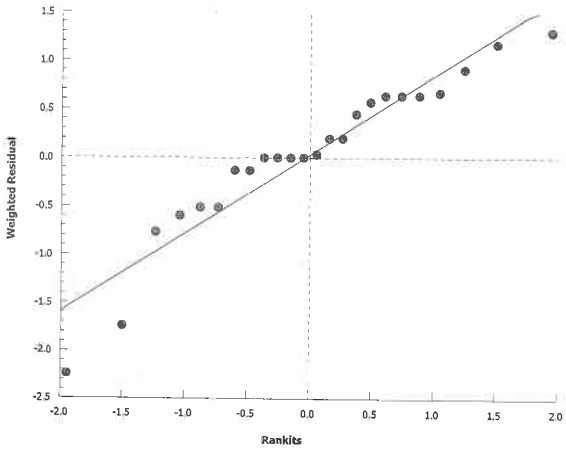
Proportion Survived Binomials

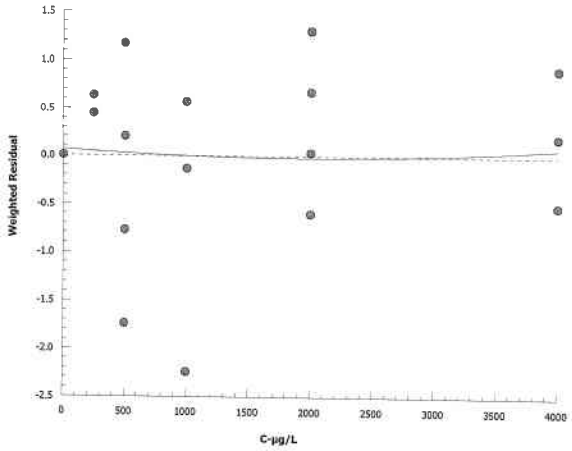
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	10/10	10/10	10/10	10/10
250		10/10	10/10	5/5	10/10
500		8/10	7/10	10/10	9/10
1000		7/10	4/10	8/10	7/10
2000		7/10	6/10	5/10	4/10
4000		3/10	2/10	4/10	2/10

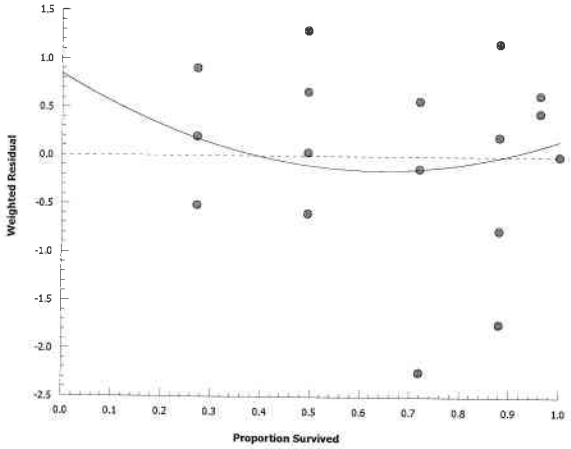
Graphics

Log-Normal [NED=A+B*log(X)]









CETIS Analytical Report

Reference Toxicant 96-h Acute Survival Test

NewFields

Analysis ID:	20-5449-8532	**Endpoint:**	Proportion Survived	**CETIS Version:**	CETISv1.8.6
Analyzed:	03 Jan-14 13:02	**Analysis:**	Parametric-Control vs Treatments	**Official Results:**	Yes
Batch ID:	08-4027-1305	**Test Type:**	Survival	**Analyst:**	
Start Date:	23 Dec-13 14:20	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Diluted Mineral Water
Ending Date:	27 Dec-13 14:55	**Species:**	Chironomus tentans	**Brine:**	Not Applicable
Duration:	4d 1h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	17-8394-4451	**Code:**	6A54D503	**Client:**	Internal Lab
Sample Date:	22 May-12	**Material:**	Copper sulfate	**Project:**	Reference Toxicant
Receive Date:		**Source:**	Reference Toxicant		
Sample Age:	580d 14h	**Station:**	p120522.36		

Data Transform	Zeta	Alt Hyp	Trials	Seed	PMSD	NOEL	LOEL	TOEL	TU
Angular (Corrected)	NA	C > T	NA	NA	13.3%	250	500	353.6	

Dunnett Multiple Comparison Test

Control	vs	C-µg/L	Test Stat	Critical	MSD	DF	P-Value	P-Type	Decision(α:5%)
Dilution Water		250	0.1869	2.407	0.215	6	0.7724	CDF	Non-Significant Effect
		500*	2.489	2.407	0.215	6	0.0427	CDF	Significant Effect
		1000*	5.249	2.407	0.215	6	0.0001	CDF	Significant Effect
		2000*	6.445	2.407	0.215	6	<0.0001	CDF	Significant Effect
		4000*	9.682	2.407	0.215	6	<0.0001	CDF	Significant Effect

ANOVA Table

Source	Sum Squares	Mean Square	DF	F Stat	P-Value	Decision(α:5%)
Between	2.314478	0.4628955	5	29.06	<0.0001	Significant Effect
Error	0.2867599	0.01593111	18			
Total	2.601238		23			

Distributional Tests

Attribute	Test	Test Stat	Critical	P-Value	Decision(α:1%)
Variances	Mod Levene Equality of Variance	2.058	4.248	0.1186	Equal Variances
Variances	Levene Equality of Variance	3.384	4.248	0.0249	Equal Variances
Distribution	Shapiro-Wilk W Normality	0.9654	0.884	0.5549	Normal Distribution

Proportion Survived Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1	1	1	1	1	1	0	0.0%	0.0%
250		4	1	1	1	1	1	1	0	0.0%	0.0%
500		4	0.85	0.6446	1	0.85	0.7	1	0.06455	15.19%	15.0%
1000		4	0.65	0.3744	0.9256	0.7	0.4	0.8	0.0866	26.65%	35.0%
2000		4	0.55	0.3446	0.7554	0.55	0.4	0.7	0.06455	23.47%	45.0%
4000		4	0.275	0.1227	0.4273	0.25	0.2	0.4	0.04787	34.82%	72.5%

Angular (Corrected) Transformed Summary

C-µg/L	Control Type	Count	Mean	95% LCL	95% UCL	Median	Min	Max	Std Err	CV%	%Effect
0	Dilution Water	4	1.412	1.412	1.412	1.412	1.412	1.412	0	0.0%	0.0%
250		4	1.395	1.342	1.448	1.412	1.345	1.412	0.01668	2.39%	1.18%
500		4	1.19	0.9005	1.479	1.178	0.9912	1.412	0.09091	15.28%	15.73%
1000		4	0.9435	0.6555	1.232	0.9912	0.6847	1.107	0.0905	19.18%	33.18%
2000		4	0.8368	0.6273	1.046	0.8357	0.6847	0.9912	0.06584	15.74%	40.73%
4000		4	0.5479	0.3787	0.7171	0.5216	0.4636	0.6847	0.05317	19.41%	61.2%

Reference Toxicant 96-h Acute Survival Test

NewFields

Analysis ID: 20-5449-8532 **Endpoint:** Proportion Survived **CETIS Version:** CETISv1.8.6
Analyzed: 03 Jan-14 13:02 **Analysis:** Parametric-Control vs Treatments **Official Results:** Yes

Proportion Survived Detail

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1	1	1	1
250		1	1	1	1
500		0.8	0.7	1	0.9
1000		0.7	0.4	0.8	0.7
2000		0.7	0.6	0.5	0.4
4000		0.3	0.2	0.4	0.2

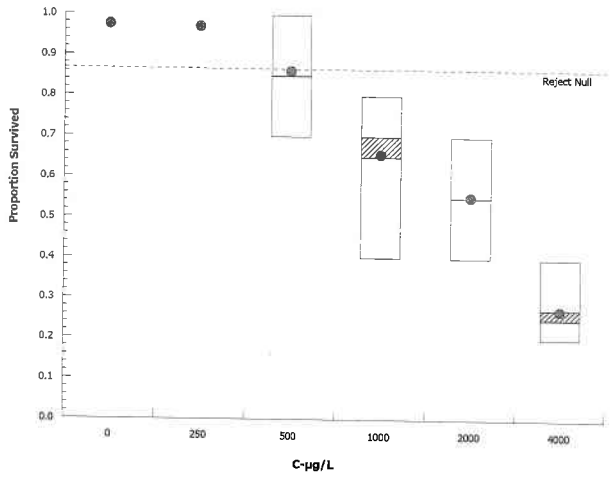
Angular (Corrected) Transformed Detail

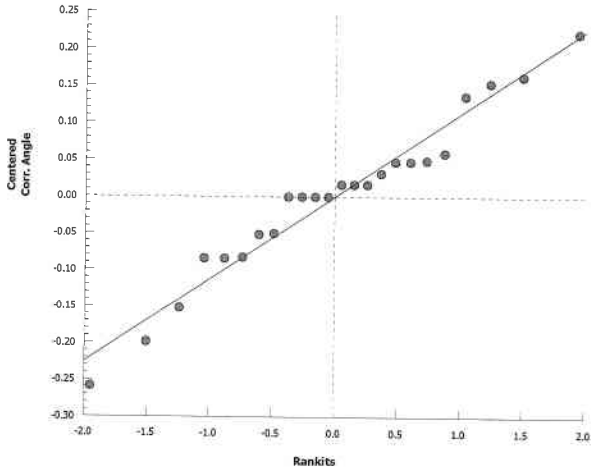
C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	1.412	1.412	1.412	1.412
250		1.412	1.412	1.345	1.412
500		1.107	0.9912	1.412	1.249
1000		0.9912	0.6847	1.107	0.9912
2000		0.9912	0.8861	0.7854	0.6847
4000		0.5796	0.4636	0.6847	0.4636

Proportion Survived Binomials

C-µg/L	Control Type	Rep 1	Rep 2	Rep 3	Rep 4
0	Dilution Water	10/10	10/10	10/10	10/10
250		10/10	10/10	5/5	10/10
500		8/10	7/10	10/10	9/10
1000		7/10	4/10	8/10	7/10
2000		7/10	6/10	5/10	4/10
4000		3/10	2/10	4/10	2/10

Graphics





Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix D

Porewater TIE Test Data Sheets
and Analytical Chemistry

Appendix D.1

10-Day Porewater TIE Test with Hyalella azteca

NewFields

10 DAY POREWATER TEST - OBSERVATIONS

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA	[illegible]	*Hyallela*	#REF!

ENDPOINT DATA & OBSERVATIONS

N = normal; B = no burrows; M = dead on surface; A = avoidance; L = anoxic surface; F = fungal patches; D = no air flow (DO?); U = excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 2/01 TECHNICIAN JL OBSERVNS.	DATE 2/02 TECHNICIAN JL OBSERVNS.	DATE 2/03 TECHNICIAN JL OBSERVNS.	DATE 2/4 TECHNICIAN CR OBSERVNS.	DATE 2/5 TECHNICIAN CR OBSERVNS.	DATE 2/6 TECHNICIAN MK OBSERVNS.	DATE 2/7 TECHNICIAN MK OBSERVNS.	DATE 2/08 TECHNICIAN JL OBSERVNS.	DATE 2/09 TECHNICIAN JL OBSERVNS.	DATE 2/10 TECHNICIAN CR OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
Control / .	1			N	N	N	N 4	N	N	N 4	4	4	4		~~1~~	~~208.58~~	④	
	2			① ~~3 TNA~~			3(0)			3	3	3	3		~~2~~	~~206.98~~		
	3						4			4	4	4	4		~~3~~	~~208.36~~		
	4						4			4	4	4	4		~~4~~	~~205.18~~		
	5						3(0)			3	3	3	3		~~5~~	~~207.62~~		
WS-1 PW / .	1			N	N	N	0(4)											
	2						0(4)											
	3						0(4)											
	4						0(4)											
	5						0(4)											
WS-1 PW C18 / .	1			N	N	N	0(4)											
	2						0(4)											
	3						0(4)											
	4						0(4)											
	5						0(4)											
C18 Control / .	1			1M	N	N	2(0)			~~3(0)~~								
	2			N			4										—	
	3						4											
	4						4											
	5						4											
[illegible]1 SIR300 / .	1			N	N	N	2(1)	N	N	1 (1)	1	1	1					
	2						2(1)			③ ~~4 (1)~~	2	2	2					
	3						1(1)			Ø (1)	—	—	—					
	4						1(1)			1	1	1	1					
	5						4			4	4	4	4					

① IE : JL 2/01

② obs 2/4 normal, # alive, (# dead) CR

③ WC MK 2/7

④ wrong Data sheet. JL 2/10/14

NewFields

10 DAY POREWATER TEST - OBSERVATIONS

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA		*Hyallela*	#REF!

ENDPOINT DATA & OBSERVATIONS

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 2/01 TECHNICIAN JL OBSERVNS.	DATE 2/02 TECHNICIAN JL OBSERVNS.	DATE 2/03 TECHNICIAN JL OBSERVNS.	DATE 2/4 TECHNICIAN CR OBSERVNS.	DATE 2/5 TECHNICIAN CR OBSERVNS.	DATE 2/6 TECHNICIAN MK OBSERVNS.	DATE 2/7 TECHNICIAN MK OBSERVNS.	DATE 2/08 TECHNICIAN JL OBSERVNS.	DATE 2/09 TECHNICIAN JL OBSERVNS.	DATE 2/10 TECHNICIAN CR OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
SIR300 Control / .	1			2	2	2	N3(0)	N	N	3(0)	3	3	3					
	2			↓	↓	↓	3(0)	↓	↓	3(0)	3	3	3					
	3			↓	↓	↓	4	↓	↓	4	3(1NB)	3	3					
	4			↓	↓	↓	4	↓	↓	4	4	4	4					
	5			↓	↓	↓	4	↓	↓	4	4	4	4					
WS-1 EDTA 1 / .	1			2	2	2	0(4)	N0(4)										
	2			↓	↓	↓		0(4)										
	3			↓	↓	↓		0(4)										
	4			↓	↓	↓		0(4)										
	5			↓	↓	↓		0(4)										
EDTA 1 Control / .	1			2	2	2		1(0)										
	2			↓	↓	↓		4										
	3			↓	↓	↓		4										
	4			↓	↓	↓		3(0)										
	5			↓	↓	↓		3(0)										
WS-1 EDTA 2 / .	1			2	2	2		0(4)										
	2			↓	↓	↓		0(4)										
	3			↓	↓	↓		0(4)										
	4			↓	↓	↓		0(4)										
	5			↓	↓	↓		0(4)										
EDTA 2 Control / .	1			2	2	2		3(0)										
	2			↓	↓	↓		4										
	3			↓	↓	↓		4										
	4			↓	↓	↓		4										
	5			↓	↓	↓		4										
WS-1 Filtered / .	1			2	2	2		0(3)										
	2			↓	↓	↓		0(4)										
	3			↓	↓	↓		0(4)										
	4			↓	↓	↓		0(4)										
	5			2		↓		0(4)										

① WC CR 2/4

② Obs 2/4 normal, # alive, (# dead)

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

				DO (mg/L)		TEMP (C)		COND.(µS/cm)		pH		DILUTION WATER BATCH		TEMP.RECDR./HOBO#		
				> 2.5		23±1		vary < 50%		7.8-8.2		0		0		
CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEED-ING
Control / .	0	WQ	Surr	7	8.7	7	~~20.9~~	2	195	12	0.1	8	7.6	KMB			
Control / .	1	WQ	Surr	6	8.4	5	23.8	6	207	5	① 0.7	5	7.9	JL			
Control / .	2	WQ	Surr	6	8.1	5	22.8	6	218	5		5	7.8	JL			
Control / .	3	WQ	Surr	7	8.8	7	22.1	6	231			5	7.9	GR			
Control / .	4	WQ	Surr	6	7.1	6	22.0	6	245			5	7.9	MMB			
Control / .	5	WQ	Surr	7	4.8	7	23.1	2	248			8	6.8	MMB			
Control / .	6	WQ	Surr	6	5.8	5	23.0	6	276			5	7.6	MK			
Control / .	7	WQ	Surr	7	6.0	8	21.9	2	485			8	6.9	MK			
Control / .	8	WQ	Surr	8	7.1	5	22.3	2	505			5	6.9	JL			
Control / .	9	WQ	Surr	6	7.8	5	22.5	6	494			5	7.1	JL			
Control / .	10	WQ	Surr	6	8.7	5	22.8	6	466			5	7.4	MK			

① WC. JL 2601

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WS-1 PW / .	0	WQ	Surr	7	4.7	7	23.3	2	1805			8	5.4 ①	KKB			
WS-1 PW / .	1	WQ	Surr	6	8.3	5	23.9	6	1769			5	5.1	JL			
WS-1 PW / .	2	WQ	Surr	6	7.7	5	23.1	6	1737	5		5	5.3	JL			
WS-1 PW / .	3	WQ	Surr	7	8.0	7	23.1	6	1691			5	5.9	CR CR ②			
WS-1 PW / .	4	WQ	Surr	6	7.8	6	22.0	6	1612			5	6.5	MMB			
WS-1 PW / .	5	WQ	Surr	③													
WS-1 PW / .	6	WQ	Surr														
WS-1 PW / .	7	WQ	Surr														
WS-1 PW / .	8	WQ	Surr														
WS-1 PW / .	9	WQ	Surr														
WS-1 PW / .	10	WQ	Surr														

① remeasured prior to initiation pH = 6.5 ③ Testing discontinued MMB 2/5/14
② IE CR 2/3

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE** / **TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

TEST CONCENTRATION	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WS-1 PW C18 / .	0	WQ	Surr	7	8.3	7	22.2	2	1751			8	5.1①	KMB			
WS-1 PW C18 / .	1	WQ	Surr	6	8.5	5	23.9	6	1750			5	7.2	JL			
WS-1 PW C18 / .	2	WQ	Surr	6	7.8	5	23.2	6	1691			5	~~7.2~~ 7.0②	JL			
WS-1 PW C18 / .	3	WQ	Surr	7	7.1	7	23.5	6	1659			5	7.0	CR	ER		
WS-1 PW C18 / .	4	WQ	Surr	6	6.3	6	22.7	6	1589			5	6.9	MMB			
WS-1 PW C18 / .	5	WQ	Surr	③													
WS-1 PW C18 / .	6	WQ	Surr														
WS-1 PW C18 / .	7	WQ	Surr														
WS-1 PW C18 / .	8	WQ	Surr														
WS-1 PW C18 / .	9	WQ	Surr														
WS-1 PW C18 / .	10	WQ	Surr														

① 10 µL 25% NaOH added bringing pH to 7.0 ③ Testing discontinued 2/5/14 MMB

② MP. JL 2/02/14.

NewFields **10 DAY POREWATER - WATER QUALITY DATA SHEET**

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
[illegible]	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
C18 Control / .	0	WQ	Surr	7	8.8	7	①~~21.5~~23	2	188	2	①~~0.1~~	8	7.8	CR			
C18 Control / .	1	WQ	Surr	6	8.4	5	23.7	6	202	5	~~7~~ ②	5	7.8	JL			
C18 Control / .	2	WQ	Surr	6	7.5	5	23.2	6	204			5	7.8	JL			
C18 Control / .	3	WQ	Surr	7	8.4	7	23.6	6	236			5	7.8	CR	CR		
C18 Control / .	4	WQ	Surr	6	8.7	6	22.2	6	272			5	7.7	MMS			
C18 Control / .	5	WQ	Surr	③													
C18 Control / .	6	WQ	Surr														
C18 Control / .	7	WQ	Surr														
C18 Control / .	8	WQ	Surr														
C18 Control / .	9	WQ	Surr														
C18 Control / .	10	WQ	Surr														

① WP CR 1/31 correct temp. = 23.1°C

② WL, JL 2/01

③ Testing discontinued MMS 2/5/14

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE** / **TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WS-1 SIR300 / .	0	WQ	Surr	7	8.1	7	22.8	2	2247			8	5.5 ①	KMB			
WS-1 SIR300 / .	1	WQ	Surr	6	6.5	5	23.8	6	2.27 mS/cm	5		5	7.7	JL			
WS-1 SIR300 / .	2	WQ	Surr	6	5.0	5	23.3	6	2.21 mS/cm	5		5	7.3	JL			
WS-1 SIR300 / .	3	WQ	Surr	7	7.7	7	23.9	6	2169			5	7.4	CR	CR		
WS-1 SIR300 / .	4	WQ	Surr	6	7.1	6	22.8	6	2095			5	7.2	MMB			
WS-1 SIR300 / .	5	WQ	Surr	7	4.9	7	23.2	2	1982			8	6.5	MMB			
WS-1 SIR300 / .	6	WQ	Surr	6	③ ~~7.8~~ 4.3	5	~~22.3~~ 22.7	6	~~190~~ 315 ④			5	② ~~8.0~~ 7.6	MK			
WS-1 SIR300 / .	7	WQ	Surr	~~7~~ ③ 6.0	~~7.2~~ ③	~~5~~ 8	~~21.8~~ 22.6	~~6~~ 5 ③	1912			8	6.6	MK			
WS-1 SIR300 / .	8	WQ	Surr	6	7.5	5	22.4	6	505 ⑤			5	7.1	JL			
WS-1 SIR300 / .	9	WQ	Surr	6	7.8	5	22.6	6	1766			5	7.1	JL			
WS-1 SIR300 / .	10	WQ	Surr	6	③ ~~7.4~~ 8.9	5	22.6	6	1631			5	7.4	MK			

① 25uL 25% added to bring pH to 8.6

~~④ spilled some of the solution while doing WQ MK 2/6/14~~ ← wrong page MK

③ WC MK

④ probe incompletely placed in vials

NewFields

10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
[illegible]	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
SIR300 Control / .	0	WQ	Surr	7	8.7	7	22.0	2	179			8	7.2	KMB			
SIR300 Control / .	1	WQ	Surr	6	8.8	5	24.5	6	193	5		5	7.8	JL			
SIR300 Control / .	2	WQ	Surr	6	7.5	5	23.1	6	201	5		5	7.6	JL			
SIR300 Control / .	3	WQ	Surr	7	6.8	7	23.9	6	218			5	7.6	CR	CR		
SIR300 Control / .	4	WQ	Surr	6	8.0	6	22.3	6	268			5	7.6	MMS			
SIR300 Control / .	5	WQ	Surr	7	5.2	7	23.2	2	265			8	6.9	MMS			
SIR300 Control / .	6	WQ	Surr	6	① ~~8.9~~ 5.0	5	21.8	6	① ~~157~~ 194.4			5	① ~~8.1~~ 7.3	MK			
SIR300 Control / .	7	WQ	Surr	~~8~~ 7	3.5	8	22.0	2	328			8	6.7	MK			
SIR300 Control / .	8	WQ	Surr	6	4.0	5	22.3	6	333			5	6.9	JL			
SIR300 Control / .	9	WQ	Surr	6	5.1	5	22.4	6	332			5	7.2	JL			
SIR300 Control / .	10	WQ	Surr	6	5.0	5	22.4	6	381			5	7.4	MK			

① wrong page MK 2/6/14

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE** / **TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEED-ING
EDTA 1 Control / .	0	WQ	Surr	7	8.9	7	22.9	2 ①	~~160~~ 155			8	① ~~6.96~~	KMB			
EDTA 1 Control / .	1	WQ	Surr	6	8.6	5	24.5	6	164			5	~~7.26~~ 7.9 ②	JL			
EDTA 1 Control / .	2	WQ	Surr	6	7.3	5	23.4	6	155			5	7.3	JL			
EDTA 1 Control / .	3	WQ	Surr	7	8.3	7	24.0	6	161			5	7.5	CR	~~CR~~		
EDTA 1 Control / .	4	WQ	Surr	6	7.1	6	23.0	6	173			5	7.2	MMB			
EDTA 1 Control / .	5	WQ	Surr														
EDTA 1 Control / .	6	WQ	Surr														
EDTA 1 Control / .	7	WQ	Surr														
EDTA 1 Control / .	8	WQ	Surr														
EDTA 1 Control / .	9	WQ	Surr														
EDTA 1 Control / .	10	WQ	Surr														

① WC. KMB 1/31/14

② WP: JL 2/01

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE** / **TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEED-ING
WS-1 EDTA 1 / .	0	WQ	Surr	~~7~~ 10	~~6.0~~ 6.1	7	22.0	2	~~1795~~ 1798			8	~~2.82~~ 7.6 ②	KMB			
WS-1 EDTA 1 / .	1	WQ	Surr	6	7.7	5	24.3	6	1749			5	7.2	JL			
WS-1 EDTA 1 / .	2	WQ	Surr	6	7.8	5	23.2	6	1722			5	7.3	JL			
WS-1 EDTA 1 / .	3	WQ	Surr	7	8.4	7	24.2	6	1700			5	7.3	CR	~~CR~~		
WS-1 EDTA 1 / .	4	WQ	Surr	6	8.9	6	22.4	6	1672			5	7.5	MMB			
WS-1 EDTA 1 / .	5	WQ	Surr														
WS-1 EDTA 1 / .	6	WQ	Surr														
WS-1 EDTA 1 / .	7	WQ	Surr														
WS-1 EDTA 1 / .	8	WQ	Surr														
WS-1 EDTA 1 / .	9	WQ	Surr														
WS-1 EDTA 1 / .	10	WQ	Surr														

① WC. KMB 1/31/14
② 75mL 25% NaOH added to bring pH to 7.3

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

[illegible]	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
EDTA 2 Control / .	0	WQ	Surr	7	9.0	7	22.0	2	161			8	6.3	KMB			
EDTA 2 Control / .	1	WQ	Surr	6	8.2	5	24.7	6	540			5	7.3	JL			
EDTA 2 Control / .	2	WQ	Surr	6	7.9	5	23.4	6	532			5	7.6	JL			
EDTA 2 Control / .	3	WQ	Surr	7	8.5	7	24.2	6	541			5	7.8	CR	ER		
EDTA 2 Control / .	4	WQ	Surr	6	9.2	6	22.3	6	561			5	7.9	MMB			
EDTA 2 Control / .	5	WQ	Surr														
EDTA 2 Control / .	6	WQ	Surr														
EDTA 2 Control / .	7	WQ	Surr														
EDTA 2 Control / .	8	WQ	Surr														
EDTA 2 Control / .	9	WQ	Surr														
EDTA 2 Control / .	10	WQ	Surr														

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES		LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*		Port Gamble, WA	[illegible]
JOB NUMBER	PROJECT MANAGER	TEST START DATE	TIME	TEST END DATE	TIME
	Bill Gardiner	31Jan14		10Feb14	

WATER QUALITY DATA #1

				DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
				> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WS-1 EDTA 2 / .	0	WQ	Surr	7	6.0	7	22.0	2	1793	[illegible]		8	2.80①	FMB			
WS-1 EDTA 2 / .	1	WQ	Surr	6	7.8	5	24.4	6	1750			5	6.8	JL			
WS-1 EDTA 2 / .	2	WQ	Surr	6	7.9	5	23.3	6	1701			5	7.0	JL			
WS-1 EDTA 2 / .	3	WQ	Surr	7	8.6	7	24.3	6	1701			5	7.1	CR	~~ER~~		
WS-1 EDTA 2 / .	4	WQ	Surr	6	9.4	6	22.8	6	1648			5	7.1	MMB			
WS-1 EDTA 2 / .	5	WQ	Surr														
WS-1 EDTA 2 / .	6	WQ	Surr														
WS-1 EDTA 2 / .	7	WQ	Surr														
WS-1 EDTA 2 / .	8	WQ	Surr														
WS-1 EDTA 2 / .	9	WQ	Surr														
WS-1 EDTA 2 / .	10	WQ	Surr														

① NaOH added to bring pH to ~~7.8~~ 6.7 wrong page CR 1/31
75 mL 25%

NewFields 10 DAY POREWATER - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
Exposure	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WS-1 Filtered / .	0	WQ	Surr	7	7.3	7	22.3	2	1772			8	5.85	KMP			
WS-1 Filtered / .	1	WQ	Surr	6	8.3	5	24.5	5	17760			5	6.9	JL			
WS-1 Filtered / .	2	WQ	Surr	6	8.1	5	23.3	6	1713			5	6.9	JL			
WS-1 Filtered / .	3	WQ	Surr	7	7.7	7	24.4	2	1705			8	7.0	CR	~~ER~~		
WS-1 Filtered / .	4	WQ	Surr	6	9.1	6	22.3	6	1655			5	7.1	MM R			
WS-1 Filtered / .	5	WQ	Surr														
WS-1 Filtered / .	6	WQ	Surr														
WS-1 Filtered / .	7	WQ	Surr														
WS-1 Filtered / .	8	WQ	Surr														
WS-1 Filtered / .	9	WQ	Surr														
WS-1 Filtered / .	10	WQ	Surr														

① remeasured prior to initiation pH = 6.9

NewFields

Page ____ of ____

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Farrallon / Yakima Steel	Hyalella azteca	10

PRETEST / INITIAL / FINAL / OTHER (circle one) DAY of TEST: 10

OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 2/10/14	Temperature: 21.7°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	pH	Cond. (µS/cm)	Hardness	Alkalinity
OV Ø	Surr.	2/10/14 MMB	0.821	21.2	2/10/14 JL	NA	NA	84	78
OV WETSED 1			0.513					80	74
WETSED 1 SIR-300			0.249					76	66
WETSED 1 PCC			0.433					79	72
SIR-300 Blank			0.409					46	58
PCC Blank			1.34					82	74
PW Ø	Surr.	2/10/14 JL	①	22.3	2/10/14 JL	①		NA	NA
WETSED 1			0.768			6.5			
WETSED 1 SIR-300			1.08			6.2			
WETSED 1 PCC			0.738			6.5			
SIR-300 Blank			5.54			7.3			
PCC Blank			2.35 ②			7.0			

① Insufficient volume collected for analyses. JL 2/10/14.

② WC. JL 2/10/14.

NewFields

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Farallon/Yakima Steel	Hyalella azteca	10

PRETEST / (INITIAL) / FINAL / OTHER (circle one) **DAY of TEST:** 0
(OVERLYING (OV)) / POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date: 2/10/14	**Temperature:** 21.7°C	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	pH	Cond. (µS/cm)	Hardness	Alkalinity
0	Surr.	1/31/14 CR			2/10/14 JL	NA	NA	79	76
WETSED1	↓	↓			↓	↓	↓	128	58
WETSED1 SIR-300								①52 54	52
SIR-300 Blank								52	66
WETSED1 PCC								136	58
PCC Blank	↓	↓			↓	↓	↓	78	64

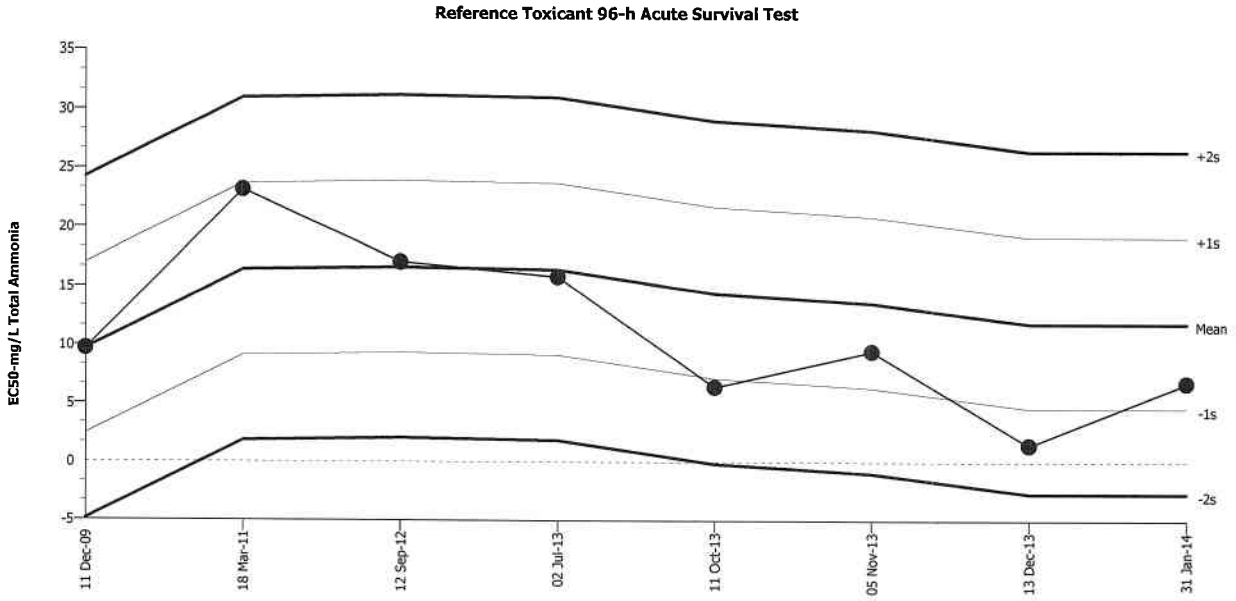
① WL. JL 2/10/14.

CETIS QC Plot

Report Date: 13 Mar-14 10:27 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Hyalella azteca (Freshwater Amphip	**Material:**	Total Ammonia
Protocol:	EPA/600/R-99/064 (2000)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	11.88	**Count:**	7	**-1s Warning Limit:**	4.592	**-2s Action Limit:**	-2.693
Sigma:	7.285	**CV:**	61.30%	**+1s Warning Limit:**	19.16	**+2s Action Limit:**	26.45

Quality Control Data

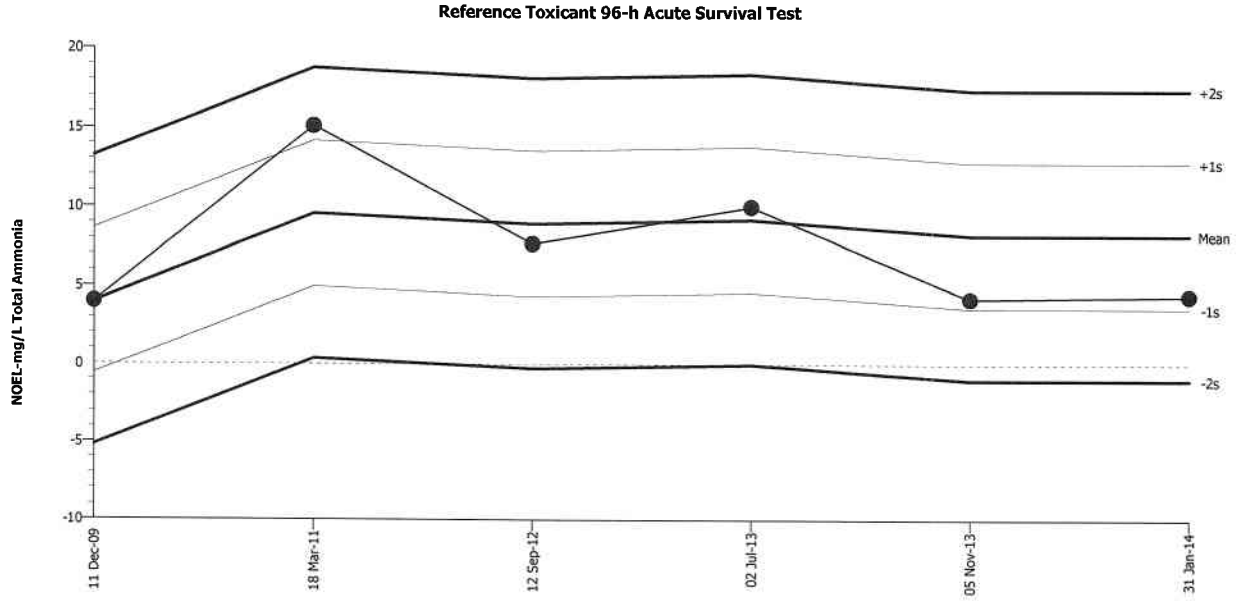
Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2009	Dec	11	16:05	9.69	-2.19	-0.3006			06-0392-7981	04-0353-3462
2	2011	Mar	18	17:40	23.15	11.27	1.548	(+)		14-6934-6989	08-7287-0236
3	2012	Sep	12	15:30	17.06	5.181	0.7112			15-6980-0340	09-8032-3348
4	2013	Jul	2	16:54	15.85	3.968	0.5447			14-0245-1637	17-3940-1363
5		Oct	11	16:30	6.435	-5.445	-0.7475			02-6747-8290	14-5731-2244
6		Nov	5	14:15	9.487	-2.393	-0.3285			00-2973-8704	14-7798-0524
7		Dec	13	16:00	1.461	-10.42	-1.43	(-)		18-8979-3951	13-5696-3347
8	2014	Jan	31	17:30	6.788	-5.092	-0.699			04-3440-6883	07-6457-6634

CETIS QC Plot

Report Date: 13 Mar-14 10:27 (1 of 1)

Reference Toxicant 96-h Acute Survival Test — **NewFields**

Test Type:	Survival	**Organism:**	Hyalella azteca (Freshwater Amphip	**Material:**	Total Ammonia
Protocol:	EPA/600/R-99/064 (2000)	**Endpoint:**	Proportion Survived	**Source:**	Reference Toxicant-REF



Mean:	8.192	**Count:**	5	**-1s Warning Limit:**	3.59	**-2s Action Limit:**	-1.012
Sigma:	4.602	**CV:**	56.20%	**+1s Warning Limit:**	12.79	**+2s Action Limit:**	17.4

Quality Control Data

Point	Year	Month	Day	Time	QC Data	Delta	Sigma	Warning	Action	Test ID	Analysis ID
1	2009	Dec	11	16:05	4.01	-4.182	-0.9087			06-0392-7981	12-3327-0136
2	2011	Mar	18	17:40	15.1	6.908	1.501	(+)		14-6934-6989	04-6091-1142
3	2012	Sep	12	15:30	7.65	-0.542	-0.1178			15-6980-0340	11-2557-0477
4	2013	Jul	2	16:54	10	1.808	0.3929			14-0245-1637	04-9865-2715
5		Nov	5	14:15	4.2	-3.992	-0.8674			00-2973-8704	21-2079-0542
6	2014	Jan	31	17:30	4.4	-3.792	-0.824			04-3440-6883	19-1835-3562

CETIS Summary Report

Reference Toxicant 96-h Acute Survival Test

NewFields

Batch ID:	11-6605-7715	**Test Type:**	Survival	**Analyst:**	
Start Date:	31 Jan-14 17:30	**Protocol:**	EPA/600/R-99/064 (2000)	**Diluent:**	Diluted Mineral Water
Ending Date:	04 Feb-14 16:52	**Species:**	Hyalella azteca	**Brine:**	Not Applicable
Duration:	95h	**Source:**	Aquatic Biosystems, CO	**Age:**	
Sample ID:	20-6890-6766	**Code:**	7B51030E	**Client:**	Internal Lab
Sample Date:	27 Sep-11	**Material:**	Total Ammonia	**Project:**	Reference Toxicant
Receive Date:	27 Sep-11	**Source:**	Reference Toxicant		
Sample Age:	857d 17h	**Station:**	p110927.191		

Comparison Summary

Analysis ID	Endpoint	NOEL	LOEL	TOEL	PMSD	TU	Method
19-1835-3562	Proportion Survived	4.4	9.43	6.441	32.7%		Dunnett Multiple Comparison Test

Point Estimate Summary

Analysis ID	Endpoint	Level	mg/L	95% LCL	95% UCL	TU	Method
07-6457-6634	Proportion Survived	EC50	6.788	6.052	7.612		Trimmed Spearman-Kärber

Proportion Survived Summary

C-mg/L	Control Type	Count	Mean	95% LCL	95% UCL	Min	Max	Std Err	Std Dev	CV%	%Effect
0	Dilution Water	3	0.9333	0.7899	1	0.9	1	0.03333	0.05774	6.19%	0.0%
4.4		3	0.8667	0.4872	1	0.7	1	0.08819	0.1528	17.63%	7.14%
9.43		3	0.1333	0	0.707	0	0.4	0.1333	0.2309	173.2%	85.71%
19.8		3	0.03333	0	0.1768	0	0.1	0.03333	0.05774	173.2%	96.43%
42.5		3	0	0	0	0	0	0	0		100.0%
91.3		3	0	0	0	0	0	0	0		100.0%

Proportion Survived Detail

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	1	0.9	0.9
4.4		0.9	1	0.7
9.43		0.4	0	0
19.8		0.1	0	0
42.5		0	0	0
91.3		0	0	0

Proportion Survived Binomials

C-mg/L	Control Type	Rep 1	Rep 2	Rep 3
0	Dilution Water	10/10	9/10	9/10
4.4		9/10	10/10	7/10
9.43		4/10	0/10	0/10
19.8		1/10	0/10	0/10
42.5		0/10	0/10	0/10
91.3		0/10	0/10	0/10

Appendix D.2

10-Day Porewater TIE Test with Microtox

Rainier ENVIRONMENTAL

Toxicological Evaluation of Freshwater Sediments

Microtox

Report date: December 28, 2013

Submitted to:

NEWFIELDS NORTHWEST
P.O. Box 216
Port Gamble, WA 98364

5013 Pacific Hwy East
Suite 20
Tacoma, WA 98424

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LIST OF APPENDICES

SIGNATURE PAGE

Eric Tollefson

Eric Tollefson
Project Manager

This report has been prepared based on data and/or samples provided by our client and the results of this study are for their sole benefit. Any reliance on the data by a third party is at the sole and exclusive risk of that party.

1.0 INTRODUCTION

Freshwater sediment samples were collected and evaluated for toxicity as part of a project being conducted by NewFields Northwest. Freshwater sediment samples were tested for toxicity using Microtox® tests.

2.0 METHODS

2.1 Sample Collection and Transportation

NewFields personnel collected three freshwater sediment subsamples on December 10, 2013. Samples were shipped by Fed Ex and received by Rainier Environmental on December 12, 2013. Sample containers were inspected upon receipt and the contents verified against information on the chain-of-custody form. The samples were stored at 4°C in the dark until used for testing.

2.2 Test Procedures

The luminescent marine bacterium *Vibrio fischeri* was used as the test organism for the Microtox® tests. The bacteria were exposed to porewater extracted from the sediment samples and light readings were measured after a 5 minute incubation period and then after an additional 5 minutes and 10 minutes of exposure. Testing was performed using the Microtox® Model 500 Analyzer which measures light output and is equipped with a 15°C chamber to maintain test temperature in the samples and a 4°C chamber to keep the rehydrated bacteria chilled.

Vials of freeze-dried bacteria (Microtox® Acute Reagent Lot # 12B4010, Expiration date 2/15) were obtained from Strategic Diagnostics, Inc. and stored at -20°C until use. On the day of the test, a vial was rehydrated with 1.0 ml of Microtox® Reconstitution Solution, mixed thoroughly, and allowed to equilibrate for 30 minutes at 4°C. The bacteria were used within 2 hours of rehydration.

The tests were conducted in accordance with Washington Department of Ecology (WDOE, 2008) test protocol, which are summarized in Table 1. Approximately 25 milliliters (mL) of porewater was extracted from each sample by centrifugation for 30 minutes at 4500 G. Each porewater extract was adjusted to a salinity of 20 parts per thousand (ppt) with Crystal Sea artificial sea salt. The dissolved oxygen (DO) in each sample was between 50 and 100 percent saturation (5.0 to 10.2 mg/L) and did not require aeration. The pH was adjusted to 7.9 to 8.2, as necessary, using NaOH or HCl. The laboratory control consisted of deionized water adjusted to 20 ppt with artificial seasalt. Each porewater was tested within 3 hours of extraction.

Tests were conducted using five replicates. Disposable glass cuvettes were placed in the Microtox® test wells and 1 mL of salinity-adjusted porewater was added. The rehydrated bacteria (reagent) were thoroughly mixed and 10 microliters (µL) were added to each test cuvette. After an initial incubation period of 5 minutes, the first control cuvette was placed in the read chamber of the Microtox® Analyzer to set the instrument. Initial light readings (I_o) were then taken by placing each cuvette in the read chamber of the Microtox® Analyzer and measurements were recorded on a data sheet. Light output was measured in each cuvette after an additional 5 minutes (I_5) and 10 minutes (I_{15}) of exposure. Test acceptability criteria is a mean control final light output greater than 72 percent of initial output and a test mean output not greater than 110 percent of the control mean output.

The data were evaluated statistically by conducting one-tailed t-tests on the change in light output over time for the test sediment porewaters compared to the control

A reference toxicant test using copper chloride was conducted in conjunction with the sediment porewater test to ensure that the sensitivity of the test was within the acceptable range of historical values determined in this laboratory.

Table 1. Summary of methods for the Microtox test.

Test date	December 13, 2013
Test organism source	Strategic Diagnostics
Batch number and expiration date	Lot#12B4010, Expiry 2/15
Control	Saltwater (20 ppt) prepared with Crystal Sea Marine Mix
Sample preparation	Centrifugation at 4500 G for 30 minutes; salinity adjustment to 20 ppt using Crystal Sea Marine Mix; pH adjustment to 7.9-8.2
Test chamber	Glass cuvette
Test volume	1 mL
Volume of inoculum/replicate	10 µL
Number of replicates/sample	5
Test temperature	15 ± 1°C
Aeration	None
Reference toxicant	Copper Chloride

3.0 RESULTS

The results of toxicity tests conducted using Microtox® are provided in Tables 2 and 3. The samples did not exceed sediment quality standards for the State of Washington (WDOE 2008).

Table 2. Results of Microtox® tests.

Sample ID	Change in light output as a % of Control (5 minutes)	Change in light output as a % of Control (15 minutes)
9	104	98
6	104	102
3	107	107
1	107	107
0	106	110

Table 3. Statistical analyses of Microtox results.

Sample ID	5-minute reading		15 minute reading	
	Mean % change in light output	Significantly different relative to the control	Mean % change in light output	Significantly different relative to the control
Control	91 ± 3	---	79 ± 4	---
9	95 ± 5	No	77 ± 4	No
6	94± 3	No	80 ± 7	No
3	98 ± 3	No	84 ± 5	No
1	98 ± 2	No	85 ± 2	No
1	97± 1	No	86 ± 2	No

4.0 QA/QC

The Microtox tests met control acceptance criteria and there were no deviations from protocol.

Results of reference toxicant test used to monitor laboratory performance and test organism sensitivity are provided in Table 4. The results for the reference toxicant test fell within the range of mean ± two standard deviations of historical results, indicating that test organisms were of an appropriate degree of sensitivity.

Table 4. Reference toxicant test results.

Exposure Duration	Test date	Toxicant	EC50	Acceptable Range	CV (%)
5 Minutes	December 13, 2013	Copper	1228 µg/L	948-1628	13.2
15 Minutes			432 µg/L	398-615	10.7

5.0 REFERENCES

American Society of Testing and Materials (ASTM). 2000. Test Method for Measuring the Toxicity of Sediment-Associated Contaminants with Freshwater Invertebrates. ASTM Designation E 1706-00.

U.S. Environmental Protection Agency (USEPA). 2000. Methods for Measuring the Toxicity and Bioaccumulation of Sediment-associated Contaminants with Freshwater Invertebrates. EPA/600/R-99/064.

Washington Department of Ecology (WDOE). 2008. Sediment Sampling and Analysis Plan Appendix: Guidance on the Development of Sediment Sampling and Analysis Plans Meeting the Requirements of the Sediment Management Standards Publication No. 03-09-043. Revised February 2008.

APPENDIX A – Results Summaries

Appendix Table A. Microtox 100 Percent Sediment Porewater Test
Sites 9,6,3,1,0
Client NewFields
Test Date: 12/13/13

Site	Light Reading								$T_{(mean)}/C_{(mean)}$	Quality Control Steps: Change in control light readings compared to initial control $F_{c(mean)}/I_{c(mean)}$	Quality Control Steps: Evaluation of initial light output in site sediments $I_{(0)T(mean)}/I_{(0)C(mean)}$
	Reading	Replicate 1	2	3	4	5	Mean	St.Dev.			
CON	$I_{(0)}$	92	93	88	95	92	92				
	$I_{(5)}$	81	86	80	84	87	84			0.91	
	$I_{(15)}$	68	77	70	73	75	73			0.79	
	$C_{(5)}$	0.88	0.92	0.91	0.88	0.95	0.91	0.03			
	$C_{(15)}$	0.74	0.83	0.80	0.77	0.82	0.79	0.04			
9	$I_{(0)}$	85	83	89	89	90	87				0.95
	$I_{(5)}$	77	77	91	85	83	83				
	$I_{(15)}$	64	62	75	69	67	67				
	$T_{(5)}$	0.91	0.93	1.02	0.96	0.92	0.95	0.05	1.04		
	$T_{(15)}$	0.75	0.75	0.84	0.78	0.74	0.77	0.04	0.98		
6	$I_{(0)}$	97	93	89	87	89	91				0.99
	$I_{(5)}$	88	87	83	85	85	86				
	$I_{(15)}$	73	70	70	80	71	73				
	$T_{(5)}$	0.91	0.94	0.93	0.98	0.96	0.94	0.03	1.04		
	$T_{(15)}$	0.75	0.75	0.79	0.92	0.80	0.80	0.07	1.02		
3	$I_{(0)}$	89	83	85	82	83	84				0.92
	$I_{(5)}$	87	79	81	79	86	82				
	$I_{(15)}$	74	66	67	72	76	71				
	$T_{(5)}$	0.98	0.95	0.95	0.96	1.04	0.98	0.03	1.07		
	$T_{(15)}$	0.83	0.80	0.79	0.88	0.92	0.84	0.05	1.07		
1	$I_{(0)}$	85	82	72	84	82	81				0.88
	$I_{(5)}$	80	82	70	82	81	79				
	$I_{(15)}$	70	71	59	73	70	69				
	$T_{(5)}$	0.94	1.00	0.97	0.98	0.99	0.98	0.02	1.07		
	$T_{(15)}$	0.82	0.87	0.82	0.87	0.85	0.85	0.02	1.07		
0	$I_{(0)}$	87	84	82	83	85	84				0.92
	$I_{(5)}$	84	82	80	80	81	81				
	$I_{(15)}$	75	72	71	74	72	73				
	$T_{(5)}$	0.97	0.98	0.98	0.96	0.95	0.97	0.01	1.06		
	$T_{(15)}$	0.86	0.86	0.87	0.89	0.85	0.86	0.02	1.10		

$I_{(0)}$ is the light reading after the initial five minute incubation period

$I_{(5)}$ is the light reading five minutes after $I_{(0)}$

$I_{(15)}$ is the light reading fifteen minutes after $I_{(0)}$

$C_{(t)}$, $R_{(t)}$, and $T_{(t)}$ are the changes in light readings from the intial reading in each sample container for the control, reference sediment

Quality Control Steps:

1. Is control final mean output greater than or equal to 72% control initial mean output?

$I_{(5)}$:$F_{c(mean)}/I_{c(mean)}$: **91%** **YES**

$I_{(15)}$:$F_{c(mean)}/I_{c(mean)}$: **79%** **YES**

YES: Control results are acceptable and can be used for statistical analyses.
NO: Control results are unacceptable (use reference sediment for statistical analysis if available).

2. Are test initial mean values greater than or equal to 80% of control initial mean values?

S1 $I_{T(mean)}/I_{C(mean)}$: **95%** **YES**

S2 $I_{T(mean)}/I_{C(mean)}$: **99%** **YES**

S3 $I_{T(mean)}/I_{C(mean)}$: **92%** **YES**

S4 $I_{T(mean)}/I_{C(mean)}$: **88%** **YES**

S5 $I_{T(mean)}/I_{C(mean)}$: **92%** **YES**

INVALD: If the test sediment is greater than 110%, the results in uninterpretable
YES: If test sediment is reference, reference is acceptable

APPENDIX B – Laboratory Bench Sheets

Rainier Environmental
5013 Pacific Hwy. E., Suite 20
Tacoma,WA 98424

Raw Data Sheet
Microtox
100% Sediment Porewater Toxicity

Client Name: Newfields **Test Date:** 12/13/13

Sample ID: 9,6,3,1,0 **Test No.:** 1312-030, 1312-031, 1312-032, 1312-033, 1312-034

Site	Light Reading	Time	Replicate 1	2	3	4	5
CON	$I_{(0)}$	5 min	92	93	88	95	92
	$I_{(5)}$	10min	81	86	80	84	87
	$I_{(15)}$	20 min	68	77	70	73	75
9	$I_{(0)}$	5 min	85	83	89	89	90
	$I_{(5)}$	10min	77	77	91	85	83
	$I_{(15)}$	20 min	64	62	75	69	67
6	$I_{(0)}$	5 min	97	93	89	87	89
	$I_{(5)}$	10min	88	87	83	85	85
	$I_{(15)}$	20 min	73	70	70	80	71
3	$I_{(0)}$	5 min	89	83	85	82	83
	$I_{(5)}$	10min	87	79	81	79	86
	$I_{(15)}$	20 min	74	66	67	72	76
1	$I_{(0)}$	5 min	85	82	72	84	82
	$I_{(5)}$	10min	80	82	70	82	81
	$I_{(15)}$	20 min	70	71	59	73	70
0	$I_{(0)}$	5 min	87	84	82	83	85
	$I_{(5)}$	10min	84	82	80	80	81
	$I_{(15)}$	20 min	75	72	71	74	72

Comments:

APPENDIX C – Water Quality Results

Rainier Environmental
5013 Pacific Highway E., Suite 20
Tacoma, WA 98424

Physical and Chemical
Measurements of Porewaters
Sediment Bioassays

Analyst: ET

Client : NewFields

Test Date: 12/13/13

Test Type: Microtox 100% Porewater Toxicity Test

Test No: 1312-030, 1312-031, 1312-032, 1312-033, 1312-034

Test Species: *Vibrio fischeri*

Site	Initial Salinity (ppt)	Final Salinity (ppt)	Initial D.O. (mg/L)	Final D.O (mg/L)	Initial pH	Adjusted pH	NaOH or HCl Vol. Used	Final Porewater Conc.	Ammonia
CON	20.0	20.0	7.5	7.5	8.15	~~8.0~~	—	100%	<1.0
9	0.0	19.3	6.7	6.7	7.99	—	—	100%	<1.0
6	0.0	20.1	7.2	7.2	7.83	7.92	10µL 0.1N NaOH	99.9%	<1.0
3	0.0	20.6	6.8	6.8	7.68	7.97	50µL 0.1N NaOH	99.8%	<1.0
1	0.0	20.7	6.7	6.7	7.58	7.98	100µL 0.1N NaOH	99.6%	<1.0
0	0.0	19.5	7.0	7.0	7.54	7.95	140µL 0.1N NaOH	99.4	<1.0

Sample Description: _____

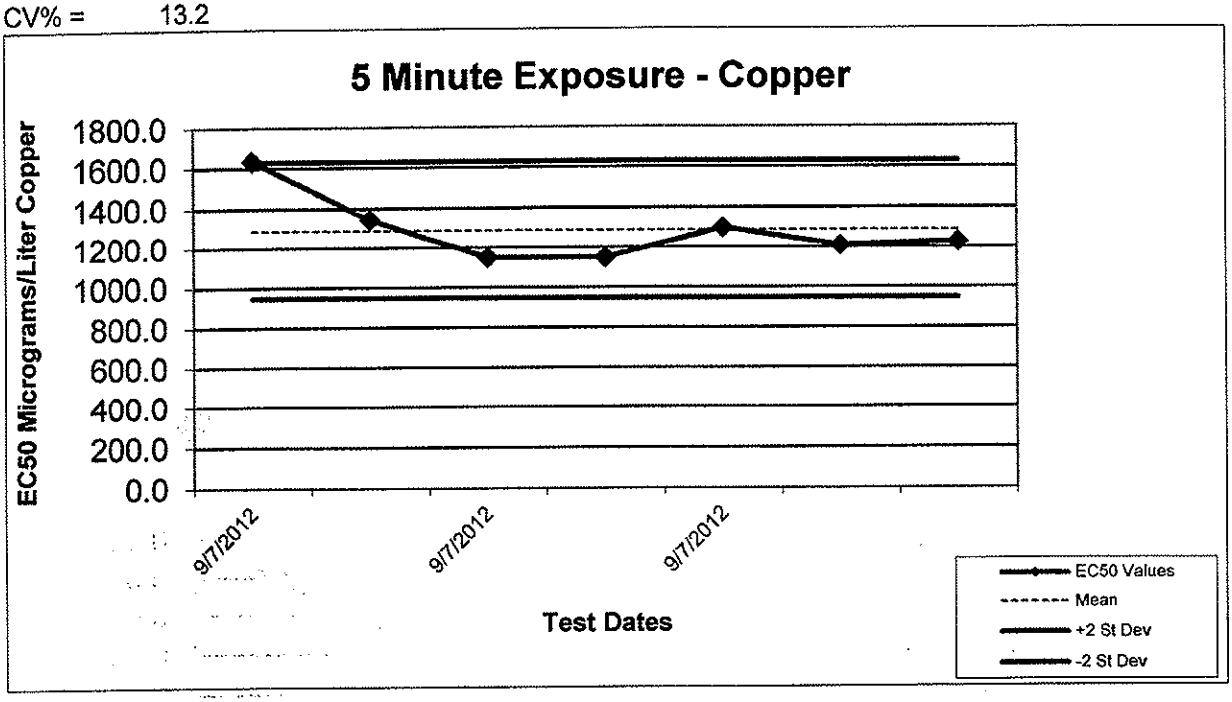
Comments: _____

QA Check: ET

APPENDIX D – Reference Toxicant Tests

Reference Toxicant Control Chart
Microtox 5-Minute Exposure

CV% = 13.2

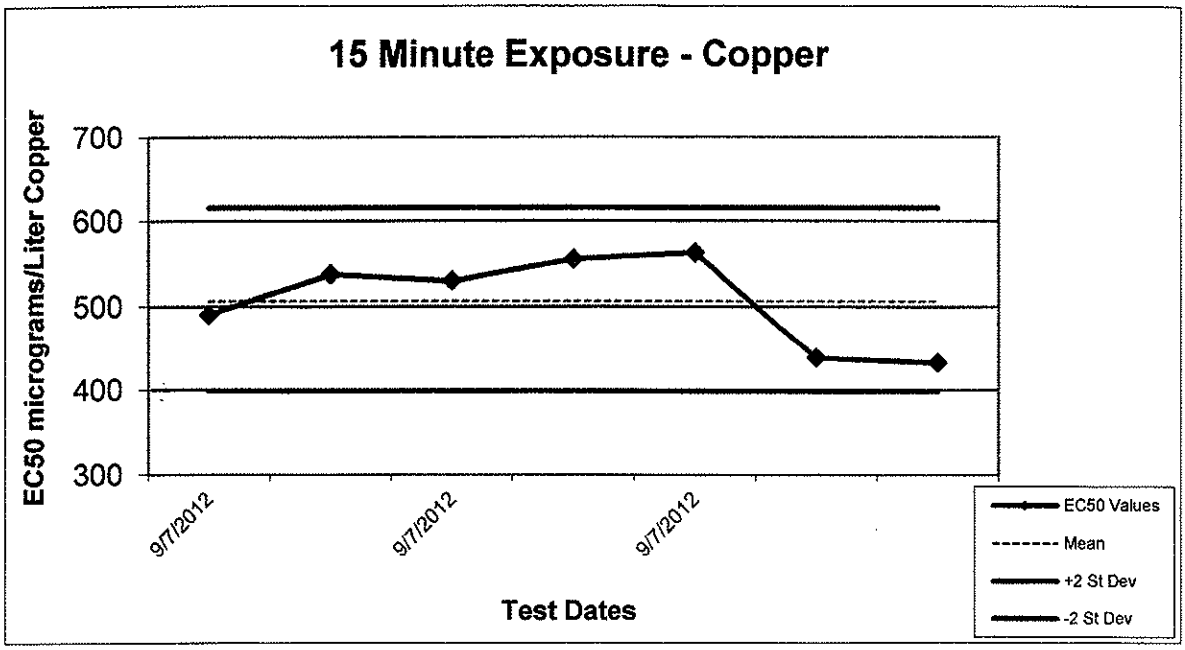


Date	Time	EC50 %	EC50 µ/L Copper [a]	Mean	StDev	-2 SD	+2 SD
9/7/2012	8:53	81.8	1636.0	1287.5	170.0	947.5	1627.6
9/7/2012	9:36	67.2	1344.0	1287.5	170.0	947.5	1627.6
9/7/2012	10:00	57.4	1148.0	1287.5	170.0	947.5	1627.6
9/7/2012	10:28	57.4	1148.0	1287.5	170.0	947.5	1627.6
9/7/2012	10:54	65.0	1300.0	1287.5	170.0	947.5	1627.6
12/5/2013	17:17	60.4	1208.8	1287.5	170.0	947.5	1627.6
12/13/2013	13:22	61.4	1228.0	1287.5	170.0	947.5	1627.6

a - Highest concentration of Copper is 2000 micro grams/Liter

Reference Toxicant Control Chart
Microtox 15-Minute Exposure

CV% = 10.7



Date	Time	EC50 %	EC50 µg/L Copper [a,µ]	Mean	StDev	-2 SD	+2 SD
9/7/2012	853	24.6	491.0	506.8	54.2	398.4	615.1
9/7/2012	937	26.9	537.8	506.8	54.2	398.4	615.1
9/7/2012	1001	26.5	530.2	506.8	54.2	398.4	615.1
9/7/2012	1028	27.8	555.4	506.8	54.2	398.4	615.1
9/7/2012	1055	28.2	563.0	506.8	54.2	398.4	615.1
12/5/2013	1717	21.9	438.0	506.8	54.2	398.4	615.1
12/13/2013	1322	21.6	432.0	506.8	54.2	398.4	615.1

a - Highest concentration of copper is 2000 micro grams/Liter

MicrotoxOmni Sample Results Report

Result Name: RT121313VF

Test Date/Time: 12/13/2013 1:22:05PM

Sample Name: Sample 1

Test Name: Basic Test

Description: Reference Toxicant

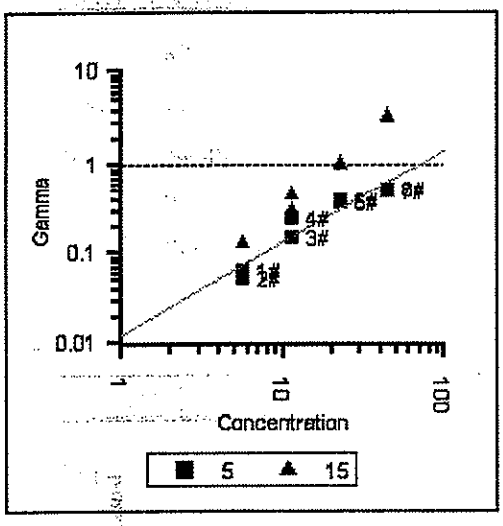
Toxicant:

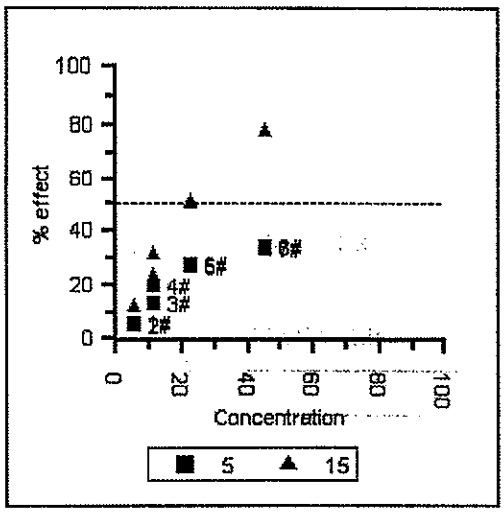
Test Location:

Instrument ID: _MASTER

Reagent Lot #:

User ID: MANAGER





Time	Sample	Conc	I0	It	Gamma	%Effect
5 Mins						
	Control	0.00	93	95	1.022#	
	Control	0.00	95	95	1.010#	
	1	5.63	99	95	0.0648#	6.09%
	2	5.63	99	96	0.0509#	4.84%
	3	11.25	98	87	0.1474#	12.84%
	4	11.25	100	82	0.2416#	19.46%
	5	22.50	98	73	0.3616#	26.56%
	6	22.50	97	71	0.3848#	27.79%
	7	45.00	103	70	0.4961#	33.16%
	8	45.00	98	66	0.5090#	33.73%

Result Name:	RT121313VF		
Test Date/Time:	12/13/2013 1:22:05PM		
Sample Name:	Sample 1		
Test Name:	Basic Test		
Description:	Reference Toxicant	Instrument ID:	_MASTER
Toxicant:		Reagent Lot #:	
Test Location:		User ID:	MANAGER

15 Mins

Control	0.00	93	71	0.7699#	
Control	0.00	95	72	0.7641#	
1	5.63	99	68	0.1279#	11.34%
2	5.63	99	72	0.0557#	5.28%
3	11.25	98	57	0.3074#	23.51%
4	11.25	100	53	0.4518#	31.12%
5	22.50	98	37	1.002#	50.05%
6	22.50	97	36	1.037#	50.92%
7	45.00	103	18	3.440#	77.48%
8	45.00	98	17	3.396#	77.25%

- included, * - invalid

Statistics:

Data: 5 Mins

EC50 Concentration: 61.38%
(95% Confidence Range: 37.14 to 101.4)
EC50 value was calculated from extrapolated data.
95% Confidence Factor: 1.653
Estimating Equation:
LOG C = 0.8712 x LOG G +1.788
Correction Factor: 1.016
Slope: 1.037
Coeff of Determination (R^2): 0.9034

Data: 15 Mins

Result Name:	RT121313VF		
Test Date/Time:	12/13/2013 1:22:05PM		
Sample Name:	Sample 1		
Test Name:	Basic Test		
Description:	Reference Toxicant	Instrument ID:	_MASTER
Toxicant:		Reagent Lot #:	
Test Location:		User ID:	MANAGER

EC50 Concentration: 21.60%
(95% Confidence Range: 18.55 to 25.15)
95% Confidence Factor: 1.164
Estimating Equation:
LOG C = 0.5534 x LOG G +1.334
Correction Factor: 0.7670
Slope: 1.747
Coeff of Determination (R^2): 0.9667

The contents of this report are private and confidential.

Printed: 12/30/2013 9:11:06AM **Signature:**

APPENDIX E – Chain-of Custody Forms

CHAIN OF CUSTODY

NewFields

Shipping: 4770 NE View Dr. Mailing: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6045, Fax: (360)297-6901

Destination Lab: Rainier Environmental	**Sample Originator:** NewFields	**Report Results To:**	**Phone:**
Destination Contact: Eric Tollefson	**Contact Name:** Bill Gardiner	**Contact Name:**	**Fax:**
Date: 12/11/2013	**Address:** See Above	**Address:**	**Email:**
Turn-Around-Time			
Project Name AT/YS	**Phone:**		**Invoicing To:**
	Fax:		**Comments or Special Instructions:**
Contract/PO:	**E-mail** bgardiner@newfields.com		

No.	Sample ID	Matrix	No. & Type of Container	Date & Time	Analysis: Microtox						Preservation	Sample Temp Upon Receipt	LAB ID
1	9	SS	1 glass	12/10/2013 1250	X						4 deg C	4.2	13-161
2	6	SS	1 glass	12/10/2013 1305	X						4 deg C	3.9	13-162
3	3	SS	1 glass	12/10/2013 1340	X						4 deg C	4.5	13-163
4	1	SS	1 glass	12/10/2013 1415	X						4 deg C	4.6	13-164
5	0	SS	1 glass	12/10/2013 1440	X						4 deg C	4.5	12-165
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:
Print Name: Collin Kay	Print Name: ERIC TOLLEFSON	Print Name:	Print Name:
Signature:	Signature: Eric Tollefson	Signature:	Signature:
Affiliation: NewFields	Affiliation: Rainier Environmental	Affiliation:	Affiliation:
Date/Time: 12/11/13 1005	Date/Time: 12/12/13 1200	Date/Time:	Date/Time:
Print Name:	Print Name:	Print Name:	Print Name:
Signature:	Signature:	Signature:	Signature:
Affiliation:	Affiliation:	Affiliation:	Affiliation:
Date/Time:	Date/Time:	Date/Time:	Date/Time:

Matrix Codes

FW = Fresh Water
WW = Waste Water
SB = Salt & Brackish Water
SS = Soil & Sediment
TS = plant & Animal Tissue
OT = Other

WHITE – return to originator • YELLOW – lab • PINK – retained by originator

Appendix D.3

Porewater TIE Test – Analytical Chemistry

Table of Contents: ARI Job XY02

Client: Newfields Northwest

Project: Yakima Steel

BE

Signature

February-12-2014

Date

Analytical Resources, Incorporated
Analytical Chemists and Consultants

February 13, 2014

Bill Gardiner
Newfields Northwest
4729 NE View Drive
Port Gamble, WA 98364

RE: Client Project: Yakima Steel
ARI Job No.: XY02

Dear Bill:

Please find enclosed the Chain-of-Custody record (COC), 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 data and associated raw data will be kept on file with ARI. Should you have any questions or problems, please feel free to contact me at any time.

Sincerely,

ANALYTICAL RESOURCES, INC.

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

cc: eFile XY02

Enclosures

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

Chain of Custody Documentation

ARI Job ID: XY02

XY02

CHAIN OF CUSTODY

NewFields

Shipping: 4770 NE View Dr. Mailing: P.O. Box 216
Port Gamble, WA. 98364
Tel: (360) 297-6045, Fax: (360)297-6901

Destination Lab: Analytical Resources Inc	**Sample Originator:** NewFields	**Report Results To:** NewFields	Phone
Destination Contact: Cheronne Oreiro	Contact Name: Bill Gardiner	Contact Name: Bill Gardiner	Fax
Date: 2/3/14	Address	Address	Email
Turn-Around-Time: Standard			
Project Name: Yakima Steel	Phone	**Analysis**	**Invoicing To:**
	Fax		**Comments or Special Instructions:**
Contract/PO	E-mail		

No.	Sample ID	Matrix	No. & Type of Container	Date & Time	Cadmium	Zinc	Manganese	Lead			Preservation	Sample Temp Upon Receipt	LAB ID
1	WETSED-1	FW	1 Glass	2/3/2014 14:00	x	x	x	x			HCl		
2	WS-1 SIR 300	FW	1 Glass	2/3/2014 14:00	x	x	x	x			HCl		
3	WS-1 EDTA-low	FW	1 Glass	2/3/2014 14:00	x	x	x	x			HCl		
4	WS-1 EDTA- high	FW	1 Glass	2/3/2014 14:00	x	x	x	x			HCl		
5	WS-1 C18	FW	1 Glass	2/3/2014 14:00	x	x	x	x			HCl		
6	WS-1 Filtered	FW	1 Glass	2/3/2014 14:00	x	x	x	x			HCl		
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Relinquished by:	Recieved by:	Relinquished by:	Recieved by:	Matrix Codes
Print Name: Collin Ray	Print Name A. Volgardsen	Print Name	Print Name.	FW = Fresh Water
Signature:	Signature:	Signature:	Signature:	WW = Waste Water
Affiliation: NewFields	Affiliation: ARI	Affiliation	Affiliation:	SB = Salt & Brackish Water
Date/Time: 2/3/14 1426	Date/Time: 2/4/14 1020	Date/Time:	Date/Time:	SS = Soil & Sediment
Print Name:	Print Name:	Print Name.	Pnnt Name	TS = plant & Animal Tissue
Signature:	Signature.	Signature:	Signature:	OT = Other
Affiliation	Affiliation:	Affiliation.	Affiliation	
Date/Time.	Date/Time:	Date/Time.	Date/Time	

WHITE – return to originator • YELLOW – lab • PINK – retained by originator

XY02 : 2SAX

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: Newfields
Project Name: Yakima Steel
COC No(s): _____ (NA)
Delivered by: (Fed-Ex) UPS Courier Hand Delivered Other: _____
Assigned ARI Job No: XY402
Tracking No. 7978 0417 1370 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)
Time: 1020 0.8 ___ ___ ___ ___

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

Cooler Accepted by: AV Date: 2/4/14 Time: 1020

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)	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: _____

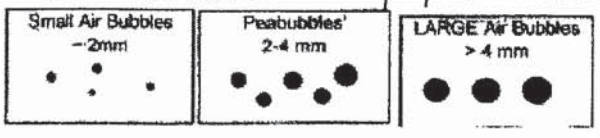
Samples Logged by: AV Date: 2/4/14 Time: 1132

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

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:
Samples received in 2oz wide mouth jars, preserved with TKI

By: AV Date: 2/4/14



Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

XY02 : 00004

PRESERVATION VERIFICATION 02/04/14
Page 1 of 1

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: **XY02**

Inquiry Number: NONE
Analysis Requested: 02/04/14
Contact: Gardiner, Bill
Client: Newfields Northwest
Logged by: AV
Sample Set Used: Yes-481
Validatable Package: Lv4
Deliverables:

PC: Cheronne
VTSR: 02/04/14

Project #:
Project: Yakima Steel
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
14-1901 **XY02A**	WETSED-1						*TOT Pass												<2	MP2592	2mL	2.04.13 DM
14-1902 **XY02B**	WS-1 SIR 300						*TOT Pass												↓	↓	↓	↓
14-1903 **XY02C**	WS-1 EDTA-LOW						*TOT Pass															
14-1904 **XY02D**	WS-1 EDTA-HIGH						TOT Fail															
14-1905 **XY02E**	WS-1 C18						TOT Pass															
14-1906 **XY02F**	WS-1 FILTERED						TOT Fail															

*Weak

Checked By AV Date 2/4/14

XY02 : 25005

Case Narrative, Data Qualifiers, Control Limits

ARI Job ID: XY02

ANALYTICAL
RESOURCES
INCORPORATED

Case Narrative

Client: Newfields
Project: Yakima Steel
ARI Job No.: XY02

Sample Receipt

Six water samples were received on February 4, 2014 under ARI job XY02. The cooler temperature measured by IR thermometer following ARI SOP was 0.8°C. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

Metals by SW6010C

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

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

XY02 : 00007

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: XY02
Client: Newfields Northwest
Project Event: N/A
Project Name: Yakima Steel

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	WETSED-1	XY02A	14-1901	Water	02/03/14 14:00	02/04/14 10:20
2.	WS-1 SIR 300	XY02B	14-1902	Water	02/03/14 14:00	02/04/14 10:20
3.	WS-1 EDTA-LOW	XY02C	14-1903	Water	02/03/14 14:00	02/04/14 10:20
4.	WS-1 EDTA-HIGH	XY02D	14-1904	Water	02/03/14 14:00	02/04/14 10:20
5.	WS-1 C18	XY02E	14-1905	Water	02/03/14 14:00	02/04/14 10:20
6.	WS-1 FILTERED	XY02F	14-1906	Water	02/03/14 14:00	02/04/14 10:20

XY02 : 00008

Quality Control Parameters for Metals Analysis-ICP-OES EPA Methods 200.7 and 6010C

	Aqueous Samples[2]			Spike Recovery		RPD[5]	Solids[3]	Tissue[4]
Analyte	DL[1] µg/L	LOD[1] µg/L	LOQ[1] µg/L	Matrix Spike	LCS		LOQ mg/kg	LOQ mg/kg
Aluminum	7.57	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Antimony	6.28	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Arsenic	3.33	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Barium	1.33	1.5	**3.0**	75 – 125	80 – 120	≤ 20	**0.3**	**0.06**
Beryllium	0.16	0.5	**1.0**	75 – 125	80 – 120	≤ 20	**0.1**	**0.02**
Boron	7.39	10	**20**	75 – 125	80 – 120	≤ 20	**2.0**	**0.4**
Cadmium	0.18	0.5	**2.0**	75 – 125	80 – 120	≤ 20	**0.2**	**0.04**
Calcium	11.27	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Chromium	1.24	2.5	**5.0**	75 – 125	80 – 120	≤ 20	**0.5**	**0.1**
Cobalt	0.27	1.5	**3.0**	75 – 125	80 – 120	≤ 20	**0.3**	**0.06**
Copper	0.92	1.0	**2.0**	75 – 125	80 – 120	≤ 20	**0.2**	**0.04**
Iron	7.50	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Lead	1.55	10	**20**	75 – 125	80 – 120	≤ 20	**2.0**	**0.4**
Magnesium	9.61	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Manganese	0.28	0.5	**1.0**	75 – 125	80 – 120	≤ 20	**0.1**	**0.02**
Molybdenum	0.79	2.5	**5.0**	75 – 125	80 – 120	≤ 20	**0.5**	**0.1**
Nickel	3.86	5.0	**10**	75 – 125	80 – 120	≤ 20	**1.0**	**0.2**
Potassium	65.70	250	**500**	75 – 125	80 – 120	≤ 20	**50**	**10**
Selenium	4.99	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Silicon	8.17	30	**60**	75 – 125	80 – 120	≤ 20	**(6)**	**(6)**
Silver	0.43	1.5	**3.0**	75 – 125	80 – 120	≤ 20	**0.3**	**0.06**
Sodium	11.35	250	**500**	75 – 125	80 – 120	≤ 20	**50**	**10**
Strontium	0.09	1.0	**1.0**	75 – 125	80 – 120	≤ 20	**0.1**	**0.02**
Thallium	3.10	25	**50**	75 – 125	80 – 120	≤ 20	**5.0**	**1.0**
Tin	1.41	5.0	**10**	75 – 125	80 – 120	≤ 20	**1.0**	**0.2**
Titanium	2.11	2.5	**5.0**	75 – 125	80 – 120	≤ 20	**0.5**	**0.1**
Vanadium	0.27	1.5	**3.0**	75 – 125	80 – 120	≤ 20	**0.3**	**0.06**
Zinc	1.45	5.0	**10**	75 – 125	80 – 120	≤ 20	**1.0**	**0.2**

(1) Detection Limit (DL), Limit of Detection Limit (LOD) and Limit of Quantitation (LOQ) as defined in ARI SOP 1018S
(2) 50 mL sample and 50 mL final volume
(3) Solids LOQ based on 100% solids using 1.0 g sample with 100 mL final volume.
(4) Tissue is reported on an "as received" (wet weight) basis using 2.5 g sample with 50 mL final volume.
(5) Relative Percent Difference between analytes in replicate analyzes. If C_O and C_D are the concentrations of the original and duplicate respectively then $$RPD = \frac{|C_O - C_D|}{\frac{C_O + C_D}{2}} x100$$
(6) ARI does not analyze for Silicon in solids or tissue samples

XY02 : 00009

Metals Analysis
Report and Summary QC Forms

ARI Job ID: XY02

Cover Page

INORGANIC ANALYSIS DATA PACKAGE

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

SDG: XY02

CLIENT ID	ARI ID	ARI LIMS ID	REPREP
WETSED-1	XY02A	14-1901	
PBW	XY02MB1	14-1901	
LCSW	XY02MB1SPK	14-1901	
WS-1 SIR 300	XY02B	14-1902	
WS-1 EDTA-LOW	XY02C	14-1903	
WS-1 EDTA-HIGH	XY02D	14-1904	
WS-1 C18	XY02E	14-1905	
WS-1 FILTERED	XY02F	14-1906	

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: 2/11/14 Title: Inorganics Director

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WETSED-1
SAMPLE

Lab Sample ID: XY02A
LIMS ID: 14-1901
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: 02/03/14
Date Received: 02/04/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	**7439-96-5**	**Manganese**	0.001	**4.49**	
3010A	02/06/14	6010C	02/10/14	**7440-66-6**	**Zinc**	0.01	**28.3**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WS-1 SIR 300
SAMPLE

Lab Sample ID: XY02B
LIMS ID: 14-1902
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: 02/03/14
Date Received: 02/04/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	**7439-96-5**	**Manganese**	0.001	**0.053**	
3010A	02/06/14	6010C	02/10/14	**7440-66-6**	**Zinc**	0.01	**0.13**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WS-1 EDTA-LOW SAMPLE

Lab Sample ID: XY02C
LIMS ID: 14-1903
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: 02/03/14
Date Received: 02/04/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	**7439-96-5**	**Manganese**	0.001	**4.18**	
3010A	02/06/14	6010C	02/10/14	**7440-66-6**	**Zinc**	0.01	**26.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS

Sample ID: WS-1 EDTA-HIGH SAMPLE

Lab Sample ID: XY02D
LIMS ID: 14-1904
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: 02/03/14
Date Received: 02/04/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	**7439-96-5**	**Manganese**	0.001	**4.36**	
3010A	02/06/14	6010C	02/10/14	**7440-66-6**	**Zinc**	0.01	**26.9**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: WS-1 C18**
Page 1 of 1 **SAMPLE**

Lab Sample ID: XY02E
LIMS ID: 14-1905
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: 02/03/14
Date Received: 02/04/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	**7439-96-5**	**Manganese**	0.001	**4.25**	
3010A	02/06/14	6010C	02/10/14	**7440-66-6**	**Zinc**	0.01	**26.0**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WS-1 FILTERED SAMPLE

Lab Sample ID: XY02F
LIMS ID: 14-1906
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: 02/03/14
Date Received: 02/04/14

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	**7439-96-5**	**Manganese**	0.001	**4.37**	
3010A	02/06/14	6010C	02/10/14	**7440-66-6**	**Zinc**	0.01	**25.8**	

U-Analyte undetected at given RL
RL-Reporting Limit

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS **Sample ID: LAB CONTROL**

Lab Sample ID: XY02LCS
LIMS ID: 14-1901
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Cadmium	6010C	0.524	0.500	105%	
Lead	6010C	2.04	2.00	102%	
Manganese	6010C	0.509	0.500	102%	
Zinc	6010C	0.53	0.50	106%	

Reported in mg/L

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

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Sample ID: METHOD BLANK

Lab Sample ID: XY02MB
LIMS ID: 14-1901
Matrix: Water
Data Release Authorized:
Reported: 02/11/14

QC Report No: XY02-Newfields Northwest
Project: Yakima Steel

Date Sampled: NA
Date Received: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	RL	mg/L	Q
3010A	02/06/14	6010C	02/10/14	7440-43-9	Cadmium	0.002	0.002	U
3010A	02/06/14	6010C	02/10/14	7439-92-1	Lead	0.02	0.02	U
3010A	02/06/14	6010C	02/10/14	7439-96-5	Manganese	0.001	0.001	U
3010A	02/06/14	6010C	02/10/14	7440-66-6	Zinc	0.01	0.01	U

U-Analyte undetected at given RL
RL-Reporting Limit

Calibration Verification

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

UNITS: ug/L

SDG: XY02

ANALYTE	EL	M	RUN	ICVTV	ICV	%R	CCVTV	CCV1	%R	CCV2	%R	CCV3	%R	CCV4	%R	CCV5	%R
Cadmium	CD	ICP	IP021071	1000.0	1021.02	**102.1**	1000.0	1037.66	**103.8**	1031.39	**103.1**	1028.76	**102.9**				
Lead	PB	ICP	IP021071	2000.0	1994.99	**99.7**	2000.0	1984.89	**99.2**	2021.14	**101.1**	2013.35	**100.7**				
Manganese	MN	ICP	IP021071	1000.0	1014.11	**101.4**	1000.0	974.80	**97.5**	979.42	**97.9**	974.61	**97.5**				
Zinc	ZN	ICP	IP021071	1000.0	1027.58	**102.8**	1000.0	1031.52	**103.2**	1034.46	**103.4**	1032.06	**103.2**				

Control Limits: Mercury 80-120; Other Metals 90-110

XY02 : 09/09/25

CRDL Standard

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

UNITS: ug/L

SDG: XY02

ANALYTE	EL	M	RUN	CRA/I TV	CR-1	%R	CR-2	%R	CR-3	%R	CR-4	%R	CR-5	%R	CR-6	%R
Cadmium	CD	ICP	IP021071	2.0	2.23	**111.5**										
Lead	PB	ICP	IP021071	20.0	21.04	**105.2**										
Manganese	MN	ICP	IP021071	1.0	1.13	**113.0**										
Zinc	ZN	ICP	IP021071	10.0	9.70	**97.0**										

XY02 : 59022

Control Limits: no control limits have been established by the EPA at this time.

Calibration Blanks

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

UNITS:ug/L

SDG: XY02

ANALYTE	EL	METH	RUN	CRDL	IDL	ICB	C	CCB1	C	CCB2	C	CCB3	C	CCB4	C	CCB5	C
Cadmium	CD	ICP	IP021071	5.0	2.0	2.0	U	2.0	U	2.0	U	2.0	U				
Lead	PB	ICP	IP021071	3.0	20.0	20.0	U	20.0	U	20.0	U	20.0	U				
Manganese	MN	ICP	IP021071	15.0	1.0	1.0	U	1.0	U	1.0	U	1.0	U				
Zinc	ZN	ICP	IP021071	20.0	10.0	10.0	U	10.0	U	10.0	U	10.0	U				

22005 : 20AX

ICP Interference Check Sample

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

SDG: XY02

ICS SOURCE: I.V.

RUNID: IP021071

INSTRUMENT ID: OPTIMA ICP 2

UNITS: ug/L

ANALYTE	ICSA TV	ICSAB TV	ICSA1	ICSAB1	%R	ICSA2	ICSAB2	%R	ICSA3	ICSAB3	%R
Aluminum	200000	200000	198625.1	199999.1	**100.0**						
Antimony		1000	7.2	1028.7	**102.9**						
Arsenic		1000	33.1	1045.1	**104.5**						
Barium		1000	-3.3	1011.1	**101.1**						
Beryllium		1000	0.1	1022.1	**102.2**						
Boron			-8.2	-8.9							
Cadmium		1000	0.7	1046.6	**104.7**						
Calcium	100000	100000	100159.7	100768.2	**100.8**						
Chromium		1000	0.6	1022.8	**102.3**						
Cobalt		1000	2.6	975.0	**97.5**						
Copper		1000	0.3	1033.8	**103.4**						
Iron	200000	200000	197981.8	198919.4	**99.5**						
Lead		1000	-11.6	959.9	**96.0**						
Magnesium	100000	100000	100975.9	98344.0	**98.3**						
Manganese		1000	-0.1	957.3	**95.7**						
Molybdenum			5.2	6.0							
Nickel		1000	1.2	985.7	**98.6**						
Potassium			25.4	30.2							
Selenium		1000	28.1	1040.8	**104.1**						
Silicon			-20.7	-17.6							
Silver		1000	-0.6	1026.1	**102.6**						
Sodium			10.5	11.3							
Strontium			5.5	5.5							
Thallium		1000	29.2	976.1	**97.6**						
Tin			-16.2	-18.2							
Titanium			4.9	5.3							
Vanadium		1000	-1.8	966.5	**96.7**						
Zinc		1000	-0.7	986.4	**98.6**						

XY02 : 000023

IDLs and ICP Linear Ranges

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

SDG: XY02 UNITS: ug/L

ANALYTE	EL	METH	INSTRUMENT	WAVELENTH (nm)	GFA BACK-GROUND	CLP CRDL	RL	RL DATE	ICP LINEAR RANGE (ug/L)	ICP LR DATE
Cadmium	CD	ICP	OPTIMA ICP 2	228.80		5	2.0	4/1/2012	20000.0	1/3/2014
Lead	PB	ICP	OPTIMA ICP 2	220.35		3	20.0	4/1/2012	300000.0	1/3/2014
Manganese	MN	ICP	OPTIMA ICP 2	257.61		15	1.0	4/1/2012	30000.0	1/3/2014
Zinc	ZN	ICP	OPTIMA ICP 2	213.86		20	10.0	4/1/2012	100000.0	1/3/2014

ICP Interelement Correction Factors

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

SDG: XY02

IEC DATE: 1/3/2014

INSTRUMENT ID: OPTIMA ICP 2

ANALYTE	WAVELENGTH	AL	AS	BA	BE	CA	CD	CO	CR	CU	FE
Aluminum	308.22	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Antimony	206.84	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	13.0001730	0.0000000	0.0000000
Arsenic	188.98	0.0000000	0.0000000	0.0000000	0.0000000	0.1128300	0.0000000	-1.1418810	1.4701580	0.0000000	0.0000000
Barium	233.53	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.1914790	0.0000000	0.0000000	0.1344770
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Boron	249.67	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	2.1178670	0.0000000	0.0000000	0.0000000
Cadmium	228.80	0.0000000	5.1456370	0.0000000	0.0000000	0.0000000	0.0000000	0.1519640	0.0000000	0.0000000	0.0000000
Calcium	317.93	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.72	0.0000000	0.0000000	0.0000000	0.0000000	0.0095990	0.0000000	0.0000000	0.0000000	0.0000000	-0.0528610
Cobalt	228.62	0.0000000	0.0000000	0.0956050	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Copper	324.75	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.1731660	0.0000000	0.0000000	-0.0508090
Iron	273.96	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-1.3572290	0.0000000	0.0000000
Lead	220.35	-0.2628260	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-1.8955100	1.3683810	0.0527180
Magnesium	279.08	0.0000000	0.0000000	0.0000000	0.0000000	0.1322750	0.0000000	-1.6154620	-1.2018020	0.0000000	0.7412760
Manganese	257.61	0.0065340	0.0000000	0.0000000	0.0000000	0.0043550	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0132610	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Potassium	766.49	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.4704930	0.0000000	0.0000000	0.0000000
Silicon	288.16	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-3.8483140	0.0000000	-0.6009380	0.0000000	0.0000000
Silver	328.07	0.0000000	0.0000000	0.0000000	0.0000000	-0.0074910	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Sodium	589.59	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Thallium	190.80	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	5.8939530	0.4135750	0.0000000	-0.1349480
Tin	189.93	0.0000000	0.0000000	0.0000000	0.0000000	-0.1372110	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Titanium	334.90	0.0000000	0.0000000	0.0000000	0.0000000	0.0738540	0.0000000	0.0000000	0.1910190	0.0000000	0.0000000
Vanadium	292.40	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-4.1255090	0.0000000	0.0607850
Zinc	206.20	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.2680380	0.0000000	0.0000000

ICP Interelement Correction Factors

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

SDG: XY02

IEC DATE: 1/3/2014

INSTRUMENT ID: OPTIMA ICP 2

ANALYTE	WAVELENGTH	MG	MN	MO	NI	PB	SB	TI	TL	V	ZN
Aluminum	308.22	0.0000000	0.0000000	15.7116050	0.0000000	0.0000000	0.0000000	2.0154950	0.0000000	14.6504130	0.0000000
Antimony	206.84	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.7865220	0.0000000	-3.6308690	0.0000000
Arsenic	188.98	0.0000000	0.0000000	3.3640920	0.0000000	0.0000000	0.0000000	-35.7069030	0.0000000	0.0000000	0.0000000
Barium	233.53	0.0000000	0.0000000	0.0000000	0.1263190	0.0000000	0.0000000	0.0000000	0.0000000	0.2049710	0.0000000
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0109650	0.0000000	0.2471980	0.0000000
Boron	249.67	0.0000000	0.0000000	-1.1300970	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	228.80	0.0000000	0.0000000	0.0000000	-0.9924980	0.0000000	0.0000000	0.0000000	0.0000000	0.0519140	0.0000000
Calcium	317.93	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.72	0.0846880	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.3711990	0.0000000
Cobalt	228.62	0.0000000	0.0000000	-0.1573840	0.1604620	0.0000000	0.0000000	1.7865010	0.0000000	0.0000000	0.0000000
Copper	324.75	0.0050268	0.0000000	0.3207980	0.0000000	0.0000000	0.0000000	0.1968290	0.0000000	0.0000000	0.0000000
Iron	273.96	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	8.0715790	0.0000000
Lead	220.35	0.0000000	0.0000000	0.0000000	0.1183620	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	279.08	0.0000000	0.0000000	-5.0356720	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	257.61	0.0030740	0.0000000	0.0000000	0.0000000	-0.2132560	0.0000000	0.0000000	0.0000000	-0.0238460	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.5233870	0.0000000	0.4243640	0.0000000	0.0000000
Potassium	766.49	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.6221340	0.0000000
Silicon	288.16	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.07	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.2593400	0.0000000
Sodium	589.59	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	265.0683530	0.0000000	0.0000000	288.8015530
Thallium	190.80	0.0000000	0.0000000	-1.6229180	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	3.6063050	0.0000000
Tin	189.93	0.0000000	0.0000000	0.0000000	0.0000000	-0.0356520	-0.5555490	-0.1890930	0.0000000	0.0000000	0.0000000
Titanium	334.90	0.0000000	0.0000000	0.9536400	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Vanadium	292.40	0.0000000	-0.1515920	-0.5364060	0.0000000	0.0000000	0.0000000	0.5783020	0.0000000	0.0000000	0.0000000
Zinc	206.20	0.0000000	0.0000000	0.2492000	0.0000000	-0.0717780	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

SDG: XY02

Preparation Log

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel

SDG: XY02

ANALYSIS METHOD: ICP

ARI PREP CODE: TWC

PREPDATE: 2/6/2014

CLIENT ID	ARI ID	MASS (g)	INITIAL VOLUME (mL)	FINAL VOLUME (mL)
WETSED-1	XY02A	0.000	25.0	25.0
WS-1 SIR 300	XY02B	0.000	25.0	25.0
WS-1 EDTA-LOW	XY02C	0.000	25.0	25.0
WS-1 EDTA-HIGH	XY02D	0.000	25.0	25.0
WS-1 C18	XY02E	0.000	25.0	25.0
WS-1 FILTERED	XY02F	0.000	25.0	25.0
PBW	XY02MB1	0.000	25.0	25.0
LCSW	XY02MB1SPK	0.000	25.0	25.0

Analysis Run Log

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: Yakima Steel | INSTRUMENT ID: OPTIMA ICP 2 | START DATE: 2/10/2014

SDG: XY02 | RUNID: IP021071 | METHOD: ICP | END DATE: 2/10/2014

CLIENT ID	ARI ID	DIL.	TIME	%R	AG	AL	AS	B	BA	BE	CA	CD	CO	CR	CU	FE	HG	K	MG	MN	MO	NA	NI	PB	SB	SE	SI	SN	TI	TL	U	V	ZN
S0	S0	1.00	10453									X								X				X									X
S2	S2	1.00	10493									X								X													
S3	S3	1.00	10512																					X									X
S4	S4	1.00	10534																														
S5	S5	1.00	10555																														
ICV	ICV	1.00	10590									X								X				X									X
ICB	ICB	1.00	11030									X								X				X									X
CRI	CRII	1.00	11070									X								X				X									X
ICSA	ICSAI	1.00	11110									X								X				X									X
ICSAB	ICSABI	1.00	11152									X								X				X									X
ZZZZZZ	DICHECK	1.00	11203																														
CCV	CCV1	1.00	11243									X								X				X									X
CCB	CCB1	1.00	11283									X								X				X									X
ZZZZZZ	XW40MB1	2.00	11323																														
ZZZZZZ	XW40A-L	10.00	11363																														
ZZZZZZ	XW40A	2.00	11403																														
ZZZZZZ	XW40ADUP	2.00	11442																														
ZZZZZZ	XW40ASPK	2.00	11482																														
ZZZZZZ	ZZZZZZ	2.00	11520																														
ZZZZZZ	XW40B	2.00	11555																														
ZZZZZZ	XW40MB1SPK	2.00	11593																														
CCV	CCV2	1.00	12033									X								X				X									X
CCB	CCB2	1.00	12073									X								X				X									X
PBW	XY02MB1	1.00	12113									X								X				X									X
ZZZZZZ	XW40MB1	2.00	12153																														
WETSED-1	XY02A	1.00	12193																														
WS-1 SIR 300	XY02B	1.00	12243									X								X				X									X
WS-1 EDTA-LOW	XY02C	1.00	12285									X								X				X									X
WS-1 EDTA-HIGH	XY02D	1.00	12331									X								X				X									X
WS-1 C18	XY02E	1.00	12372									X								X				X									X
WS-1 FILTERED	XY02F	1.00	12414									X								X				X									X
WETSED-1	XY02A	1.00	12455									X								X				X									X
LCSW	XY02MB1SPK	1.00	12501									X								X				X									X
CCV	CCV3	1.00	12541									X								X				X									X
CCB	CCB3	1.00	12581									X								X				X									X

FORM XIV

XY02 : 00028

Analytical Resources, Incorporated
Analytical Chemists and Consultants

SPIKING LOG

Analyst: TJM **Final Volume** 25 **Sample ID** XY02 MBSPK

Date: 2-06-14 **Final Volume (Hg):**

	Prepcode.	TNC		
	Spike Solution:	ICP Routine	ICP No GFA	GFA
	Standard No .	81845		
	Vol Added (mL):	0.25		
	Ag	50		2.0
S	Al	200	200	
T	As	200		10
O	Ba	200	200	
C	Be	50	50	
K	Ca	1000	1000	
	Cd	50 ✓		2.0
	Co	50	50	
C	Cr	50	50	
O	Cu	50	50	
N	Fe	200	200	
C	K	1000	1000	
E	Mg	1000	1000	
N	Mn	50 ✓	50	
T	Na	1000	1000	
R	Ni	50	50	
A	Pb	200 ✓		10
T	Se	200		10
I	Sr	50	50	
O	Tl	200		10
N	V	50	50	
	Zn	50 ✓	50	

	ICP-MS #1	ICP-MS #2	ICP-MS Minerals
Ag	25		
Al			500
As	25		
Ba	25		
Be	25		
Ca			500
Cd	25		
Co	25		
Cr	25		
Cu	25		
Fe			500
K			500
Mg			500
Mn	25		
Mo		25	
Na			500
Ni	25		
Pb	25		
Sb		25	
Se	80		
Tl	25		
U	25		
V	25		
Zn	80		

Element	Prepcode	Analysis	Stock Conc	Stock Added	Std No
Hg		CVA	1.0		
Hg MBSPK		CVA	1.0		
Sb		ICP	2000		
Sb		GFA	100		
B		ICP	500		
Mo		ICP	500		
Si		ICP	10000		
Sn		ICP	500		
Ti		ICP	2000		

Additional Elements:

Element	Prepcode	Analysis	Stock Conc.	Stock Added	Std. No

XY02 : 00225

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Digestion Log

Analyst: DM Date: 02·06·14 Time: 0815

Matrix: Water Block ID: #7 Block Temp: 90°C Thermometer: MP 28

ARI Sample ID	Btl #	pH<2	Prep Code: TWC Initial ~~Wt (g)~~ Vol (mL)	Prep Code: TWC Final Vol (mL)	Prep Code: Initial Wt (g) Vol (mL)	Prep Code: Final Vol (mL)	Comments
XW36R A	7	✓	25.0	25.0			
" B	7	✓					
" C	7	✓					
" D	7	✓					
" E	7	✓					
" EDUP	7	✓					
" ESPK	7	✓					
" F	7	✓					
" G	6	✓					
" H	7	✓					
" MB1	—	✓					
" MB1SPK	—	✓					
XY24 A	C	✓					
" B	C	✓					
" MB1	—	✓					
" MB1SPK	—	✓					
XY02 A	1	—					Preserved in Lab
" B	1	—					
" C	1	—					
" D	1	—					
" E	1	—					
" F	1	—					
" MB1	—	—					
" MB1SPK	—	—	25.0	25.0			Preserved in Lab
				2-06-14	DM		

Chemical/Reagent ID: HNO3: C0082 HCl: C0454 Tube Lot # 130877
MP2592

XY02 : 26228

ANALYTICAL RESOURCES INCORPORATED

Metals Data Review Checklist

Method: (ICP) ICP-MS GFA CVA **Analysis Date:** 2-10-14

ICP2	Analyst BA 2-11-14	Peer 2/11/14	Comment
Logbook:			
Analyst, Date, Method info	✓	✓	
Sample ID's	✓	✓	
Standard/QC solution ID's recorded	✓	✓	
Prep codes	✓	✓	
Dilution factors	✓	✓	
Crossouts/Corrections/Deletions	✓	✓	
Calibration:			
Blank & Standard intensities	✓	✓	
Standard deviations	✓	✓	
Curve fit	✓	✓	
Calibration Verification:			
ICV/CCV	✓	✓	
ICB/CCB	✓	✓	
Samples:			
RSD's & SD's	✓	✓	See log
Internal Standards	✓	✓	
Carry-over	✓	✓	
Method QC:			
CRI/CRA	✓	✓	
ICSA/ICSAB	✓	✓	
Post Spikes/Serial Dilutions	✓	✓	
Analytic Spikes	—	—	
Matrix QC:			
SRM/LCS	✓	✓	
Matrix Spikes	✓	✓	
Matrix Duplicates	✓	✓	XW40
Method Blanks	✓	✓	XW40
Data Distribution:			
Requested elements/isotope identified	✓	✓	
Correct samples identified for distribution	✓	✓	
Raw data match distributed data	✓	✓	
Data filename correct	✓	✓	
Necessary Analysts Notes and CAF's	✓	✓	AN-XW40 CAF-XW40

Analytical Resources, Incorporated
Analytical Chemists and Consultants

SAMPLE RUN LOG-ICP-OES-02
Perkin Elmer OPTIMA 7300
Serial No. – 077C8121202

IEC Date: 1-3-14 Analysis Date: 2-10-14 Analyst: BA

LR Date: 1-3-14 Page: 1 of 4

All corrections made by analyst unless otherwise noted. BA 2-10-14

Edit Label	Delete Data	ARI Sample ID	Prep. Code	Dilution	Comments
		STD 0			C0531
		2			C0556
		3			C0557
		4			C0558
		5			C0560
		ICV			B25c7
		ICB			STD0
		CRI			C0538
		ICSA			C0532
		ICSAB			C0533
		DI Check			
		CCV1			ICV
		CCB1			STD0
		XW40 MB1	SWC	2	Zn↑ (0.01420 mg/L) (A.N.)
		A-L		10	
		A		2	CAF
		ADUP			Cu, Zn↑ RPD Pb > RL dif.
		ASPK			
ZZZ		~~ARSI~~ ZZZZZZ			
		B			
		MB1SPK			
		CCV2			
		CCB2			
		XY02 MB1	TWC		

XY02 : 00032

Analytical Resources, Incorporated
Analytical Chemists and Consultants

SAMPLE RUN LOG-ICP-OES-02
Perkin Elmer OPTIMA 7300
Serial No. – 077C8121202

IEC Date: — Analysis Date: 2-10-14 Analyst: BA

LR Date: — Page: 2 of 4

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep. Code	Dilution	Comments
	✓	XW40 MB1	SWC	2	Zn↑ confirmed
	✓	XY02 A	TWC		Did not inject
		B			
		C			
		D			
		E			
		F			
		A MBSPK		✓	
		CCV3			
		CCB3			E,J (XW40, XY02)
		XW92 MB	TWC	✓	
		ADUP			
		A		✓	
		ASPK			C≤ STL
		B			
		C	BA 2-11-14		
		MBSPK			
		CCV4			
		CCB4			
		XY03 MB2	DMN		
		F			
		G			
		H		✓	
		EDUP			

XY02 : 00033

Analysis Begun

Start Time: 2/10/2014 9:07:27 AM
Logged In Analyst: Metals
Spectrometer: Optima 7300 DV, S/N 077C8121202
Plasma On Time: 2/10/2014 8:20:12 AM
Technique: ICP Continuous
Autosampler: ESI

Sample Information File: C:\pe\metals\Sample Information\BLKS.sif
Batch ID:
Results Data Set: I2140210
Results Library: C:\Documents and Settings\All Users\PerkinElmer\ICP\Data\Results\Results.mdb

Method Loaded
Method Name: 7300bcESI2FAST
IEC File: IEC010314.iec
Method Description: 12Axial Elements
Method Last Saved: 8/13/2012 7:13:22 AM
MSF File:

Analyte	Calibration Equation	Processing	View	Internal Standard	IEC
Ag 328.068	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Al 308.215	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
As 188.979	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
B 249.677	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Ba 233.527	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Be 313.042	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Ca 317.933	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Cd 228.802	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Co 228.616	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Cr 267.716	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Cu 324.752	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Fe 273.955	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
K 766.490	Lin Thru 0	Peak Area	Radial	ScR 361.383	No
Mg 279.077	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Mn 257.610	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Mo 202.031	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Na 589.592	Lin Thru 0	Peak Area	Radial	ScR 361.383	No
Na 330.237	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Ni 231.604	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Pb 220.353	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Sb 206.836	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Se 196.026	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Si 288.158	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Sn 189.927	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Sr 421.552	Lin Thru 0	Peak Area	Radial	ScR 361.383	No
Ti 334.903	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
Tl 190.801	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
V 292.402	Lin Thru 0	Peak Area	Axial	ScA 357.253	Yes
Zn 206.200	Lin Thru 0	Peak Area	Radial	ScR 361.383	Yes
ScA 357.253	Lin, Calc Int	Peak Area	Axial	n/a	n/a
ScR 361.383	Lin, Calc Int	Peak Area	Radial	n/a	n/a

Sequence No.: 1
Sample ID: B1
Autosampler Location: 1
Date Collected: 2/10/2014 9:07:33 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: B1

Analyte	Back Pressure	Flow
All	197.0 kPa	0.75 L/min

Mean Data: B1

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std Dev.	Sample Conc.	Sample Units	Sample Std.Dev.	Sample RSD
ScA 357.253	11165.4	100.0	%	0.64				0.64%
ScR 361.383	-134.6	100.0	%	44.40				44.40%
Ag 328.068†	1009.6						54.67	5.42%
Al 308.215†	107.2						67.18	62.67%
As 188.979†	-12.2						2.07	17.01%

BA
2/10/14

XY02 : 00038

Analysis Begun

Start Time: 2/10/2014 10:45:36 AM
Logged In Analyst: Metals
Spectrometer: Optima 7300 DV, S/N 077C8121202
Plasma On Time: 2/10/2014 9:56:43 AM
Technique: ICP Continuous
Autosampler: ESI

Sample Information File: C:\pe\metals\Sample Information\CRISETMON.sif
Batch ID:
Results Data Set: I2140210
Results Library: C:\Documents and Settings\All Users\PerkinElmer\ICP\Data\Results\Results.mdb

Sequence No.: 1
Sample ID: Calib Blank 1
Autosampler Location: 1
Date Collected: 2/10/2014 10:45:38 AM
Data Type: Original

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc.	Calib Units
ScA 357.253	2101497.7	10278.62	0.49%	100.0	%
ScR 361.383	228142.8	1529.98	0.67%	100.0	%
Ag 328.068†	960.5	41.70	4.34%	[0.00]	mg/L
Al 308.215†	85.4	1.85	2.17%	[0.00]	mg/L
As 188.979†	-14.2	2.44	17.17%	[0.00]	mg/L
B 249.677†	-1.0	1.54	157.08%	[0.00]	mg/L
Ba 233.527†	33.1	1.78	5.39%	[0.00]	mg/L
Be 313.042†	685.2	3.75	0.55%	[0.00]	mg/L
Ca 317.933†	-35.1	5.99	17.08%	[0.00]	mg/L
Cd 228.802†	179.0	2.29	1.28%	[0.00]	mg/L
Co 228.616†	-135.9	5.64	4.15%	[0.00]	mg/L
Cr 267.716†	-66.4	2.49	3.75%	[0.00]	mg/L
Cu 324.752†	2781.8	30.19	1.09%	[0.00]	mg/L
Fe 273.955†	-58.3	0.91	1.55%	[0.00]	mg/L
K 766.490†	330.0	51.87	15.72%	[0.00]	mg/L
Mg 279.077†	45.2	3.58	7.91%	[0.00]	mg/L
Mn 257.610†	5.8	2.30	39.45%	[0.00]	mg/L
Mo 202.031†	70.9	2.90	4.08%	[0.00]	mg/L
Na 589.592†	-526.1	23.26	4.42%	[0.00]	mg/L
Na 330.237†	-16.7	5.19	31.13%	[0.00]	mg/L
Ni 231.604†	21.0	5.21	24.78%	[0.00]	mg/L
Pb 220.353†	-29.7	3.23	10.88%	[0.00]	mg/L
Sb 206.836†	34.5	5.06	14.65%	[0.00]	mg/L
Se 196.026†	-47.1	6.54	13.87%	[0.00]	mg/L
Si 288.158†	-7.9	1.66	21.09%	[0.00]	mg/L
Sn 189.927†	-11.2	1.40	12.52%	[0.00]	mg/L
Sr 421.552†	107.1	32.06	29.94%	[0.00]	mg/L
Ti 334.903†	109.6	13.11	11.96%	[0.00]	mg/L
Tl 190.801†	-32.9	2.26	6.86%	[0.00]	mg/L
V 292.402†	186.7	4.28	2.29%	[0.00]	mg/L
Zn 206.200†	-18.5	0.61	3.28%	[0.00]	mg/L

Sequence No.: 2
Sample ID: STD2
Autosampler Location: 2
Date Collected: 2/10/2014 10:49:38 AM
Data Type: Original

Nebulizer Parameters: STD2

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: STD2

	Mean Corrected				Calib

Analyte	Intensity	Std.Dev.	RSD	Conc.	Units
ScA 357.253	2071341.0	4114.68	0.20%	98.56	%
ScR 361.383	223794.1	662.71	0.30%	98.09	%
Ba 233.527†	45232.3	366.51	0.81%	[10]	mg/L
Cd 228.802†	185149.9	152.55	0.08%	[10]	mg/L
Co 228.616†	292414.1	106.35	0.04%	[10]	mg/L
Cr 267.716†	53866.9	83.81	0.16%	[10]	mg/L
Cu 324.752†	2089385.1	4288.01	0.21%	[10]	mg/L
Mn 257.610†	301592.1	821.16	0.27%	[10]	mg/L
V 292.402†	1172250.2	2109.98	0.18%	[10]	mg/L

Sequence No.: 3
Sample ID: STD3
Autosampler Location: 3
Date Collected: 2/10/2014 10:51:24 AM
Data Type: Original

Nebulizer Parameters: STD3

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: STD3

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc.	Units
ScA 357.253	2081210.2	15691.30	0.75%	99.03	%
ScR 361.383	226740.3	868.71	0.38%	99.39	%
Ag 328.068†	191475.1	319.59	0.17%	[1.0]	mg/L
As 188.979†	11083.9	120.38	1.09%	[10]	mg/L
B 249.677†	45895.3	159.03	0.35%	[10]	mg/L
Be 313.042†	2006368.8	7749.13	0.39%	[5.0]	mg/L
Na 589.592†	519566.9	405.90	0.08%	[50]	mg/L
Ni 231.604†	28871.0	165.58	0.57%	[10]	mg/L
Pb 220.353†	69578.9	750.60	1.08%	[10]	mg/L
Se 196.026†	12086.1	164.34	1.36%	[10]	mg/L
Sr 421.552†	3246855.1	14962.03	0.46%	[5]	mg/L
Tl 190.801†	14399.8	157.47	1.09%	[10]	mg/L
Zn 206.200†	29842.0	66.35	0.22%	[10]	mg/L

Sequence No.: 4
Sample ID: STD4
Autosampler Location: 4
Date Collected: 2/10/2014 10:53:41 AM
Data Type: Original

Nebulizer Parameters: STD4

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: STD4

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Calib Conc.	Units
ScA 357.253	2105851.3	4116.05	0.20%	100.2	%
ScR 361.383	227101.1	1037.03	0.46%	99.54	%
Mo 202.031†	151494.2	566.15	0.37%	[10]	mg/L
Sb 206.836†	23118.9	46.87	0.20%	[10]	mg/L
Si 288.158†	10049.6	121.97	1.21%	[10]	mg/L
Sn 189.927†	34264.8	117.38	0.34%	[10]	mg/L
Ti 334.903†	171052.5	421.25	0.25%	[10]	mg/L

Sequence No.: 5
Sample ID: STD5
Autosampler Location: 5
Date Collected: 2/10/2014 10:55:56 AM
Data Type: Original

Nebulizer Parameters: STD5

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: STD5

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc.	Calib Units
ScA 357.253	1969054.4	9420.16	0.48%	93.70	%
ScR 361.383	225259.6	679.07	0.30%	98.74	%
Al 308.215†	24652.3	87.22	0.35%	[30]	mg/L
Ca 317.933†	219517.8	664.23	0.30%	[30]	mg/L
Fe 273.955†	77787.6	227.82	0.29%	[100]	mg/L
K 766.490†	180206.9	134.67	0.07%	[100]	mg/L
Mg 279.077†	20913.6	63.22	0.30%	[30]	mg/L
Na 330.237†	2083.9	12.91	0.62%	[100]	mg/L

Calibration Summary

Analyte	Stds.	Equation	Intercept	Slope	Curvature	Corr. Coef.	Reslope
Ag 328.068	1	Lin Thru 0	0.0	191500	0.00000	1.000000	
Al 308.215	1	Lin Thru 0	0.0	821.7	0.00000	1.000000	
As 188.979	1	Lin Thru 0	0.0	1108	0.00000	1.000000	
B 249.677	1	Lin Thru 0	0.0	4590	0.00000	1.000000	
Ba 233.527	1	Lin Thru 0	0.0	4523	0.00000	1.000000	
Be 313.042	1	Lin Thru 0	0.0	401300	0.00000	1.000000	
Ca 317.933	1	Lin Thru 0	0.0	7317	0.00000	1.000000	
Cd 228.802	1	Lin Thru 0	0.0	18510	0.00000	1.000000	
Co 228.616	1	Lin Thru 0	0.0	29240	0.00000	1.000000	
Cr 267.716	1	Lin Thru 0	0.0	5387	0.00000	1.000000	
Cu 324.752	1	Lin Thru 0	0.0	208900	0.00000	1.000000	
Fe 273.955	1	Lin Thru 0	0.0	777.9	0.00000	1.000000	
K 766.490	1	Lin Thru 0	0.0	1802	0.00000	1.000000	
Mg 279.077	1	Lin Thru 0	0.0	697.1	0.00000	1.000000	
Mn 257.610	1	Lin Thru 0	0.0	30160	0.00000	1.000000	
Mo 202.031	1	Lin Thru 0	0.0	15150	0.00000	1.000000	
Na 589.592	1	Lin Thru 0	0.0	10390	0.00000	1.000000	
Na 330.237	1	Lin Thru 0	0.0	20.84	0.00000	1.000000	
Ni 231.604	1	Lin Thru 0	0.0	2887	0.00000	1.000000	
Pb 220.353	1	Lin Thru 0	0.0	6958	0.00000	1.000000	
Sb 206.836	1	Lin Thru 0	0.0	2312	0.00000	1.000000	
Se 196.026	1	Lin Thru 0	0.0	1209	0.00000	1.000000	
Si 288.158	1	Lin Thru 0	0.0	1005	0.00000	1.000000	
Sn 189.927	1	Lin Thru 0	0.0	3426	0.00000	1.000000	
Sr 421.552	1	Lin Thru 0	0.0	649400	0.00000	1.000000	
Ti 334.903	1	Lin Thru 0	0.0	17110	0.00000	1.000000	
Tl 190.801	1	Lin Thru 0	0.0	1440	0.00000	1.000000	
V 292.402	1	Lin Thru 0	0.0	117200	0.00000	1.000000	
Zn 206.200	1	Lin Thru 0	0.0	2984	0.00000	1.000000	

==========

Analysis Begun

Start Time: 2/10/2014 10:59:06 AM **Plasma On Time: 2/10/2014 9:56:43 AM**
Logged In Analyst: Metals **Technique: ICP Continuous**
Spectrometer: Optima 7300 DV, S/N 077C8121202 **Autosampler: ESI**

Sample Information File: C:\pe\metals\Sample Information\CRISETMON.sif
Batch ID:
Results Data Set: I2140210
Results Library: C:\Documents and Settings\All Users\PerkinElmer\ICP\Data\Results\Results.mdb

==========

Sequence No.: 1 **Autosampler Location: 7**
Sample ID: ICV **Date Collected: 2/10/2014 10:59:07 AM**
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CV

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: CV

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2077902.1	98.88	%	0.588				0.59%
ScR 361.383	221761.4	97.20	%	0.415				0.43%
Ag 328.068†	199036.7	1.040	mg/L	0.0060	1.040	mg/L	0.0060	0.58%
Al 308.215†	1694.8	2.030	mg/L	0.0151	2.030	mg/L	0.0151	0.74%
As 188.979†	2220.7	2.035	mg/L	0.0123	2.035	mg/L	0.0123	0.61%
B 249.677†	4716.9	1.027	mg/L	0.0066	1.027	mg/L	0.0066	0.64%
Ba 233.527†	4625.3	1.022	mg/L	0.0045	1.022	mg/L	0.0045	0.44%
Be 313.042†	417100.5	1.039	mg/L	0.0054	1.039	mg/L	0.0054	0.52%
Ca 317.933†	15139.4	2.069	mg/L	0.0133	2.069	mg/L	0.0133	0.65%
Cd 228.802†	19079.8	1.021	mg/L	0.0087	1.021	mg/L	0.0087	0.85%
Co 228.616†	29137.1	0.9945	mg/L	0.00777	0.9945	mg/L	0.00777	0.78%
Cr 267.716†	5562.7	1.032	mg/L	0.0044	1.032	mg/L	0.0044	0.43%
Cu 324.752†	219132.6	1.049	mg/L	0.0074	1.049	mg/L	0.0074	0.70%
Fe 273.955†	1600.7	2.051	mg/L	0.0169	2.051	mg/L	0.0169	0.82%
K 766.490†	35874.3	19.91	mg/L	0.036	19.91	mg/L	0.036	0.18%
Mg 279.077†	1376.0	1.980	mg/L	0.0108	1.980	mg/L	0.0108	0.54%
Mn 257.610†	30572.1	1.014	mg/L	0.0069	1.014	mg/L	0.0069	0.68%
Mo 202.031†	14744.9	0.9733	mg/L	0.00535	0.9733	mg/L	0.00535	0.55%
Na 589.592†	530160.0	51.02	mg/L	0.067	51.02	mg/L	0.067	0.13%
Na 330.237†	1078.0	51.70	mg/L	0.681	51.70	mg/L	0.681	1.32%
Ni 231.604†	2988.4	1.035	mg/L	0.0054	1.035	mg/L	0.0054	0.52%
Pb 220.353†	13873.4	1.995	mg/L	0.0120	1.995	mg/L	0.0120	0.60%
Sb 206.836†	4842.0	2.093	mg/L	0.0098	2.093	mg/L	0.0098	0.47%
Se 196.026†	2444.7	2.022	mg/L	0.0097	2.022	mg/L	0.0097	0.48%
Si 288.158†	2033.4	2.028	mg/L	0.0054	2.028	mg/L	0.0054	0.27%
Sn 189.927†	3425.5	1.001	mg/L	0.0086	1.001	mg/L	0.0086	0.86%
Sr 421.552†	660734.7	1.017	mg/L	0.0021	1.017	mg/L	0.0021	0.21%
Ti 334.903†	16993.1	0.9922	mg/L	0.00148	0.9922	mg/L	0.00148	0.15%
Tl 190.801†	2983.5	2.064	mg/L	0.0066	2.064	mg/L	0.0066	0.32%
V 292.402†	118241.2	1.013	mg/L	0.0058	1.013	mg/L	0.0058	0.58%
Zn 206.200†	3064.8	1.028	mg/L	0.0068	1.028	mg/L	0.0068	0.66%

Sequence No.: 2
Sample ID: ICB

Autosampler Location: 1
Date Collected: 2/10/2014 11:03:08 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2063626.0	98.20	%	0.659				0.67%
ScR 361.383	225198.1	98.71	%	0.668				0.68%
Ag 328.068†	17.9	0.00009	mg/L	0.000301	0.00009	mg/L	0.000301	320.60%
Al 308.215†	-3.8	-0.00470	mg/L	0.003082	-0.00470	mg/L	0.003082	65.59%
As 188.979†	0.8	0.00071	mg/L	0.001734	0.00071	mg/L	0.001734	243.65%
B 249.677†	8.8	0.00192	mg/L	0.000775	0.00192	mg/L	0.000775	40.26%
Ba 233.527†	1.8	0.00040	mg/L	0.000119	0.00040	mg/L	0.000119	29.54%
Be 313.042†	32.1	0.00008	mg/L	0.000011	0.00008	mg/L	0.000011	13.78%
Ca 317.933†	4.4	0.00061	mg/L	0.000672	0.00061	mg/L	0.000672	110.75%
Cd 228.802†	-0.3	-0.00002	mg/L	0.000198	-0.00002	mg/L	0.000198	>999.9%
Co 228.616†	-6.7	-0.00023	mg/L	0.000010	-0.00023	mg/L	0.000010	4.24%
Cr 267.716†	2.8	0.00051	mg/L	0.000863	0.00051	mg/L	0.000863	168.76%
Cu 324.752†	32.0	0.00015	mg/L	0.000207	0.00015	mg/L	0.000207	135.41%
Fe 273.955†	-2.0	-0.00251	mg/L	0.001153	-0.00251	mg/L	0.001153	45.87%
K 766.490†	26.6	0.01478	mg/L	0.011287	0.01478	mg/L	0.011287	76.35%
Mg 279.077†	3.2	0.00460	mg/L	0.007884	0.00460	mg/L	0.007884	171.29%
Mn 257.610†	6.4	0.00021	mg/L	0.000147	0.00021	mg/L	0.000147	69.36%
Mo 202.031†	20.7	0.00137	mg/L	0.000414	0.00137	mg/L	0.000414	30.28%
Na 589.592†	69.9	0.00673	mg/L	0.005393	0.00673	mg/L	0.005393	80.19%
Na 330.237†	-7.1	-0.3406	mg/L	0.47502	-0.3406	mg/L	0.47502	139.48%
Ni 231.604†	-1.4	-0.00049	mg/L	0.000852	-0.00049	mg/L	0.000852	173.44%
Pb 220.353†	7.1	0.00102	mg/L	0.000155	0.00102	mg/L	0.000155	15.16%
Sb 206.836†	10.1	0.00436	mg/L	0.001539	0.00436	mg/L	0.001539	35.28%
Se 196.026†	-2.3	-0.00193	mg/L	0.000868	-0.00193	mg/L	0.000868	45.00%
Si 288.158†	-7.0	-0.00700	mg/L	0.004418	-0.00700	mg/L	0.004418	63.08%
Sn 189.927†	4.8	0.00140	mg/L	0.000306	0.00140	mg/L	0.000306	21.94%
Sr 421.552†	21.8	0.00003	mg/L	0.000044	0.00003	mg/L	0.000044	132.36%
Ti 334.903†	10.2	0.00059	mg/L	0.000632	0.00059	mg/L	0.000632	106.62%
Tl 190.801†	1.2	0.00084	mg/L	0.002198	0.00084	mg/L	0.002198	260.50%
V 292.402†	19.7	0.00017	mg/L	0.000139	0.00017	mg/L	0.000139	81.36%
Zn 206.200†	-0.2	-0.00008	mg/L	0.000235	-0.00008	mg/L	0.000235	293.04%

XY02 · 00039

Sequence No.: 3
Sample ID: CRI

Autosampler Location: 301
Date Collected: 2/10/2014 11:07:08 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CRI

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: CRI

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2081201.5	99.03	%	0.736				0.74%
ScR 361.383	228512.8	100.2	%	0.21				0.21%
Ag 328.068†	633.6	0.00331	mg/L	0.000236	0.00331	mg/L	0.000236	7.13%
Al 308.215†	39.0	0.04730	mg/L	0.011461	0.04730	mg/L	0.011461	24.23%
As 188.979†	58.1	0.05253	mg/L	0.003106	0.05253	mg/L	0.003106	5.91%
B 249.677†	96.3	0.02098	mg/L	0.000830	0.02098	mg/L	0.000830	3.95%
Ba 233.527†	11.3	0.00249	mg/L	0.000365	0.00249	mg/L	0.000365	14.66%
Be 313.042†	418.9	0.00104	mg/L	0.000011	0.00104	mg/L	0.000011	1.02%
Ca 317.933†	349.1	0.04771	mg/L	0.000225	0.04771	mg/L	0.000225	0.47%
Cd 228.802†	46.1	0.00223	mg/L	0.000103	0.00223	mg/L	0.000103	4.61%
Co 228.616†	90.4	0.00308	mg/L	0.000216	0.00308	mg/L	0.000216	7.00%
Cr 267.716†	27.7	0.00514	mg/L	0.000484	0.00514	mg/L	0.000484	9.41%
Cu 324.752†	449.2	0.00215	mg/L	0.000225	0.00215	mg/L	0.000225	10.46%
Fe 273.955†	37.8	0.04861	mg/L	0.001745	0.04861	mg/L	0.001745	3.59%
K 766.490†	926.3	0.5140	mg/L	0.01381	0.5140	mg/L	0.01381	2.69%
Mg 279.077†	32.8	0.04702	mg/L	0.005140	0.04702	mg/L	0.005140	10.93%
Mn 257.610†	33.9	0.00113	mg/L	0.000109	0.00113	mg/L	0.000109	9.65%
Mo 202.031†	82.6	0.00545	mg/L	0.000086	0.00545	mg/L	0.000086	1.57%
Na 589.592†	5409.3	0.5206	mg/L	0.00300	0.5206	mg/L	0.00300	0.58%
Na 330.237†	-0.5	-0.02490	mg/L	0.511377	-0.02490	mg/L	0.511377	>999.9%
Ni 231.604†	33.2	0.01152	mg/L	0.001373	0.01152	mg/L	0.001373	11.92%
Pb 220.353†	146.3	0.02104	mg/L	0.000371	0.02104	mg/L	0.000371	1.76%
Sb 206.836†	123.4	0.05339	mg/L	0.002197	0.05339	mg/L	0.002197	4.11%
Se 196.026†	62.9	0.05203	mg/L	0.006264	0.05203	mg/L	0.006264	12.04%
Si 288.158†	53.1	0.05287	mg/L	0.003465	0.05287	mg/L	0.003465	6.55%
Sn 189.927†	37.8	0.01105	mg/L	0.000472	0.01105	mg/L	0.000472	4.27%
Sr 421.552†	653.6	0.00101	mg/L	0.000015	0.00101	mg/L	0.000015	1.54%
Ti 334.903†	56.3	0.00328	mg/L	0.001370	0.00328	mg/L	0.001370	41.78%
Tl 190.801†	70.9	0.04920	mg/L	0.001861	0.04920	mg/L	0.001861	3.78%
V 292.402†	370.5	0.00318	mg/L	0.000197	0.00318	mg/L	0.000197	6.19%
Zn 206.200†	28.9	0.00970	mg/L	0.000605	0.00970	mg/L	0.000605	6.23%

Sequence No.: 4
Sample ID: ICSA

Autosampler Location: 302
Date Collected: 2/10/2014 11:11:09 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: ICSA

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: ICSA

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2003634.1	95.34	%	0.587				0.62%
ScR 361.383	221086.1	96.91	%	0.548				0.57%
Ag 328.068†	-263.4	-0.00062	mg/L	0.000364	-0.00062	mg/L	0.000364	58.40%
Al 308.215†	163218.9	198.6	mg/L	1.57	198.6	mg/L	1.57	0.79%
As 188.979†	48.7	0.03306	mg/L	0.000827	0.03306	mg/L	0.000827	2.50%
B 249.677†	-37.5	-0.00816	mg/L	0.000891	-0.00816	mg/L	0.000891	10.92%
Ba 233.527†	105.4	-0.00333	mg/L	0.000037	-0.00333	mg/L	0.000037	1.12%
Be 313.042†	31.6	0.00008	mg/L	0.000027	0.00008	mg/L	0.000027	34.96%
Ca 317.933†	732894.7	100.2	mg/L	0.90	100.2	mg/L	0.90	0.90%
Cd 228.802†	17.8	0.00074	mg/L	0.000148	0.00074	mg/L	0.000148	20.14%
Co 228.616†	75.4	0.00255	mg/L	0.000124	0.00255	mg/L	0.000124	4.84%
Cr 267.716†	-1.7	0.00063	mg/L	0.000977	0.00063	mg/L	0.000977	155.77%
Cu 324.752†	-1925.7	0.00033	mg/L	0.000267	0.00033	mg/L	0.000267	80.83%
Fe 273.955†	154005.3	198.0	mg/L	0.74	198.0	mg/L	0.74	0.37%
K 766.490†	45.7	0.02536	mg/L	0.023255	0.02536	mg/L	0.023255	91.71%
Mg 279.077†	70503.8	101.0	mg/L	0.87	101.0	mg/L	0.87	0.86%
Mn 257.610†	57.7	-0.00014	mg/L	0.000356	-0.00014	mg/L	0.000356	251.32%
Mo 202.031†	99.2	0.00522	mg/L	0.000415	0.00522	mg/L	0.000415	7.94%
Na 589.592†	108.8	0.01047	mg/L	0.003075	0.01047	mg/L	0.003075	29.37%
Na 330.237†	-21.7	-1.040	mg/L	0.4482	-1.040	mg/L	0.4482	43.09%
Ni 231.604†	3.4	0.00116	mg/L	0.002160	0.00116	mg/L	0.002160	185.50%
Pb 220.353†	-371.2	-0.01157	mg/L	0.000780	-0.01157	mg/L	0.000780	6.74%
Sb 206.836†	17.1	0.00721	mg/L	0.001244	0.00721	mg/L	0.001244	17.27%
Se 196.026†	34.0	0.02810	mg/L	0.001997	0.02810	mg/L	0.001997	7.10%
Si 288.158†	-20.8	-0.02067	mg/L	0.005027	-0.02067	mg/L	0.005027	24.31%
Sn 189.927†	-102.8	-0.01625	mg/L	0.001566	-0.01625	mg/L	0.001566	9.64%
Sr 421.552†	3577.9	0.00551	mg/L	0.000060	0.00551	mg/L	0.000060	1.09%
Ti 334.903†	211.2	0.00494	mg/L	0.000419	0.00494	mg/L	0.000419	8.49%
Tl 190.801†	3.6	0.02917	mg/L	0.006045	0.02917	mg/L	0.006045	20.72%
V 292.402†	1200.7	-0.00180	mg/L	0.000578	-0.00180	mg/L	0.000578	32.16%
Zn 206.200†	-2.0	-0.00069	mg/L	0.001158	-0.00069	mg/L	0.001158	168.10%

Sequence No.: 5
Sample ID: ICSAB

Autosampler Location: 303
Date Collected: 2/10/2014 11:15:24 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: ICSAB

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: ICSAB

Analyte	Mean Corrected Intensity	Calib. Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
ScA 357.253	2014724.0	95.87	%	1.099				1.15%
ScR 361.383	221233.1	96.97	%	0.429				0.44%
Ag 328.068†	196283.1	1.026	mg/L	0.0140	1.026	mg/L	0.0140	1.36%
Al 308.215†	164359.7	200.0	mg/L	1.11	200.0	mg/L	1.11	0.55%
As 188.979†	1170.9	1.045	mg/L	0.0178	1.045	mg/L	0.0178	1.70%
B 249.677†	-31.4	-0.00890	mg/L	0.002037	-0.00890	mg/L	0.002037	22.88%
Ba 233.527†	4695.1	1.011	mg/L	0.0035	1.011	mg/L	0.0035	0.35%
Be 313.042†	410244.1	1.022	mg/L	0.0065	1.022	mg/L	0.0065	0.63%
Ca 317.933†	737347.0	100.8	mg/L	1.22	100.8	mg/L	1.22	1.21%
Cd 228.802†	19464.9	1.047	mg/L	0.0168	1.047	mg/L	0.0168	1.60%
Co 228.616†	28517.1	0.9750	mg/L	0.01513	0.9750	mg/L	0.01513	1.55%
Cr 267.716†	5505.0	1.023	mg/L	0.0062	1.023	mg/L	0.0062	0.60%
Cu 324.752†	213967.2	1.034	mg/L	0.0131	1.034	mg/L	0.0131	1.27%
Fe 273.955†	154739.6	198.9	mg/L	2.22	198.9	mg/L	2.22	1.12%
K 766.490†	54.4	0.03020	mg/L	0.019013	0.03020	mg/L	0.019013	62.95%
Mg 279.077†	68667.7	98.34	mg/L	0.881	98.34	mg/L	0.881	0.90%
Mn 257.610†	28925.8	0.9573	mg/L	0.00899	0.9573	mg/L	0.00899	0.94%
Mo 202.031†	110.9	0.00599	mg/L	0.000321	0.00599	mg/L	0.000321	5.37%
Na 589.592†	116.9	0.01125	mg/L	0.002266	0.01125	mg/L	0.002266	20.14%
Na 330.237†	-8.1	-0.6710	mg/L	0.26116	-0.6710	mg/L	0.26116	38.92%
Ni 231.604†	2845.3	0.9857	mg/L	0.00307	0.9857	mg/L	0.00307	0.31%
Pb 220.353†	6381.5	0.9599	mg/L	0.01295	0.9599	mg/L	0.01295	1.35%
Sb 206.836†	2401.2	1.029	mg/L	0.0213	1.029	mg/L	0.0213	2.08%
Se 196.026†	1259.2	1.041	mg/L	0.0181	1.041	mg/L	0.0181	1.74%
Si 288.158†	-22.4	-0.01758	mg/L	0.007315	-0.01758	mg/L	0.007315	41.61%
Sn 189.927†	-111.8	-0.01818	mg/L	0.000825	-0.01818	mg/L	0.000825	4.54%
Sr 421.552†	3589.2	0.00553	mg/L Cont.	0.000005	0.00553	mg/L	0.000005	0.09%
Ti 334.903†	221.3	0.00529	mg/L	0.000419	0.00529	mg/L	0.000419	7.92%
Tl 190.801†	1380.8	0.9761	mg/L	0.00861	0.9761	mg/L	0.00861	0.88%
V 292.402†	114200.5	0.9665	mg/L	0.01288	0.9665	mg/L	0.01288	1.33%
Zn 206.200†	2942.7	0.9864	mg/L	0.00729	0.9864	mg/L	0.00729	0.74%

Sequence No.: 6
Sample ID: DI CHECK

Autosampler Location: 304
Date Collected: 2/10/2014 11:20:33 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: DI CHECK

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: DI CHECK

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Calib. Std.Dev.	Sample Conc.	Sample Units	Sample Std.Dev.	RSD
ScA 357.253	2122017.1	101.0	%	0.77				0.77%
ScR 361.383	233049.5	102.2	%	2.15				2.10%
Ag 328.068†	0.9	0.00000	mg/L	0.000379	0.00000	mg/L	0.000379	>999.9%
Al 308.215†	-0.7	-0.00087	mg/L	0.003606	-0.00087	mg/L	0.003606	414.94%
As 188.979†	4.2	0.00376	mg/L	0.003196	0.00376	mg/L	0.003196	85.01%
B 249.677†	-3.7	-0.00081	mg/L	0.000779	-0.00081	mg/L	0.000779	96.28%
Ba 233.527†	-2.6	-0.00058	mg/L	0.000690	-0.00058	mg/L	0.000690	118.16%
Be 313.042†	10.2	0.00003	mg/L	0.000043	0.00003	mg/L	0.000043	170.85%
Ca 317.933†	26.4	0.00361	mg/L	0.001170	0.00361	mg/L	0.001170	32.36%
Cd 228.802†	-3.0	-0.00018	mg/L	0.000239	-0.00018	mg/L	0.000239	132.73%
Co 228.616†	20.2	0.00069	mg/L	0.000076	0.00069	mg/L	0.000076	10.99%
Cr 267.716†	-0.6	-0.00011	mg/L	0.000765	-0.00011	mg/L	0.000765	677.22%
Cu 324.752†	-30.3	-0.00014	mg/L	0.000092	-0.00014	mg/L	0.000092	63.34%
Fe 273.955†	2.1	0.00264	mg/L	0.005047	0.00264	mg/L	0.005047	190.88%
K 766.490†	35.9	0.01991	mg/L	0.013569	0.01991	mg/L	0.013569	68.16%
Mg 279.077†	1.9	0.00274	mg/L	0.007312	0.00274	mg/L	0.007312	266.46%
Mn 257.610†	1.3	0.00004	mg/L	0.000054	0.00004	mg/L	0.000054	124.61%
Mo 202.031†	-4.1	-0.00027	mg/L	0.000160	-0.00027	mg/L	0.000160	58.95%
Na 589.592†	23.7	0.00228	mg/L	0.003567	0.00228	mg/L	0.003567	156.15%
Na 330.237†	-5.0	-0.2412	mg/L	0.20593	-0.2412	mg/L	0.20593	85.37%
Ni 231.604†	1.0	0.00034	mg/L	0.001368	0.00034	mg/L	0.001368	399.52%
Pb 220.353†	1.9	0.00027	mg/L	0.001022	0.00027	mg/L	0.001022	381.03%
Sb 206.836†	-9.7	-0.00420	mg/L	0.000434	-0.00420	mg/L	0.000434	10.34%
Se 196.026†	9.6	0.00798	mg/L	0.001837	0.00798	mg/L	0.001837	23.01%
Si 288.158†	-4.3	-0.00427	mg/L	0.000429	-0.00427	mg/L	0.000429	10.04%
Sn 189.927†	2.8	0.00081	mg/L	0.001227	0.00081	mg/L	0.001227	152.09%
Sr 421.552†	7.4	0.00001	mg/L	0.000006	0.00001	mg/L	0.000006	55.18%
Ti 334.903†	-3.6	-0.00021	mg/L	0.000477	-0.00021	mg/L	0.000477	225.49%
Tl 190.801†	9.3	0.00643	mg/L	0.003164	0.00643	mg/L	0.003164	49.24%
V 292.402†	11.8	0.00010	mg/L	0.000109	0.00010	mg/L	0.000109	109.50%
Zn 206.200†	2.8	0.00094	mg/L	0.000202	0.00094	mg/L	0.000202	21.51%

Sequence No.: 7
Sample ID: CV

Autosampler Location: 7
Date Collected: 2/10/2014 11:24:32 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CV

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: CV

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2054308.4	97.75	%	0.471				0.48%
ScR 361.383	224236.6	98.29	%	0.291				0.30%
Ag 328.068†	201649.6	1.053	mg/L	0.0027	1.053	mg/L	0.0027	0.25%
Al 308.215†	1685.2	2.018	mg/L	0.0078	2.018	mg/L	0.0078	0.39%
As 188.979†	2255.3	2.066	mg/L	0.0031	2.066	mg/L	0.0031	0.15%
B 249.677†	4681.3	1.019	mg/L	0.0048	1.019	mg/L	0.0048	0.47%
Ba 233.527†	4621.1	1.021	mg/L	0.0057	1.021	mg/L	0.0057	0.56%
Be 313.042†	417134.1	1.039	mg/L	0.0031	1.039	mg/L	0.0031	0.30%
Ca 317.933†	15169.7	2.073	mg/L	0.0058	2.073	mg/L	0.0058	0.28%
Cd 228.802†	19390.9	1.038	mg/L	0.0055	1.038	mg/L	0.0055	0.53%
Co 228.616†	29550.7	1.009	mg/L	0.0036	1.009	mg/L	0.0036	0.36%
Cr 267.716†	5559.3	1.032	mg/L	0.0032	1.032	mg/L	0.0032	0.31%
Cu 324.752†	220684.8	1.056	mg/L	0.0080	1.056	mg/L	0.0080	0.76%
Fe 273.955†	1607.7	2.060	mg/L	0.0119	2.060	mg/L	0.0119	0.58%
K 766.490†	35558.3	19.73	mg/L	0.080	19.73	mg/L	0.080	0.40%
Mg 279.077†	1381.8	1.988	mg/L	0.0093	1.988	mg/L	0.0093	0.47%
Mn 257.610†	29386.6	0.9748	mg/L	0.00278	0.9748	mg/L	0.00278	0.29%
Mo 202.031†	14979.4	0.9888	mg/L	0.00821	0.9888	mg/L	0.00821	0.83%
Na 589.592†	525931.5	50.61	mg/L	0.233	50.61	mg/L	0.233	0.46%
Na 330.237†	1070.4	51.33	mg/L	0.144	51.33	mg/L	0.144	0.28%
Ni 231.604†	2991.9	1.037	mg/L	0.0015	1.037	mg/L	0.0015	0.14%
Pb 220.353†	13803.3	1.985	mg/L	0.0122	1.985	mg/L	0.0122	0.62%
Sb 206.836†	4912.8	2.124	mg/L	0.0041	2.124	mg/L	0.0041	0.20%
Se 196.026†	2484.1	2.054	mg/L	0.0069	2.054	mg/L	0.0069	0.33%
Si 288.158†	2014.4	2.009	mg/L	0.0106	2.009	mg/L	0.0106	0.53%
Sn 189.927†	3472.6	1.015	mg/L	0.0037	1.015	mg/L	0.0037	0.36%
Sr 421.552†	657594.6	1.013	mg/L	0.0029	1.013	mg/L	0.0029	0.29%
Ti 334.903†	16972.1	0.9909	mg/L	0.00323	0.9909	mg/L	0.00323	0.33%
Tl 190.801†	3038.7	2.102	mg/L	0.0118	2.102	mg/L	0.0118	0.56%
V 292.402†	120120.6	1.029	mg/L	0.0026	1.029	mg/L	0.0026	0.26%
Zn 206.200†	3076.6	1.032	mg/L	0.0046	1.032	mg/L	0.0046	0.44%

XY02.00044

Sequence No.: 8
Sample ID: CB

Autosampler Location: 1
Date Collected: 2/10/2014 11:28:34 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2102050.7	100.0	%	0.21				0.21%
ScR 361.383	227662.2	99.79	%	0.387				0.39%
Ag 328.068†	46.1	0.00024	mg/L	0.000309	0.00024	mg/L	0.000309	128.38%
Al 308.215†	0.5	0.00059	mg/L	0.005563	0.00059	mg/L	0.005563	942.65%
As 188.979†	0.7	0.00068	mg/L	0.001060	0.00068	mg/L	0.001060	156.07%
B 249.677†	4.3	0.00093	mg/L	0.002727	0.00093	mg/L	0.002727	292.45%
Ba 233.527†	2.5	0.00056	mg/L	0.000539	0.00056	mg/L	0.000539	95.95%
Be 313.042†	34.8	0.00009	mg/L	0.000024	0.00009	mg/L	0.000024	27.58%
Ca 317.933†	14.8	0.00202	mg/L	0.000571	0.00202	mg/L	0.000571	28.29%
Cd 228.802†	-0.7	-0.00004	mg/L	0.000055	-0.00004	mg/L	0.000055	129.74%
Co 228.616†	1.9	0.00007	mg/L	0.000256	0.00007	mg/L	0.000256	390.88%
Cr 267.716†	-7.8	-0.00144	mg/L	0.000683	-0.00144	mg/L	0.000683	47.30%
Cu 324.752†	2.4	0.00001	mg/L	0.000099	0.00001	mg/L	0.000099	909.94%
Fe 273.955†	-2.2	-0.00284	mg/L	0.001568	-0.00284	mg/L	0.001568	55.19%
K 766.490†	41.8	0.02319	mg/L	0.011497	0.02319	mg/L	0.011497	49.58%
Mg 279.077†	4.1	0.00586	mg/L	0.009455	0.00586	mg/L	0.009455	161.22%
Mn 257.610†	3.1	0.00010	mg/L	0.000037	0.00010	mg/L	0.000037	36.25%
Mo 202.031†	16.3	0.00108	mg/L	0.000515	0.00108	mg/L	0.000515	47.85%
Na 589.592†	80.6	0.00776	mg/L	0.005798	0.00776	mg/L	0.005798	74.75%
Na 330.237†	0.4	0.01870	mg/L	0.171332	0.01870	mg/L	0.171332	916.39%
Ni 231.604†	0.3	0.00010	mg/L	0.000277	0.00010	mg/L	0.000277	277.57%
Pb 220.353†	-2.1	-0.00030	mg/L	0.001066	-0.00030	mg/L	0.001066	350.96%
Sb 206.836†	10.2	0.00442	mg/L	0.000986	0.00442	mg/L	0.000986	22.31%
Se 196.026†	1.1	0.00090	mg/L	0.002529	0.00090	mg/L	0.002529	281.40%
Si 288.158†	-5.2	-0.00518	mg/L	0.002649	-0.00518	mg/L	0.002649	51.15%
Sn 189.927†	2.1	0.00062	mg/L	0.000729	0.00062	mg/L	0.000729	117.25%
Sr 421.552†	44.3	0.00007	mg/L	0.000039	0.00007	mg/L	0.000039	57.68%
Ti 334.903†	4.8	0.00028	mg/L	0.000186	0.00028	mg/L	0.000186	66.68%
Tl 190.801†	2.9	0.00202	mg/L	0.001071	0.00202	mg/L	0.001071	53.14%
V 292.402†	19.4	0.00016	mg/L	0.000123	0.00016	mg/L	0.000123	76.50%
Zn 206.200†	1.6	0.00052	mg/L	0.000836	0.00052	mg/L	0.000836	161.29%

Sequence No.: 9
Sample ID: XW40 MB1 SWC

Autosampler Location: 305
Date Collected: 2/10/2014 11:32:34 AM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 MB1 SWC

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: XW40 MB1 SWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2094439.9	99.66	%	1.402				1.41%
ScR 361.383	225741.1	98.95	%	0.489				0.49%
Ag 328.068†	-10.8	-0.00006	mg/L	0.000107	-0.00011	mg/L	0.000213	190.53%
Al 308.215†	27.5	0.03344	mg/L	0.007975	0.06688	mg/L	0.015950	23.85%
As 188.979†	-1.1	-0.00092	mg/L	0.002302	-0.00184	mg/L	0.004605	249.95%
B 249.677†	4.1	0.00089	mg/L	0.001799	0.00178	mg/L	0.003599	201.95%
Ba 233.527†	-0.5	-0.00010	mg/L	0.000695	-0.00020	mg/L	0.001390	693.63%
Be 313.042†	16.0	0.00004	mg/L	0.000030	0.00008	mg/L	0.000061	76.78%
Ca 317.933†	225.7	0.03085	mg/L	0.001510	0.06170	mg/L	0.003020	4.90%
Cd 228.802†	0.2	0.00001	mg/L	0.000076	0.00003	mg/L	0.000152	507.92%
Co 228.616†	-0.5	-0.00002	mg/L	0.000308	-0.00004	mg/L	0.000616	>999.9%
Cr 267.716†	-2.6	-0.00049	mg/L	0.000554	-0.00098	mg/L	0.001109	112.88%
Cu 324.752†	45.8	0.00022	mg/L	0.000267	0.00044	mg/L	0.000534	122.18%
Fe 273.955†	2.9	0.00367	mg/L	0.002425	0.00735	mg/L	0.004850	66.00%
K 766.490†	41.4	0.02299	mg/L	0.018857	0.04598	mg/L	0.037715	82.02%
Mg 279.077†	10.3	0.01483	mg/L	0.002131	0.02966	mg/L	0.004263	14.37%
Mn 257.610†	6.3	0.00021	mg/L	0.000059	0.00042	mg/L	0.000118	28.13%
Mo 202.031†	2.4	0.00016	mg/L	0.000282	0.00031	mg/L	0.000564	180.00%
Na 589.592†	133.0	0.01280	mg/L	0.004694	0.02560	mg/L	0.009387	36.67%
Na 330.237†	-9.4	-0.4532	mg/L	1.10155	-0.9063	mg/L	2.20310	243.09%
Ni 231.604†	0.2	0.00006	mg/L	0.001023	0.00012	mg/L	0.002046	>999.9%
Pb 220.353†	-0.6	-0.00008	mg/L	0.001126	-0.00015	mg/L	0.002251	>999.9%
Sb 206.836†	-0.4	-0.00015	mg/L	0.002695	-0.00029	mg/L	0.005390	>999.9%
Se 196.026†	-2.6	-0.00216	mg/L	0.002033	-0.00432	mg/L	0.004067	94.20%
Si 288.158†	2.2	0.00224	mg/L	0.003253	0.00447	mg/L	0.006507	145.45%
Sn 189.927†	1.4	0.00041	mg/L	0.000617	0.00081	mg/L	0.001235	151.92%
Sr 421.552†	19.2	0.00003	mg/L	0.000050	0.00006	mg/L	0.000099	167.80%
Ti 334.903†	41.7	0.00244	mg/L	0.000282	0.00487	mg/L	0.000563	11.56%
Tl 190.801†	0.2	0.00013	mg/L	0.001767	0.00026	mg/L	0.003533	>999.9%
V 292.402†	18.9	0.00016	mg/L	0.000079	0.00032	mg/L	0.000158	50.18%
Zn 206.200†	42.4	0.01420	mg/L	0.000638	0.02840	mg/L	0.001275	4.49%

Sequence No.: 10
Sample ID: XW40 A-L SWC

Autosampler Location: 306
Date Collected: 2/10/2014 11:36:35 AM
Data Type: Original

Dilution: 10.000000X

Nebulizer Parameters: XW40 A-L SWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XW40 A-L SWC

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2118718.3	100.8	%	0.18				0.18%
ScR 361.383	232186.8	101.8	%	0.22				0.22%
Ag 328.068†	-70.2	-0.00021	mg/L	0.000250	-0.00207	mg/L	0.002502	121.07%
Al 308.215†	22556.2	27.44	mg/L	0.059	274.4	mg/L	0.59	0.22%
As 188.979†	-61.3	0.01460	mg/L	0.001507	0.1460	mg/L	0.01507	10.32%
B 249.677†	29.5	0.00637	mg/L	0.000526	0.06373	mg/L	0.005261	8.26%
Ba 233.527†	505.1	0.1054	mg/L	0.00297	1.054	mg/L	0.0297	2.81%
Be 313.042†	229.6	0.00052	mg/L	0.000023	0.00523	mg/L	0.000234	4.47%
Ca 317.933†	128853.1	17.61	mg/L	0.018	176.1	mg/L	0.18	0.10%
Cd 228.802†	2.1	0.00045	mg/L	0.000017	0.00449	mg/L	0.000166	3.70%
Co 228.616†	648.2	0.01855	mg/L	0.000273	0.1855	mg/L	0.00273	1.47%
Cr 267.716†	258.7	0.04922	mg/L	0.000304	0.4922	mg/L	0.00304	0.62%
Cu 324.752†	9475.5	0.04726	mg/L	0.000698	0.4726	mg/L	0.00698	1.48%
Fe 273.955†	36152.6	46.48	mg/L	0.210	464.8	mg/L	2.10	0.45%
K 766.490†	7057.8	3.916	mg/L	0.0247	39.16	mg/L	0.247	0.63%
Mg 279.077†	8741.5	12.50	mg/L	0.016	125.0	mg/L	0.16	0.12%
Mn 257.610†	19960.6	0.6615	mg/L	0.00191	6.615	mg/L	0.0191	0.29%
Mo 202.031†	36.9	0.00220	mg/L	0.000290	0.02205	mg/L	0.002895	13.13%
Na 589.592†	31754.5	3.056	mg/L	0.0033	30.56	mg/L	0.033	0.11%
Na 330.237†	47.8	2.795	mg/L	0.1319	27.95	mg/L	1.319	4.72%
Ni 231.604†	179.6	0.06221	mg/L	0.000488	0.6221	mg/L	0.00488	0.78%
Pb 220.353†	-6.3	0.00389	mg/L	0.001539	0.03889	mg/L	0.015386	39.56%
Sb 206.836†	8.3	0.00488	mg/L	0.002645	0.04876	mg/L	0.026448	54.23%
Se 196.026†	4.1	0.00335	mg/L	0.002148	0.03349	mg/L	0.021477	64.12%
Si 288.158†	914.5	0.9100	mg/L	0.00657	9.100	mg/L	0.0657	0.72%
Sn 189.927†	-31.8	-0.00648	mg/L	0.001528	-0.06476	mg/L	0.015277	23.59%
Sr 421.552†	58132.4	0.08952	mg/L	0.000123	0.8952	mg/L	0.00123	0.14%
Ti 334.903†	34446.9	2.013	mg/L	0.0032	20.13	mg/L	0.032	0.16%
Tl 190.801†	5.7	0.00968	mg/L	0.003558	0.09684	mg/L	0.035584	36.75%
V 292.402†	12644.3	0.1042	mg/L	0.00117	1.042	mg/L	0.0117	1.13%
Zn 206.200†	314.5	0.1056	mg/L	0.00088	1.056	mg/L	0.0088	0.84%

XY02 : 00047

Sequence No.: 11
Sample ID: XW40 A SWC

Autosampler Location: 307
Date Collected: 2/10/2014 11:40:34 AM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 A SWC

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: XW40 A SWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2086263.7	99.28	%	0.260				0.26%
ScR 361.383	227386.3	99.67	%	0.283				0.28%
Ag 328.068†	-307.8	-0.00084	mg/L	0.000191	-0.00167	mg/L	0.000382	22.81%
Al 308.215†	111379.4	135.5	mg/L	0.81	271.0	mg/L	1.61	0.59%
As 188.979†	-323.7	0.04661	mg/L	0.006617	0.09322	mg/L	0.013233	14.20%
B 249.677†	141.7	0.03066	mg/L	0.000416	0.06132	mg/L	0.000832	1.36%
Ba 233.527†	2438.8	0.5092	mg/L	0.00258	1.018	mg/L	0.0052	0.51%
Be 313.042†	1068.7	0.00243	mg/L	0.000012	0.00486	mg/L	0.000025	0.51%
Ca 317.933†	624605.9	85.36	mg/L	0.193	170.7	mg/L	0.39	0.23%
Cd 228.802†	25.7	0.00314	mg/L	0.000343	0.00628	mg/L	0.000685	10.92%
Co 228.616†	3011.7	0.08546	mg/L	0.000315	0.1709	mg/L	0.00063	0.37%
Cr 267.716†	1201.3	0.2286	mg/L	0.00038	0.4572	mg/L	0.00077	0.17%
Cu 324.752†	46390.8	0.2311	mg/L	0.00061	0.4622	mg/L	0.00123	0.27%
Fe 273.955†	172635.6	221.9	mg/L	0.23	443.9	mg/L	0.46	0.10%
K 766.490†	34668.7	19.24	mg/L	0.043	38.48	mg/L	0.085	0.22%
Mg 279.077†	42495.9	60.78	mg/L	0.159	121.6	mg/L	0.32	0.26%
Mn 257.610†	95594.2	3.168	mg/L	0.0048	6.336	mg/L	0.0095	0.15%
Mo 202.031†	103.4	0.00569	mg/L	0.000467	0.01139	mg/L	0.000933	8.20%
Na 589.592†	156555.1	15.07	mg/L	0.063	30.13	mg/L	0.126	0.42%
Na 330.237†	251.1	14.50	mg/L	0.042	28.99	mg/L	0.085	0.29%
Ni 231.604†	848.1	0.2938	mg/L	0.00367	0.5875	mg/L	0.00733	1.25%
Pb 220.353†	-66.1	0.01457	mg/L	0.001045	0.02914	mg/L	0.002089	7.17%
Sb 206.836†	14.6	0.01276	mg/L	0.002069	0.02552	mg/L	0.004138	16.21%
Se 196.026†	30.8	0.02513	mg/L	0.001937	0.05025	mg/L	0.003873	7.71%
Si 288.158†	4398.3	4.377	mg/L	0.0166	8.754	mg/L	0.0332	0.38%
Sn 189.927†	-88.3	-0.01221	mg/L	0.000546	-0.02441	mg/L	0.001092	4.47%
Sr 421.552†	283336.1	0.4363	mg/L	0.00207	0.8726	mg/L	0.00414	0.47%
Ti 334.903†	166970.2	9.755	mg/L	0.0406	19.51	mg/L	0.081	0.42%
Tl 190.801†	-2.6	0.02563	mg/L	0.001687	0.05126	mg/L	0.003374	6.58%
V 292.402†	59510.7	0.4899	mg/L	0.00214	0.9799	mg/L	0.00429	0.44%
Zn 206.200†	1483.0	0.4978	mg/L	0.00153	0.9957	mg/L	0.00306	0.31%

XY02 : 00048

Sequence No.: 12
Sample ID: XW40 ADUP SWC

Autosampler Location: 308
Date Collected: 2/10/2014 11:44:20 AM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 ADUP SWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XW40 ADUP SWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2101104.4	99.98	%	0.252				0.25%
ScR 361.383	233799.1	102.5	%	0.97				0.95%
Ag 328.068†	-404.1	-0.00096	mg/L	0.000093	-0.00191	mg/L	0.000186	9.75%
Al 308.215†	118698.5	144.4	mg/L	0.88	288.9	mg/L	1.76	0.61%
As 188.979†	-202.4	0.05963	mg/L	0.006902	0.1193	mg/L	0.01380	11.58%
B 249.677†	131.3	0.02845	mg/L	0.000966	0.05690	mg/L	0.001933	3.40%
Ba 233.527†	1758.3	0.3625	mg/L	0.00217	0.7250	mg/L	0.00433	0.60%
Be 313.042†	1173.5	0.00273	mg/L	0.000038	0.00547	mg/L	0.000075	1.38%
Ca 317.933†	1015478.4	138.8	mg/L	1.52	277.6	mg/L	3.03	1.09%
Cd 228.802†	14.7	0.00193	mg/L	0.000017	0.00386	mg/L	0.000033	0.86%
Co 228.616†	2212.8	0.06269	mg/L	0.000171	0.1254	mg/L	0.00034	0.27%
Cr 267.716†	1033.0	0.1959	mg/L	0.00161	0.3917	mg/L	0.00322	0.82%
Cu 324.752†	35374.3	0.1775	mg/L	0.00024	0.3550	mg/L	0.00048	0.14%
Fe 273.955†	150994.8	194.1	mg/L	0.26	388.2	mg/L	0.53	0.14%
K 766.490†	24511.2	13.60	mg/L	0.080	27.20	mg/L	0.160	0.59%
Mg 279.077†	38399.4	54.92	mg/L	0.356	109.8	mg/L	0.71	0.65%
Mn 257.610†	85102.0	2.820	mg/L	0.0033	5.640	mg/L	0.0067	0.12%
Mo 202.031†	116.3	0.00583	mg/L	0.000522	0.01167	mg/L	0.001045	8.95%
Na 589.592†	174952.2	16.84	mg/L	0.178	33.67	mg/L	0.355	1.06%
Na 330.237†	298.3	16.11	mg/L	0.027	32.23	mg/L	0.054	0.17%
Ni 231.604†	673.0	0.2331	mg/L	0.00408	0.4662	mg/L	0.00817	1.75%
Pb 220.353†	550.0	0.1069	mg/L	0.00127	0.2139	mg/L	0.00254	1.19%
Sb 206.836†	7.9	0.00799	mg/L	0.005114	0.01598	mg/L	0.010227	63.99%
Se 196.026†	32.8	0.02686	mg/L	0.003315	0.05371	mg/L	0.006631	12.34%
Si 288.158†	670.2	0.6670	mg/L	0.01147	1.334	mg/L	0.0229	1.72%
Sn 189.927†	-103.7	-0.00986	mg/L	0.000833	-0.01973	mg/L	0.001667	8.45%
Sr 421.552†	607504.3	0.9355	mg/L	0.00855	1.871	mg/L	0.0171	0.91%
Ti 334.903†	123661.7	7.219	mg/L	0.0359	14.44	mg/L	0.072	0.50%
Tl 190.801†	23.4	0.04035	mg/L	0.004030	0.08071	mg/L	0.008059	9.99%
V 292.402†	52346.8	0.4318	mg/L	0.00059	0.8636	mg/L	0.00118	0.14%
Zn 206.200†	1191.6	0.3995	mg/L	0.00285	0.7990	mg/L	0.00570	0.71%

Sequence No.: 13
Sample ID: XW40 ASPK SWC

Autosampler Location: 309
Date Collected: 2/10/2014 11:48:21 AM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 ASPK SWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XW40 ASPK SWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2060665.9	98.06	%	0.547				0.56%
ScR 361.383	225844.1	98.99	%	0.190				0.19%
Ag 328.068†	95498.7	0.4999	mg/L	0.00287	0.9997	mg/L	0.00575	0.57%
Al 308.215†	125698.4	152.9	mg/L	1.25	305.9	mg/L	2.50	0.82%
As 188.979†	1996.3	2.051	mg/L	0.0114	4.103	mg/L	0.0227	0.55%
B 249.677†	125.4	0.02606	mg/L	0.001532	0.05211	mg/L	0.003063	5.88%
Ba 233.527†	10444.9	2.277	mg/L	0.0158	4.553	mg/L	0.0317	0.70%
Be 313.042†	194958.8	0.4855	mg/L	0.00757	0.9711	mg/L	0.01514	1.56%
Ca 317.933†	838181.4	114.5	mg/L	1.04	229.1	mg/L	2.08	0.91%
Cd 228.802†	10029.2	0.5331	mg/L	0.00292	1.066	mg/L	0.0058	0.55%
Co 228.616†	17450.1	0.5832	mg/L	0.00315	1.166	mg/L	0.0063	0.54%
Cr 267.716†	4021.9	0.7510	mg/L	0.00211	1.502	mg/L	0.0042	0.28%
Cu 324.752†	148612.5	0.7217	mg/L	0.00391	1.443	mg/L	0.0078	0.54%
Fe 273.955†	186548.8	239.8	mg/L	1.54	479.6	mg/L	3.07	0.64%
K 766.490†	43948.8	24.39	mg/L	0.141	48.78	mg/L	0.282	0.58%
Mg 279.077†	56480.0	80.83	mg/L	0.621	161.7	mg/L	1.24	0.77%
Mn 257.610†	117386.4	3.891	mg/L	0.0304	7.782	mg/L	0.0608	0.78%
Mo 202.031†	114.6	0.00604	mg/L	0.000493	0.01209	mg/L	0.000986	8.16%
Na 589.592†	295911.4	28.48	mg/L	0.213	56.95	mg/L	0.426	0.75%
Na 330.237†	545.7	27.86	mg/L	0.068	55.72	mg/L	0.137	0.25%
Ni 231.604†	2296.1	0.7945	mg/L	0.00216	1.589	mg/L	0.0043	0.27%
Pb 220.353†	13538.9	1.974	mg/L	0.0128	3.948	mg/L	0.0257	0.65%
Sb 206.836†	27.6	0.01131	mg/L	0.005974	0.02262	mg/L	0.011948	52.83%
Se 196.026†	2431.2	2.011	mg/L	0.0154	4.021	mg/L	0.0307	0.76%
Si 288.158†	3349.3	3.335	mg/L	0.0147	6.671	mg/L	0.0293	0.44%
Sn 189.927†	-101.5	-0.01242	mg/L	0.000634	-0.02484	mg/L	0.001268	5.10%
Sr 421.552†	717360.6	1.105	mg/L	0.0088	2.209	mg/L	0.0176	0.80%
Ti 334.903†	126287.9	7.374	mg/L	0.0635	14.75	mg/L	0.127	0.86%
Tl 190.801†	2764.5	1.945	mg/L	0.0064	3.890	mg/L	0.0128	0.33%
V 292.402†	113145.9	0.9500	mg/L	0.00627	1.900	mg/L	0.0125	0.66%
Zn 206.200†	2913.7	0.9773	mg/L	0.00315	1.955	mg/L	0.0063	0.32%

Sequence No.: 14
Sample ID: ~~XW40 APOST SWC~~ ZZZZZZ

Autosampler Location: 310
Date Collected: 2/10/2014 11:52:07 AM
Data Type: Original

Dilution: 2.000000X 3A 2/10/14

Nebulizer Parameters: XW40 APOST SWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XW40 APOST SWC

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2076385.2	98.81	%	0.243				0.25%
ScR 361.383	228563.5	100.2	%	0.51				0.50%
Ag 328.068†	92595.4	0.4846	mg/L	0.00290	0.9691	mg/L	0.00580	0.60%
Al 308.215†	111098.3	135.2	mg/L	0.69	270.3	mg/L	1.38	0.51%
As 188.979†	1912.4	2.058	mg/L	0.0077	4.116	mg/L	0.0155	0.38%
B 249.677†	154.9	0.03251	mg/L	0.000844	0.06502	mg/L	0.001688	2.60%
Ba 233.527†	11340.4	2.477	mg/L	0.0185	4.954	mg/L	0.0370	0.75%
Be 313.042†	191150.1	0.4760	mg/L	0.00315	0.9520	mg/L	0.00631	0.66%
Ca 317.933†	690303.7	94.34	mg/L	0.631	188.7	mg/L	1.26	0.67%
Cd 228.802†	9841.7	0.5233	mg/L	0.00052	1.047	mg/L	0.0010	0.10%
Co 228.616†	17138.7	0.5686	mg/L	0.00126	1.137	mg/L	0.0025	0.22%
Cr 267.716†	3858.1	0.7208	mg/L	0.00302	1.442	mg/L	0.0060	0.42%
Cu 324.752†	152701.2	0.7400	mg/L	0.00338	1.480	mg/L	0.0068	0.46%
Fe 273.955†	173029.4	222.4	mg/L	1.66	444.9	mg/L	3.32	0.75%
K 766.490†	52285.8	29.01	mg/L	0.108	58.03	mg/L	0.217	0.37%
Mg 279.077†	48831.1	69.87	mg/L	0.323	139.7	mg/L	0.65	0.46%
Mn 257.610†	109225.1	3.621	mg/L	0.0257	7.241	mg/L	0.0514	0.71%
Mo 202.031†	109.6	0.00598	mg/L	0.000149	0.01196	mg/L	0.000297	2.48%
Na 589.592†	260149.1	25.04	mg/L	0.118	50.07	mg/L	0.236	0.47%
Na 330.237†	456.8	24.18	mg/L	0.423	48.37	mg/L	0.847	1.75%
Ni 231.604†	2240.6	0.7753	mg/L	0.00465	1.551	mg/L	0.0093	0.60%
Pb 220.353†	13348.0	1.943	mg/L	0.0011	3.885	mg/L	0.0023	0.06%
Sb 206.836†	23.5	0.01180	mg/L	0.001926	0.02359	mg/L	0.003852	16.33%
Se 196.026†	2519.3	2.084	mg/L	0.0053	4.167	mg/L	0.0106	0.25%
Si 288.158†	4324.4	4.306	mg/L	0.0216	8.611	mg/L	0.0433	0.50%
Sn 189.927†	-91.7	-0.01193	mg/L	0.002175	-0.02386	mg/L	0.004351	18.23%
Sr 421.552†	601650.3	0.9265	mg/L	0.00490	1.853	mg/L	0.0098	0.53%
Ti 334.903†	164603.8	9.616	mg/L	0.0524	19.23	mg/L	0.105	0.54%
Tl 190.801†	2723.1	1.914	mg/L	0.0066	3.828	mg/L	0.0133	0.35%
V 292.402†	115258.0	0.9676	mg/L	0.00535	1.935	mg/L	0.0107	0.55%
Zn 206.200†	2990.3	1.003	mg/L	0.0062	2.006	mg/L	0.0125	0.62%

Sequence No.: 15
Sample ID: XW40 B SWC

Autosampler Location: 311
Date Collected: 2/10/2014 11:55:53 AM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 B SWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XW40 B SWC

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2072821.0	98.64	%	0.646				0.66%
ScR 361.383	227227.0	99.60	%	0.570				0.57%
Ag 328.068†	-359.2	-0.00080	mg/L	0.000162	-0.00160	mg/L	0.000323	20.26%
Al 308.215†	116640.2	141.9	mg/L	0.46	283.8	mg/L	0.91	0.32%
As 188.979†	-311.2	0.05541	mg/L	0.001090	0.1108	mg/L	0.00218	1.97%
B 249.677†	145.1	0.03141	mg/L	0.001064	0.06282	mg/L	0.002127	3.39%
Ba 233.527†	1299.1	0.2573	mg/L	0.00057	0.5146	mg/L	0.00113	0.22%
Be 313.042†	1168.2	0.00268	mg/L	0.000022	0.00535	mg/L	0.000043	0.80%
Ca 317.933†	923650.6	126.2	mg/L	0.52	252.5	mg/L	1.04	0.41%
Cd 228.802†	18.1	0.00269	mg/L	0.000019	0.00538	mg/L	0.000038	0.70%
Co 228.616†	3087.9	0.08798	mg/L	0.001089	0.1760	mg/L	0.00218	1.24%
Cr 267.716†	1410.4	0.2658	mg/L	0.00163	0.5316	mg/L	0.00326	0.61%
Cu 324.752†	37060.1	0.1863	mg/L	0.00178	0.3727	mg/L	0.00357	0.96%
Fe 273.955†	172188.2	221.4	mg/L	1.29	442.7	mg/L	2.57	0.58%
K 766.490†	20913.8	11.61	mg/L	0.040	23.21	mg/L	0.079	0.34%
Mg 279.077†	52242.9	74.76	mg/L	0.272	149.5	mg/L	0.54	0.36%
Mn 257.610†	103464.5	3.429	mg/L	0.0210	6.858	mg/L	0.0420	0.61%
Mo 202.031†	111.7	0.00570	mg/L	0.000472	0.01140	mg/L	0.000944	8.28%
Na 589.592†	200083.2	19.25	mg/L	0.086	38.51	mg/L	0.172	0.45%
Na 330.237†	331.9	18.40	mg/L	0.250	36.79	mg/L	0.500	1.36%
Ni 231.604†	906.4	0.3140	mg/L	0.00125	0.6279	mg/L	0.00250	0.40%
Pb 220.353†	-112.7	0.00973	mg/L	0.000391	0.01947	mg/L	0.000782	4.02%
Sb 206.836†	4.6	0.00796	mg/L	0.002736	0.01591	mg/L	0.005472	34.39%
Se 196.026†	40.9	0.03345	mg/L	0.004768	0.06691	mg/L	0.009535	14.25%
Si 288.158†	3312.9	3.297	mg/L	0.0166	6.593	mg/L	0.0332	0.50%
Sn 189.927†	-106.6	-0.01192	mg/L	0.001100	-0.02384	mg/L	0.002201	9.23%
Sr 421.552†	499108.8	0.7686	mg/L	0.00306	1.537	mg/L	0.0061	0.40%
Ti 334.903†	167985.8	9.811	mg/L	0.0368	19.62	mg/L	0.074	0.38%
Tl 190.801†	4.1	0.03014	mg/L	0.003079	0.06027	mg/L	0.006157	10.22%
V 292.402†	59972.3	0.4941	mg/L	0.00629	0.9881	mg/L	0.01257	1.27%
Zn 206.200†	1387.0	0.4655	mg/L	0.00359	0.9309	mg/L	0.00718	0.77%

XY02 : 00052

Sequence No.: 16
Sample ID: XW40 MB1SPK SWC

Autosampler Location: 312
Date Collected: 2/10/2014 11:59:39 AM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 MB1SPK SWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XW40 MB1SPK SWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2101199.8	99.99	%	0.280				0.28%
ScR 361.383	229397.7	100.6	%	0.54				0.53%
Ag 328.068†	102354.7	0.5348	mg/L	0.00682	1.070	mg/L	0.0136	1.27%
Al 308.215†	1744.3	2.115	mg/L	0.0184	4.230	mg/L	0.0368	0.87%
As 188.979†	2339.9	2.110	mg/L	0.0243	4.220	mg/L	0.0485	1.15%
B 249.677†	-0.7	-0.00123	mg/L	0.000162	-0.00246	mg/L	0.000323	13.14%
Ba 233.527†	9549.2	2.111	mg/L	0.0224	4.222	mg/L	0.0447	1.06%
Be 313.042†	203241.8	0.5064	mg/L	0.00029	1.013	mg/L	0.0006	0.06%
Ca 317.933†	76528.4	10.46	mg/L	0.015	20.92	mg/L	0.031	0.15%
Cd 228.802†	10045.7	0.5321	mg/L	0.00446	1.064	mg/L	0.0089	0.84%
Co 228.616†	15007.8	0.5129	mg/L	0.00553	1.026	mg/L	0.0111	1.08%
Cr 267.716†	2902.0	0.5376	mg/L	0.00298	1.075	mg/L	0.0060	0.55%
Cu 324.752†	105473.0	0.5049	mg/L	0.00285	1.010	mg/L	0.0057	0.56%
Fe 273.955†	1676.9	2.152	mg/L	0.0130	4.305	mg/L	0.0259	0.60%
K 766.490†	18927.9	10.50	mg/L	0.047	21.01	mg/L	0.095	0.45%
Mg 279.077†	7506.2	10.77	mg/L	0.073	21.53	mg/L	0.146	0.68%
Mn 257.610†	15419.5	0.5116	mg/L	0.00335	1.023	mg/L	0.0067	0.66%
Mo 202.031†	27.3	0.00166	mg/L	0.000428	0.00333	mg/L	0.000857	25.76%
Na 589.592†	111339.0	10.71	mg/L	0.028	21.43	mg/L	0.056	0.26%
Na 330.237†	227.1	10.74	mg/L	0.096	21.48	mg/L	0.192	0.89%
Ni 231.604†	1553.7	0.5373	mg/L	0.00376	1.075	mg/L	0.0075	0.70%
Pb 220.353†	14238.1	2.047	mg/L	0.0200	4.094	mg/L	0.0400	0.98%
Sb 206.836†	13.0	0.00050	mg/L	0.001498	0.00100	mg/L	0.002997	301.08%
Se 196.026†	2561.4	2.119	mg/L	0.0300	4.237	mg/L	0.0599	1.41%
Si 288.158†	-0.3	0.00212	mg/L	0.006023	0.00424	mg/L	0.012045	284.41%
Sn 189.927†	-20.9	-0.00459	mg/L	0.001649	-0.00918	mg/L	0.003299	35.92%
Sr 421.552†	341292.1	0.5256	mg/L	0.00123	1.051	mg/L	0.0025	0.23%
Ti 334.903†	126.9	0.00654	mg/L	0.000721	0.01308	mg/L	0.001443	11.03%
Tl 190.801†	3003.6	2.081	mg/L	0.0256	4.162	mg/L	0.0511	1.23%
V 292.402†	61339.6	0.5254	mg/L	0.00657	1.051	mg/L	0.0131	1.25%
Zn 206.200†	1622.1	0.5439	mg/L	0.00316	1.088	mg/L	0.0063	0.58%

Sequence No.: 17
Sample ID: CV 2

Autosampler Location: 7
Date Collected: 2/10/2014 12:03:38 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CV

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: CV

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2090218.3	99.46	%	0.122				0.12%
ScR 361.383	224668.9	98.48	%	0.544				0.55%
Ag 328.068†	200565.7	1.048	mg/L	0.0065	1.048	mg/L	0.0065	0.62%
Al 308.215†	1697.7	2.033	mg/L	0.0138	2.033	mg/L	0.0138	0.68%
As 188.979†	2252.2	2.063	mg/L	0.0035	2.063	mg/L	0.0035	0.17%
B 249.677†	4699.1	1.023	mg/L	0.0085	1.023	mg/L	0.0085	0.83%
Ba 233.527†	4597.4	1.016	mg/L	0.0089	1.016	mg/L	0.0089	0.88%
Be 313.042†	417217.6	1.039	mg/L	0.0052	1.039	mg/L	0.0052	0.50%
Ca 317.933†	15211.4	2.079	mg/L	0.0159	2.079	mg/L	0.0159	0.77%
Cd 228.802†	19274.5	1.031	mg/L	0.0023	1.031	mg/L	0.0023	0.23%
Co 228.616†	29491.5	1.007	mg/L	0.0036	1.007	mg/L	0.0036	0.36%
Cr 267.716†	5589.6	1.037	mg/L	0.0061	1.037	mg/L	0.0061	0.59%
Cu 324.752†	219876.7	1.052	mg/L	0.0051	1.052	mg/L	0.0051	0.48%
Fe 273.955†	1626.5	2.084	mg/L	0.0145	2.084	mg/L	0.0145	0.70%
K 766.490†	36080.8	20.02	mg/L	0.078	20.02	mg/L	0.078	0.39%
Mg 279.077†	1388.0	1.997	mg/L	0.0118	1.997	mg/L	0.0118	0.59%
Mn 257.610†	29525.7	0.9794	mg/L	0.00621	0.9794	mg/L	0.00621	0.63%
Mo 202.031†	15286.8	1.009	mg/L	0.0022	1.009	mg/L	0.0022	0.21%
Na 589.592†	532106.1	51.21	mg/L	0.195	51.21	mg/L	0.195	0.38%
Na 330.237†	1073.6	51.48	mg/L	0.208	51.48	mg/L	0.208	0.40%
Ni 231.604†	2995.5	1.038	mg/L	0.0059	1.038	mg/L	0.0059	0.57%
Pb 220.353†	14055.3	2.021	mg/L	0.0024	2.021	mg/L	0.0024	0.12%
Sb 206.836†	4891.2	2.114	mg/L	0.0020	2.114	mg/L	0.0020	0.09%
Se 196.026†	2481.4	2.052	mg/L	0.0064	2.052	mg/L	0.0064	0.31%
Si 288.158†	2028.7	2.023	mg/L	0.0192	2.023	mg/L	0.0192	0.95%
Sn 189.927†	3471.3	1.015	mg/L	0.0020	1.015	mg/L	0.0020	0.19%
Sr 421.552†	660853.4	1.018	mg/L	0.0043	1.018	mg/L	0.0043	0.42%
Ti 334.903†	16990.9	0.9920	mg/L	0.00413	0.9920	mg/L	0.00413	0.42%
Tl 190.801†	3030.3	2.096	mg/L	0.0031	2.096	mg/L	0.0031	0.15%
V 292.402†	119419.1	1.023	mg/L	0.0055	1.023	mg/L	0.0055	0.54%
Zn 206.200†	3085.4	1.034	mg/L	0.0068	1.034	mg/L	0.0068	0.66%

Sequence No.: 18
Sample ID: CB 2

Autosampler Location: 1
Date Collected: 2/10/2014 12:07:39 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2078060.7	98.88	%	0.935				0.95%
ScR 361.383	226454.9	99.26	%	0.367				0.37%
Ag 328.068†	47.8	0.00025	mg/L	0.000059	0.00025	mg/L	0.000059	23.49%
Al 308.215†	3.7	0.00447	mg/L	0.000926	0.00447	mg/L	0.000926	20.73%
As 188.979†	4.2	0.00380	mg/L	0.000537	0.00380	mg/L	0.000537	14.11%
B 249.677†	5.9	0.00130	mg/L	0.000986	0.00130	mg/L	0.000986	76.00%
Ba 233.527†	0.4	0.00010	mg/L	0.000632	0.00010	mg/L	0.000632	643.17%
Be 313.042†	35.0	0.00009	mg/L	0.000016	0.00009	mg/L	0.000016	17.99%
Ca 317.933†	13.8	0.00188	mg/L	0.001607	0.00188	mg/L	0.001607	85.27%
Cd 228.802†	1.0	0.00003	mg/L	0.000107	0.00003	mg/L	0.000107	311.82%
Co 228.616†	0.8	0.00003	mg/L	0.000118	0.00003	mg/L	0.000118	441.62%
Cr 267.716†	-2.4	-0.00045	mg/L	0.000968	-0.00045	mg/L	0.000968	217.13%
Cu 324.752†	25.3	0.00012	mg/L	0.000123	0.00012	mg/L	0.000123	102.40%
Fe 273.955†	-2.4	-0.00304	mg/L	0.003489	-0.00304	mg/L	0.003489	114.70%
K 766.490†	2.1	0.00119	mg/L	0.014910	0.00119	mg/L	0.014910	>999.9%
Mg 279.077†	6.2	0.00884	mg/L	0.005174	0.00884	mg/L	0.005174	58.53%
Mn 257.610†	4.1	0.00014	mg/L	0.000056	0.00014	mg/L	0.000056	40.97%
Mo 202.031†	21.2	0.00140	mg/L	0.000208	0.00140	mg/L	0.000208	14.89%
Na 589.592†	68.6	0.00660	mg/L	0.003200	0.00660	mg/L	0.003200	48.47%
Na 330.237†	-5.2	-0.2479	mg/L	0.76422	-0.2479	mg/L	0.76422	308.34%
Ni 231.604†	-3.9	-0.00135	mg/L	0.000421	-0.00135	mg/L	0.000421	31.07%
Pb 220.353†	6.4	0.00092	mg/L	0.000415	0.00092	mg/L	0.000415	45.19%
Sb 206.836†	9.9	0.00430	mg/L	0.001838	0.00430	mg/L	0.001838	42.72%
Se 196.026†	1.5	0.00123	mg/L	0.003602	0.00123	mg/L	0.003602	293.47%
Si 288.158†	-1.8	-0.00183	mg/L	0.004428	-0.00183	mg/L	0.004428	242.41%
Sn 189.927†	1.5	0.00044	mg/L	0.000219	0.00044	mg/L	0.000219	49.94%
Sr 421.552†	35.6	0.00005	mg/L	0.000051	0.00005	mg/L	0.000051	93.40%
Ti 334.903†	5.6	0.00032	mg/L	0.000162	0.00032	mg/L	0.000162	49.91%
Tl 190.801†	3.5	0.00241	mg/L	0.003019	0.00241	mg/L	0.003019	125.35%
V 292.402†	24.1	0.00020	mg/L	0.000189	0.00020	mg/L	0.000189	92.20%
Zn 206.200†	-1.1	-0.00037	mg/L	0.000421	-0.00037	mg/L	0.000421	114.86%

Sequence No.: 19
Sample ID: XY02 MB1 TWC

Autosampler Location: 313
Date Collected: 2/10/2014 12:11:39 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 MB1 TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 MB1 TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Calib. Std.Dev.	Sample Conc.	Sample Units	Sample Std.Dev.	RSD
ScA 357.253	2084235.3	99.18	%	0.634				0.64%
ScR 361.383	226452.2	99.26	%	1.356				1.37%
Ag 328.068†	9.1	0.00005	mg/L	0.000157	0.00005	mg/L	0.000157	330.49%
Al 308.215†	3.3	0.00404	mg/L	0.004810	0.00404	mg/L	0.004810	119.06%
As 188.979†	1.7	0.00156	mg/L	0.000612	0.00156	mg/L	0.000612	39.27%
B 249.677†	2.6	0.00056	mg/L	0.000735	0.00056	mg/L	0.000735	130.61%
Ba 233.527†	1.3	0.00028	mg/L	0.000660	0.00028	mg/L	0.000660	237.83%
Be 313.042†	7.9	0.00002	mg/L	0.000037	0.00002	mg/L	0.000037	186.57%
Ca 317.933†	53.9	0.00737	mg/L	0.000993	0.00737	mg/L	0.000993	13.48%
Cd 228.802†	-1.1	-0.00007	mg/L	0.000208	-0.00007	mg/L	0.000208	302.21%
Co 228.616†	-10.7	-0.00037	mg/L	0.000172	-0.00037	mg/L	0.000172	46.90%
Cr 267.716†	0.4	0.00008	mg/L	0.000713	0.00008	mg/L	0.000713	939.44%
Cu 324.752†	44.6	0.00021	mg/L	0.000154	0.00021	mg/L	0.000154	72.22%
Fe 273.955†	0.1	0.00015	mg/L	0.002645	0.00015	mg/L	0.002645	>999.9%
K 766.490†	39.0	0.02163	mg/L	0.019104	0.02163	mg/L	0.019104	88.31%
Mg 279.077†	5.0	0.00724	mg/L	0.004282	0.00724	mg/L	0.004282	59.17%
Mn 257.610†	4.9	0.00016	mg/L	0.000100	0.00016	mg/L	0.000100	61.94%
Mo 202.031†	6.9	0.00045	mg/L	0.000308	0.00045	mg/L	0.000308	67.89%
Na 589.592†	31.6	0.00304	mg/L	0.000488	0.00304	mg/L	0.000488	16.03%
Na 330.237†	4.4	0.2109	mg/L	0.46955	0.2109	mg/L	0.46955	222.60%
Ni 231.604†	1.5	0.00052	mg/L	0.002167	0.00052	mg/L	0.002167	419.22%
Pb 220.353†	2.2	0.00031	mg/L	0.000742	0.00031	mg/L	0.000742	237.34%
Sb 206.836†	5.3	0.00227	mg/L	0.000729	0.00227	mg/L	0.000729	32.05%
Se 196.026†	-7.0	-0.00575	mg/L	0.001474	-0.00575	mg/L	0.001474	25.62%
Si 288.158†	1.8	0.00181	mg/L	0.000687	0.00181	mg/L	0.000687	37.92%
Sn 189.927†	0.2	0.00006	mg/L	0.000936	0.00006	mg/L	0.000936	>999.9%
Sr 421.552†	-7.9	-0.00001	mg/L	0.000023	-0.00001	mg/L	0.000023	189.74%
Ti 334.903†	8.6	0.00050	mg/L	0.000722	0.00050	mg/L	0.000722	143.91%
Tl 190.801†	1.6	0.00110	mg/L	0.002730	0.00110	mg/L	0.002730	247.69%
V 292.402†	-2.0	-0.00002	mg/L	0.000224	-0.00002	mg/L	0.000224	>999.9%
Zn 206.200†	28.0	0.00938	mg/L	0.000622	0.00938	mg/L	0.000622	6.63%

Sequence No.: 20
Sample ID: XW40 MB1 SWC

Del

Autosampler Location: 328
Date Collected: 2/10/2014 12:15:39 PM
Data Type: Original

Dilution: 2.000000X

Nebulizer Parameters: XW40 MB1 SWC

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: XW40 MB1 SWC

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2108795.0	100.3	%	0.35				0.35%
ScR 361.383	231447.6	101.4	%	0.29				0.28%
Ag 328.068†	-5.8	-0.00003	mg/L	0.000284	-0.00006	mg/L	0.000569	960.03%
Al 308.215†	31.3	0.03803	mg/L	0.003678	0.07606	mg/L	0.007355	9.67%
As 188.979†	2.4	0.00231	mg/L	0.002403	0.00461	mg/L	0.004806	104.15%
B 249.677†	2.7	0.00059	mg/L	0.000764	0.00117	mg/L	0.001529	130.50%
Ba 233.527†	-2.5	-0.00056	mg/L	0.000462	-0.00112	mg/L	0.000924	82.41%
Be 313.042†	6.1	0.00002	mg/L	0.000035	0.00003	mg/L	0.000069	231.17%
Ca 317.933†	385.5	0.05268	mg/L	0.002030	0.1054	mg/L	0.00406	3.85%
Cd 228.802†	-1.8	-0.00011	mg/L	0.000073	-0.00021	mg/L	0.000146	68.41%
Co 228.616†	5.2	0.00017	mg/L	0.000160	0.00034	mg/L	0.000321	93.21%
Cr 267.716†	4.2	0.00077	mg/L	0.000631	0.00154	mg/L	0.001262	82.01%
Cu 324.752†	12.3	0.00006	mg/L	0.000061	0.00012	mg/L	0.000122	104.52%
Fe 273.955†	4.7	0.00601	mg/L	0.007547	0.01202	mg/L	0.015094	125.55%
K 766.490†	38.5	0.02135	mg/L	0.005571	0.04270	mg/L	0.011142	26.10%
Mg 279.077†	12.4	0.01779	mg/L	0.004907	0.03559	mg/L	0.009814	27.58%
Mn 257.610†	6.2	0.00021	mg/L	0.000060	0.00041	mg/L	0.000121	29.44%
Mo 202.031†	4.6	0.00030	mg/L	0.000239	0.00060	mg/L	0.000477	79.60%
Na 589.592†	2103.8	0.2025	mg/L	0.00288	0.4049	mg/L	0.00577	1.42%
Na 330.237†	1.6	0.07140	mg/L	0.362583	0.1428	mg/L	0.72517	507.84%
Ni 231.604†	0.0	0.00001	mg/L	0.001679	0.00002	mg/L	0.003359	>999.9%
Pb 220.353†	0.2	0.00004	mg/L	0.000621	0.00008	mg/L	0.001241	>999.9%
Sb 206.836†	-6.1	-0.00265	mg/L	0.001448	-0.00530	mg/L	0.002895	54.67%
Se 196.026†	0.3	0.00025	mg/L	0.002078	0.00051	mg/L	0.004157	818.95%
Si 288.158†	-5.8	-0.00581	mg/L	0.002005	-0.01162	mg/L	0.004011	34.51%
Sn 189.927†	1.7	0.00050	mg/L	0.000323	0.00100	mg/L	0.000645	64.80%
Sr 421.552†	24.0	0.00004	mg/L	0.000013	0.00007	mg/L	0.000027	36.36%
Ti 334.903†	61.8	0.00361	mg/L	0.000151	0.00721	mg/L	0.000302	4.19%
Tl 190.801†	4.7	0.00323	mg/L	0.001908	0.00646	mg/L	0.003815	59.03%
V 292.402†	24.2	~~0.00021 mg/L~~		0.000156	0.00041	mg/L	0.000311	75.12%
Zn 206.200†	62.6	0.02098	mg/L	0.000229	0.04196	mg/L	0.000458	1.09%

Sequence No.: 21
Sample ID: XY02 A TWC

Dil

Dilution: 1.000000X

Autosampler Location: 314
Date Collected: 2/10/2014 12:19:38 PM
Data Type: Original

Nebulizer Parameters: XY02 A TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 A TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	5117127.5	243.5	%	18.53				7.61%
ScR 361.383	566933.4	248.5	%	4.19				1.69%
Ag 328.068†	-607.0	-0.00317	mg/L	0.000152	-0.00317	mg/L	0.000152	4.80%
Al 308.215†	-58.1	-0.07058	mg/L	0.001659	-0.07058	mg/L	0.001659	2.35%
As 188.979†	9.6	0.00858	mg/L	0.000177	0.00858	mg/L	0.000177	2.07%
B 249.677†	0.5	0.00009	mg/L	0.001002	0.00009	mg/L	0.001002	>999.9%
Ba 233.527†	-21.6	-0.00478	mg/L	0.000411	-0.00478	mg/L	0.000411	8.60%
Be 313.042†	-453.1	-0.00113	mg/L	0.000009	-0.00113	mg/L	0.000009	0.80%
Ca 317.933†	33.7	0.00461	mg/L	0.001324	0.00461	mg/L	0.001324	28.71%
Cd 228.802†	-44.9	-0.00248	mg/L	0.000696	-0.00248	mg/L	0.000696	28.13%
Co 228.616†	79.8	0.00274	mg/L	0.000182	0.00274	mg/L	0.000182	6.67%
Cr 267.716†	43.1	0.00800	mg/L	0.000274	0.00800	mg/L	0.000274	3.43%
Cu 324.752†	-1949.8	-0.00933	mg/L	0.000304	-0.00933	mg/L	0.000304	3.26%
Fe 273.955†	36.8	0.04729	mg/L	0.001034	0.04729	mg/L	0.001034	2.19%
K 766.490†	-168.2	-0.09335	mg/L	0.004018	-0.09335	mg/L	0.004018	4.30%
Mg 279.077†	-29.6	-0.04248	mg/L	0.003060	-0.04248	mg/L	0.003060	7.20%
Mn 257.610†	-3.4	-0.00011	mg/L	0.000083	-0.00011	mg/L	0.000083	74.29%
Mo 202.031†	-41.7	-0.00275	mg/L	0.000163	-0.00275	mg/L	0.000163	5.93%
Na 589.592†	310.8	0.02991	mg/L	0.001936	0.02991	mg/L	0.001936	6.47%
Na 330.237†	14.3	0.6846	mg/L	0.10918	0.6846	mg/L	0.10918	15.95%
Ni 231.604†	-12.6	-0.00438	mg/L	0.000493	-0.00438	mg/L	0.000493	11.26%
Pb 220.353†	22.4	0.00322	mg/L	0.000158	0.00322	mg/L	0.000158	4.91%
Sb 206.836†	-18.2	-0.00797	mg/L	0.001144	-0.00797	mg/L	0.001144	14.35%
Se 196.026†	27.2	0.02255	mg/L	0.001982	0.02255	mg/L	0.001982	8.79%
Si 288.158†	3.8	0.00379	mg/L	0.002995	0.00379	mg/L	0.002995	79.01%
Sn 189.927†	7.1	0.00206	mg/L	0.000162	0.00206	mg/L	0.000162	7.87%
Sr 421.552†	-80.0	-0.00012	mg/L	0.000013	-0.00012	mg/L	0.000013	10.37%
Ti 334.903†	-61.9	-0.00362	mg/L	0.000256	-0.00362	mg/L	0.000256	7.07%
Tl 190.801†	19.6	0.01359	mg/L	0.001485	0.01359	mg/L	0.001485	10.92%
V 292.402†	-109.8	-0.00091	mg/L	0.000076	-0.00091	mg/L	0.000076	8.42%
Zn 206.200†	13.0	0.00437	mg/L	0.000413	0.00437	mg/L	0.000413	9.45%

Sequence No.: 22
Sample ID: XY02 B TWC

Autosampler Location: 315
Date Collected: 2/10/2014 12:24:39 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 B TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 B TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	1991513.4	94.77	%	0.156				0.16%
ScR 361.383	224320.9	98.32	%	0.532				0.54%
Ag 328.068†	50.8	0.00030	mg/L	0.000083	0.00030	mg/L	0.000083	27.63%
Al 308.215†	44.0	0.05350	mg/L	0.008837	0.05350	mg/L	0.008837	16.52%
As 188.979†	4.2	0.00333	mg/L	0.000396	0.00333	mg/L	0.000396	11.91%
B 249.677†	449.6	0.09796	mg/L	0.001875	0.09796	mg/L	0.001875	1.91%
Ba 233.527†	9.2	0.00151	mg/L	0.000201	0.00151	mg/L	0.000201	13.26%
Be 313.042†	4.5	0.00001	mg/L	0.000035	0.00001	mg/L	0.000035	315.70%
Ca 317.933†	33280.5	4.548	mg/L	0.0212	4.548	mg/L	0.0212	0.47%
Cd 228.802†	5.3	0.00027	mg/L	0.000059	0.00027	mg/L	0.000059	21.64%
Co 228.616†	-0.4	-0.00002	mg/L	0.000094	-0.00002	mg/L	0.000094	497.17%
Cr 267.716†	6.1	0.00121	mg/L	0.001440	0.00121	mg/L	0.001440	118.54%
Cu 324.752†	746.5	0.00376	mg/L	0.000121	0.00376	mg/L	0.000121	3.22%
Fe 273.955†	2951.3	3.794	mg/L	0.0255	3.794	mg/L	0.0255	0.67%
K 766.490†	3760.1	2.087	mg/L	0.0193	2.087	mg/L	0.0193	0.93%
Mg 279.077†	584.0	0.8344	mg/L	0.01331	0.8344	mg/L	0.01331	1.59%
Mn 257.610†	1598.8	0.05299	mg/L	0.000525	0.05299	mg/L	0.000525	0.99%
Mo 202.031†	15.7	0.00098	mg/L	0.000206	0.00098	mg/L	0.000206	21.16%
Na 589.592†	4812064.3	463.1	mg/L	4.54	463.1	mg/L	4.54	0.98%
Na 330.237†	9548.3	458.2	mg/L	1.74	458.2	mg/L	1.74	0.38%
Ni 231.604†	9.1	0.00314	mg/L	0.002024	0.00314	mg/L	0.002024	64.49%
Pb 220.353†	-3.8	-0.00074	mg/L	0.000175	-0.00074	mg/L	0.000175	23.76%
Sb 206.836†	7.4	0.00388	mg/L	0.000366	0.00388	mg/L	0.000366	9.45%
Se 196.026†	0.5	0.00045	mg/L	0.000887	0.00045	mg/L	0.000887	197.84%
Si 288.158†	11176.9	11.12	mg/L	0.027	11.12	mg/L	0.027	0.24%
Sn 189.927†	305.9	0.08991	mg/L	0.001537	0.08991	mg/L	0.001537	1.71%
Sr 421.552†	7718.7	0.01189	mg/L	0.000043	0.01189	mg/L	0.000043	0.36%
Ti 334.903†	40.4	0.00203	mg/L	0.000166	0.00203	mg/L	0.000166	8.18%
Tl 190.801†	3.8	0.00316	mg/L	0.001443	0.00316	mg/L	0.001443	45.60%
V 292.402†	84.8	0.00050	mg/L	0.000122	0.00050	mg/L	0.000122	24.23%
Zn 206.200†	372.8	0.1270	mg/L	0.00045	0.1270	mg/L	0.00045	0.35%

Sequence No.: 23
Sample ID: XY02 C TWC

Autosampler Location: 316
Date Collected: 2/10/2014 12:28:56 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 C TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 C TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	1988255.6	94.61	%	0.535				0.57%
ScR 361.383	217290.1	95.24	%	0.279				0.29%
Ag 328.068†	-378.2	0.00027	mg/L	0.000065	0.00027	mg/L	0.000065	23.87%
Al 308.215†	95.9	0.1165	mg/L	0.00527	0.1165	mg/L	0.00527	4.52%
As 188.979†	79.3	0.03920	mg/L	0.006456	0.03920	mg/L	0.006456	16.47%
B 249.677†	186.5	0.04036	mg/L	0.000435	0.04036	mg/L	0.000435	1.08%
Ba 233.527†	155.7	0.03351	mg/L	0.000323	0.03351	mg/L	0.000323	0.96%
Be 313.042†	42.1	0.00010	mg/L	0.000006	0.00010	mg/L	0.000006	5.42%
Ca 317.933†	2194751.8	299.9	mg/L	0.43	299.9	mg/L	0.43	0.14%
Cd 228.802†	14.1	0.00043	mg/L	0.000210	0.00043	mg/L	0.000210	48.39%
Co 228.616†	4071.2	0.1391	mg/L	0.00071	0.1391	mg/L	0.00071	0.51%
Cr 267.716†	34.0	0.00147	mg/L	0.000261	0.00147	mg/L	0.000261	17.72%
Cu 324.752†	1344.5	0.00666	mg/L	0.000083	0.00666	mg/L	0.000083	1.24%
Fe 273.955†	5413.9	6.960	mg/L	0.0551	6.960	mg/L	0.0551	0.79%
K 766.490†	8416.5	4.670	mg/L	0.0294	4.670	mg/L	0.0294	0.63%
Mg 279.077†	19156.3	27.43	mg/L	0.212	27.43	mg/L	0.212	0.77%
Mn 257.610†	125959.0	4.175	mg/L	0.0172	4.175	mg/L	0.0172	0.41%
Mo 202.031†	126.7	0.00439	mg/L	0.000544	0.00439	mg/L	0.000544	12.40%
Na 589.592†	571537.9	55.00	mg/L	0.176	55.00	mg/L	0.176	0.32%
Na 330.237†	1267.9	53.34	mg/L	1.006	53.34	mg/L	1.006	1.89%
Ni 231.604†	177.4	0.06143	mg/L	0.001043	0.06143	mg/L	0.001043	1.70%
Pb 220.353†	-32.9	-0.00505	mg/L	0.000363	-0.00505	mg/L	0.000363	7.19%
Sb 206.836†	21.5	0.01051	mg/L	0.000729	0.01051	mg/L	0.000729	6.94%
Se 196.026†	36.2	0.02987	mg/L	0.002298	0.02987	mg/L	0.002298	7.69%
Si 288.158†	12050.0	11.99	mg/L	0.063	11.99	mg/L	0.063	0.53%
Sn 189.927†	564.2	0.2058	mg/L	0.00125	0.2058	mg/L	0.00125	0.61%
Sr 421.552†	439917.5	0.6775	mg/L	0.00224	0.6775	mg/L	0.00224	0.33%
Ti 334.903†	653.3	0.01603	mg/L	0.000308	0.01603	mg/L	0.000308	1.92%
Tl 190.801†	57.4	0.03996	mg/L	0.000908	0.03996	mg/L	0.000908	2.27%
V 292.402†	76.4	0.00087	mg/L	0.000071	0.00087	mg/L	0.000071	8.20%
Zn 206.200†	77681.1	26.03	mg/L	0.121	26.03	mg/L	0.121	0.46%

Sequence No.: 24
Sample ID: XY02 D TWC

Autosampler Location: 317
Date Collected: 2/10/2014 12:33:12 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 D TWC

Analyte	Back Pressure	Flow
All	200.0 kPa	0.75 L/min

Mean Data: XY02 D TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Calib. Std.Dev.	Sample Conc.	Sample Units	Sample Std.Dev.	RSD
ScA 357.253	1969617.1	93.72	%	0.482				0.51%
ScR 361.383	217325.0	95.26	%	0.726				0.76%
Ag 328.068†	-422.3	0.00013	mg/L	0.000071	0.00013	mg/L	0.000071	55.98%
Al 308.215†	56.6	0.06863	mg/L	0.006529	0.06863	mg/L	0.006529	9.51%
As 188.979†	81.8	0.04008	mg/L	0.001375	0.04008	mg/L	0.001375	3.43%
B 249.677†	198.7	0.04299	mg/L	0.001121	0.04299	mg/L	0.001121	2.61%
Ba 233.527†	158.4	0.03423	mg/L	0.001173	0.03423	mg/L	0.001173	3.43%
Be 313.042†	36.3	0.00009	mg/L	0.000018	0.00009	mg/L	0.000018	20.08%
Ca 317.933†	2278226.2	311.3	mg/L	3.74	311.3	mg/L	3.74	1.20%
Cd 228.802†	15.4	0.00049	mg/L	0.000156	0.00049	mg/L	0.000156	31.83%
Co 228.616†	4243.8	0.1451	mg/L	0.00105	0.1451	mg/L	0.00105	0.73%
Cr 267.716†	38.3	0.00204	mg/L	0.001817	0.00204	mg/L	0.001817	88.95%
Cu 324.752†	1203.1	0.00594	mg/L	0.000261	0.00594	mg/L	0.000261	4.40%
Fe 273.955†	4745.2	6.100	mg/L	0.0689	6.100	mg/L	0.0689	1.13%
K 766.490†	8524.6	4.730	mg/L	0.0525	4.730	mg/L	0.0525	1.11%
Mg 279.077†	19816.7	28.38	mg/L	0.288	28.38	mg/L	0.288	1.01%
Mn 257.610†	131606.6	4.362	mg/L	0.0652	4.362	mg/L	0.0652	1.49%
Mo 202.031†	130.6	0.00449	mg/L	0.000364	0.00449	mg/L	0.000364	8.11%
Na 589.592†	763671.8	73.49	mg/L	1.195	73.49	mg/L	1.195	1.63%
Na 330.237†	1654.9	71.67	mg/L	0.828	71.67	mg/L	0.828	1.16%
Ni 231.604†	180.1	0.06238	mg/L	0.001400	0.06238	mg/L	0.001400	2.24%
Pb 220.353†	-38.2	-0.00578	mg/L	0.001772	-0.00578	mg/L	0.001772	30.68%
Sb 206.836†	31.1	0.01491	mg/L	0.002900	0.01491	mg/L	0.002900	19.46%
Se 196.026†	37.2	0.03074	mg/L	0.003039	0.03074	mg/L	0.003039	9.89%
Si 288.158†	14184.3	14.11	mg/L	0.036	14.11	mg/L	0.036	0.25%
Sn 189.927†	689.6	0.2440	mg/L	0.00456	0.2440	mg/L	0.00456	1.87%
Sr 421.552†	459838.5	0.7081	mg/L	0.01034	0.7081	mg/L	0.01034	1.46%
Ti 334.903†	633.4	0.01402	mg/L	0.000942	0.01402	mg/L	0.000942	6.72%
Tl 190.801†	59.8	0.04150	mg/L	0.002133	0.04150	mg/L	0.002133	5.14%
V 292.402†	36.8	0.00062	mg/L	0.000127	0.00062	mg/L	0.000127	20.61%
Zn 206.200†	80163.5	26.87	mg/L	0.272	26.87	mg/L	0.272	1.01%

Sequence No.: 25
Sample ID: XY02 E TWC

Autosampler Location: 318
Date Collected: 2/10/2014 12:37:28 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 E TWC

Analyte	Back Pressure	Flow
All	198.0 kPa	0.75 L/min

Mean Data: XY02 E TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	1990856.2	94.74	%	0.282				0.30%
ScR 361.383	216729.4	95.00	%	0.736				0.77%
Ag 328.068†	-433.4	0.00001	mg/L	0.000106	0.00001	mg/L	0.000106	>999.9%
Al 308.215†	106.7	0.1296	mg/L	0.00517	0.1296	mg/L	0.00517	3.99%
As 188.979†	80.7	0.04001	mg/L	0.003437	0.04001	mg/L	0.003437	8.59%
B 249.677†	545.2	0.1185	mg/L	0.00396	0.1185	mg/L	0.00396	3.35%
Ba 233.527†	152.5	0.03350	mg/L	0.000311	0.03350	mg/L	0.000311	0.93%
Be 313.042†	38.2	0.00009	mg/L	0.000049	0.00009	mg/L	0.000049	52.05%
Ca 317.933†	2218364.9	303.2	mg/L	3.63	303.2	mg/L	3.63	1.20%
Cd 228.802†	38.0	0.00175	mg/L	0.000108	0.00175	mg/L	0.000108	6.17%
Co 228.616†	4102.8	0.1402	mg/L	0.00046	0.1402	mg/L	0.00046	0.33%
Cr 267.716†	38.0	0.00189	mg/L	0.000458	0.00189	mg/L	0.000458	24.28%
Cu 324.752†	2555.9	0.01220	mg/L	0.000159	0.01220	mg/L	0.000159	1.31%
Fe 273.955†	1335.3	1.717	mg/L	0.0245	1.717	mg/L	0.0245	1.43%
K 766.490†	5946.4	3.300	mg/L	0.0309	3.300	mg/L	0.0309	0.94%
Mg 279.077†	19263.5	27.59	mg/L	0.417	27.59	mg/L	0.417	1.51%
Mn 257.610†	128084.3	4.246	mg/L	0.0620	4.246	mg/L	0.0620	1.46%
Mo 202.031†	124.5	0.00420	mg/L	0.000517	0.00420	mg/L	0.000517	12.30%
Na 589.592†	402958.0	38.78	mg/L	0.572	38.78	mg/L	0.572	1.48%
Na 330.237†	937.6	37.50	mg/L	1.327	37.50	mg/L	1.327	3.54%
Ni 231.604†	262.2	0.09082	mg/L	0.001947	0.09082	mg/L	0.001947	2.14%
Pb 220.353†	-44.1	-0.00639	mg/L	0.001200	-0.00639	mg/L	0.001200	18.80%
Sb 206.836†	23.0	0.01189	mg/L	0.000514	0.01189	mg/L	0.000514	4.32%
Se 196.026†	35.3	0.02911	mg/L	0.001621	0.02911	mg/L	0.001621	5.57%
Si 288.158†	12956.0	12.89	mg/L	0.165	12.89	mg/L	0.165	1.28%
Sn 189.927†	918.9	0.3098	mg/L	0.00171	0.3098	mg/L	0.00171	0.55%
Sr 421.552†	447781.4	0.6896	mg/L	0.01032	0.6896	mg/L	0.01032	1.50%
Ti 334.903†	602.7	0.01283	mg/L	0.000598	0.01283	mg/L	0.000598	4.66%
Tl 190.801†	58.7	0.04019	mg/L	0.005552	0.04019	mg/L	0.005552	13.81%
V 292.402†	-0.9	0.00054	mg/L	0.000065	0.00054	mg/L	0.000065	12.02%
Zn 206.200†	77560.2	25.99	mg/L	0.334	25.99	mg/L	0.334	1.28%

Sequence No.: 26
Sample ID: XY02 F TWC

Autosampler Location: 319
Date Collected: 2/10/2014 12:41:43 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 F TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 F TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
ScA 357.253	1983033.5	94.36	%	1.502				1.59%
ScR 361.383	219762.6	96.33	%	0.264				0.27%
Ag 328.068†	-410.4	0.00022	mg/L	0.000100	0.00022	mg/L	0.000100	45.46%
Al 308.215†	36.0	0.04358	mg/L	0.009813	0.04358	mg/L	0.009813	22.52%
As 188.979†	87.5	0.04476	mg/L	0.004682	0.04476	mg/L	0.004682	10.46%
B 249.677†	520.5	0.1131	mg/L	0.00087	0.1131	mg/L	0.00087	0.77%
Ba 233.527†	154.6	0.03415	mg/L	0.000782	0.03415	mg/L	0.000782	2.29%
Be 313.042†	27.6	0.00007	mg/L	0.000034	0.00007	mg/L	0.000034	50.10%
Ca 317.933†	2308495.7	315.5	mg/L	0.45	315.5	mg/L	0.45	0.14%
Cd 228.802†	8.4	0.00009	mg/L	0.000259	0.00009	mg/L	0.000259	292.78%
Co 228.616†	4275.4	0.1461	mg/L	0.00186	0.1461	mg/L	0.00186	1.27%
Cr 267.716†	36.5	0.00132	mg/L	0.001781	0.00132	mg/L	0.001781	135.02%
Cu 324.752†	841.9	0.00391	mg/L	0.000184	0.00391	mg/L	0.000184	4.69%
Fe 273.955†	208.1	0.2675	mg/L	0.00516	0.2675	mg/L	0.00516	1.93%
K 766.490†	8004.9	4.442	mg/L	0.0063	4.442	mg/L	0.0063	0.14%
Mg 279.077†	20062.3	28.74	mg/L	0.073	28.74	mg/L	0.073	0.26%
Mn 257.610†	131875.8	4.371	mg/L	0.0216	4.371	mg/L	0.0216	0.49%
Mo 202.031†	126.3	0.00416	mg/L	0.000772	0.00416	mg/L	0.000772	18.58%
Na 589.592†	410192.0	39.47	mg/L	0.087	39.47	mg/L	0.087	0.22%
Na 330.237†	939.6	37.66	mg/L	0.303	37.66	mg/L	0.303	0.81%
Ni 231.604†	181.9	0.06301	mg/L	0.000776	0.06301	mg/L	0.000776	1.23%
Pb 220.353†	-43.0	-0.00616	mg/L	0.001791	-0.00616	mg/L	0.001791	29.06%
Sb 206.836†	24.0	0.01088	mg/L	0.001224	0.01088	mg/L	0.001224	11.25%
Se 196.026†	38.9	0.03212	mg/L	0.005904	0.03212	mg/L	0.005904	18.38%
Si 288.158†	13119.0	13.05	mg/L	0.052	13.05	mg/L	0.052	0.40%
Sn 189.927†	257.9	0.1186	mg/L	0.00077	0.1186	mg/L	0.00077	0.65%
Sr 421.552†	461974.2	0.7114	mg/L	0.00158	0.7114	mg/L	0.00158	0.22%
Ti 334.903†	600.5	0.01180	mg/L	0.000714	0.01180	mg/L	0.000714	6.05%
Tl 190.801†	58.5	0.03981	mg/L	0.002218	0.03981	mg/L	0.002218	5.57%
V 292.402†	-16.8	0.00052	mg/L	0.000010	0.00052	mg/L	0.000010	2.00%
Zn 206.200†	76878.8	25.76	mg/L	0.054	25.76	mg/L	0.054	0.21%

Sequence No.: 27
Sample ID: XY02 A TWC

Autosampler Location: 314
Date Collected: 2/10/2014 12:45:59 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 A TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 A TWC

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2001305.7	95.23	%	0.449				0.47%
ScR 361.383	219672.4	96.29	%	0.458				0.48%
Ag 328.068†	-415.9	0.00022	mg/L	0.000189	0.00022	mg/L	0.000189	86.97%
Al 308.215†	626.9	0.7625	mg/L	0.00186	0.7625	mg/L	0.00186	0.24%
As 188.979†	84.2	0.04289	mg/L	0.000805	0.04289	mg/L	0.000805	1.88%
B 249.677†	191.7	0.04146	mg/L	0.001378	0.04146	mg/L	0.001378	3.32%
Ba 233.527†	182.4	0.03760	mg/L	0.000302	0.03760	mg/L	0.000302	0.80%
Be 313.042†	38.5	0.00009	mg/L	0.000025	0.00009	mg/L	0.000025	26.21%
Ca 317.933†	2333255.9	318.9	mg/L	0.88	318.9	mg/L	0.88	0.28%
Cd 228.802†	20.2	0.00074	mg/L	0.000029	0.00074	mg/L	0.000029	3.90%
Co 228.616†	4416.0	0.1509	mg/L	0.00107	0.1509	mg/L	0.00107	0.71%
Cr 267.716†	32.2	0.00153	mg/L	0.000797	0.00153	mg/L	0.000797	51.97%
Cu 324.752†	2433.7	0.01254	mg/L	0.000185	0.01254	mg/L	0.000185	1.47%
Fe 273.955†	15838.7	20.36	mg/L	0.171	20.36	mg/L	0.171	0.84%
K 766.490†	8127.7	4.510	mg/L	0.0319	4.510	mg/L	0.0319	0.71%
Mg 279.077†	20286.5	29.04	mg/L	0.105	29.04	mg/L	0.105	0.36%
Mn 257.610†	135451.6	4.490	mg/L	0.0109	4.490	mg/L	0.0109	0.24%
Mo 202.031†	135.8	0.00474	mg/L	0.000256	0.00474	mg/L	0.000256	5.40%
Na 589.592†	342940.9	33.00	mg/L	0.061	33.00	mg/L	0.061	0.19%
Na 330.237†	837.6	32.06	mg/L	0.535	32.06	mg/L	0.535	1.67%
Ni 231.604†	192.2	0.06656	mg/L	0.000536	0.06656	mg/L	0.000536	0.81%
Pb 220.353†	-4.4	-0.00150	mg/L	0.000862	-0.00150	mg/L	0.000862	57.41%
Sb 206.836†	25.1	0.01238	mg/L	0.001880	0.01238	mg/L	0.001880	15.19%
Se 196.026†	36.3	0.02994	mg/L	0.006261	0.02994	mg/L	0.006261	20.91%
Si 288.158†	12796.2	12.73	mg/L	0.080	12.73	mg/L	0.080	0.63%
Sn 189.927†	689.9	0.2451	mg/L	0.00149	0.2451	mg/L	0.00149	0.61%
Sr 421.552†	470856.6	0.7251	mg/L	0.00033	0.7251	mg/L	0.00033	0.05%
Ti 334.903†	1343.1	0.05496	mg/L	0.000822	0.05496	mg/L	0.000822	1.50%
Tl 190.801†	57.0	0.04145	mg/L	0.002363	0.04145	mg/L	0.002363	5.70%
V 292.402†	454.4	0.00330	mg/L	0.000151	0.00330	mg/L	0.000151	4.57%
Zn 206.200†	84299.1	28.25	mg/L	0.176	28.25	mg/L	0.176	0.62%

Sequence No.: 28
Sample ID: XY02 MB1SPK TWC

Autosampler Location: 320
Date Collected: 2/10/2014 12:50:16 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XY02 MB1SPK TWC

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: XY02 MB1SPK TWC

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2075929.8	98.78	%	0.917				0.93%
ScR 361.383	225316.9	98.76	%	0.218				0.22%
Ag 328.068†	102307.8	0.5345	mg/L	0.00584	0.5345	mg/L	0.00584	1.09%
Al 308.215†	1722.0	2.088	mg/L	0.0057	2.088	mg/L	0.0057	0.27%
As 188.979†	2271.1	2.048	mg/L	0.0153	2.048	mg/L	0.0153	0.75%
B 249.677†	0.5	-0.00098	mg/L	0.000821	-0.00098	mg/L	0.000821	83.85%
Ba 233.527†	9453.1	2.090	mg/L	0.0043	2.090	mg/L	0.0043	0.20%
Be 313.042†	200677.3	0.5000	mg/L	0.00444	0.5000	mg/L	0.00444	0.89%
Ca 317.933†	75922.1	10.38	mg/L	0.137	10.38	mg/L	0.137	1.32%
Cd 228.802†	9893.9	0.5243	mg/L	0.00609	0.5243	mg/L	0.00609	1.16%
Co 228.616†	15103.2	0.5162	mg/L	0.00444	0.5162	mg/L	0.00444	0.86%
Cr 267.716†	2904.9	0.5382	mg/L	0.00157	0.5382	mg/L	0.00157	0.29%
Cu 324.752†	107343.2	0.5139	mg/L	0.00395	0.5139	mg/L	0.00395	0.77%
Fe 273.955†	1664.4	2.136	mg/L	0.0087	2.136	mg/L	0.0087	0.41%
K 766.490†	18927.8	10.50	mg/L	0.138	10.50	mg/L	0.138	1.31%
Mg 279.077†	7460.6	10.70	mg/L	0.025	10.70	mg/L	0.025	0.23%
Mn 257.610†	15345.7	0.5092	mg/L	0.00551	0.5092	mg/L	0.00551	1.08%
Mo 202.031†	34.0	0.00211	mg/L	0.000248	0.00211	mg/L	0.000248	11.78%
Na 589.592†	111602.7	10.74	mg/L	0.147	10.74	mg/L	0.147	1.37%
Na 330.237†	232.4	11.00	mg/L	0.264	11.00	mg/L	0.264	2.40%
Ni 231.604†	1534.4	0.5306	mg/L	0.00400	0.5306	mg/L	0.00400	0.75%
Pb 220.353†	14177.8	2.038	mg/L	0.0247	2.038	mg/L	0.0247	1.21%
Sb 206.836†	18.2	0.00276	mg/L	0.000367	0.00276	mg/L	0.000367	13.31%
Se 196.026†	2368.9	1.959	mg/L	0.0109	1.959	mg/L	0.0109	0.56%
Si 288.158†	15.8	0.01811	mg/L	0.004897	0.01811	mg/L	0.004897	27.04%
Sn 189.927†	-20.9	-0.00460	mg/L	0.001112	-0.00460	mg/L	0.001112	24.18%
Sr 421.552†	342738.6	0.5278	mg/L	0.00722	0.5278	mg/L	0.00722	1.37%
Ti 334.903†	33.9	0.00111	mg/L	0.000324	0.00111	mg/L	0.000324	29.18%
Tl 190.801†	2957.2	2.049	mg/L	0.0134	2.049	mg/L	0.0134	0.65%
V 292.402†	62614.7	0.5363	mg/L	0.00607	0.5363	mg/L	0.00607	1.13%
Zn 206.200†	1590.5	0.5333	mg/L	0.00048	0.5333	mg/L	0.00048	0.09%

Sequence No.: 29
Sample ID: CV 3

Autosampler Location: 7
Date Collected: 2/10/2014 12:54:17 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CV

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: CV

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2105029.6	100.2	%	0.49				0.49%
ScR 361.383	230445.8	101.0	%	0.41				0.40%
Ag 328.068†	198280.7	1.036	mg/L	0.0032	1.036	mg/L	0.0032	0.31%
Al 308.215†	1662.3	1.991	mg/L	0.0209	1.991	mg/L	0.0209	1.05%
As 188.979†	2233.6	2.046	mg/L	0.0057	2.046	mg/L	0.0057	0.28%
B 249.677†	4628.9	1.008	mg/L	0.0034	1.008	mg/L	0.0034	0.33%
Ba 233.527†	4537.1	1.003	mg/L	0.0045	1.003	mg/L	0.0045	0.45%
Be 313.042†	415177.6	1.034	mg/L	0.0052	1.034	mg/L	0.0052	0.50%
Ca 317.933†	15137.6	2.069	mg/L	0.0104	2.069	mg/L	0.0104	0.50%
Cd 228.802†	19224.2	1.029	mg/L	0.0042	1.029	mg/L	0.0042	0.41%
Co 228.616†	29128.7	0.9943	mg/L	0.00454	0.9943	mg/L	0.00454	0.46%
Cr 267.716†	5540.9	1.028	mg/L	0.0063	1.028	mg/L	0.0063	0.62%
Cu 324.752†	217625.7	1.041	mg/L	0.0060	1.041	mg/L	0.0060	0.58%
Fe 273.955†	1609.5	2.062	mg/L	0.0062	2.062	mg/L	0.0062	0.30%
K 766.490†	35579.0	19.74	mg/L	0.016	19.74	mg/L	0.016	0.08%
Mg 279.077†	1370.1	1.971	mg/L	0.0013	1.971	mg/L	0.0013	0.06%
Mn 257.610†	29380.5	0.9746	mg/L	0.00118	0.9746	mg/L	0.00118	0.12%
Mo 202.031†	14776.9	0.9754	mg/L	0.00485	0.9754	mg/L	0.00485	0.50%
Na 589.592†	523005.2	50.33	mg/L	0.111	50.33	mg/L	0.111	0.22%
Na 330.237†	1053.6	50.52	mg/L	0.211	50.52	mg/L	0.211	0.42%
Ni 231.604†	2980.5	1.033	mg/L	0.0045	1.033	mg/L	0.0045	0.44%
Pb 220.353†	14001.2	2.013	mg/L	0.0096	2.013	mg/L	0.0096	0.48%
Sb 206.836†	4846.2	2.095	mg/L	0.0158	2.095	mg/L	0.0158	0.76%
Se 196.026†	2467.9	2.041	mg/L	0.0135	2.041	mg/L	0.0135	0.66%
Si 288.158†	2006.1	2.001	mg/L	0.0090	2.001	mg/L	0.0090	0.45%
Sn 189.927†	3465.5	1.013	mg/L	0.0017	1.013	mg/L	0.0017	0.16%
Sr 421.552†	651810.1	1.004	mg/L	0.0009	1.004	mg/L	0.0009	0.09%
Ti 334.903†	16839.2	0.9832	mg/L	0.00328	0.9832	mg/L	0.00328	0.33%
Tl 190.801†	3006.4	2.080	mg/L	0.0095	2.080	mg/L	0.0095	0.46%
V 292.402†	118205.6	1.013	mg/L	0.0028	1.013	mg/L	0.0028	0.28%
Zn 206.200†	3078.2	1.032	mg/L	0.0053	1.032	mg/L	0.0053	0.52%

Sequence No.: 30
Sample ID: CB 3

Autosampler Location: 1
Date Collected: 2/10/2014 12:58:19 PM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	199.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Conc.	Calib. Units	Std.Dev.	Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2112936.0	100.5	%	0.45				0.45%
ScR 361.383	231386.8	101.4	%	0.71				0.70%
Ag 328.068†	8.8	0.00005	mg/L	0.000111	0.00005	mg/L	0.000111	240.36%
Al 308.215†	3.5	0.00422	mg/L	0.007504	0.00422	mg/L	0.007504	177.69%
As 188.979†	2.2	0.00197	mg/L	0.001683	0.00197	mg/L	0.001683	85.30%
B 249.677†	6.1	0.00132	mg/L	0.000932	0.00132	mg/L	0.000932	70.40%
Ba 233.527†	3.7	0.00083	mg/L	0.000033	0.00083	mg/L	0.000033	3.96%
Be 313.042†	38.2	0.00010	mg/L	0.000018	0.00010	mg/L	0.000018	19.24%
Ca 317.933†	35.8	0.00489	mg/L	0.000820	0.00489	mg/L	0.000820	16.79%
Cd 228.802†	-5.0	-0.00028	mg/L	0.000086	-0.00028	mg/L	0.000086	30.43%
Co 228.616†	3.6	0.00012	mg/L	0.000189	0.00012	mg/L	0.000189	153.67%
Cr 267.716†	1.5	0.00028	mg/L	0.001834	0.00028	mg/L	0.001834	654.19%
Cu 324.752†	-20.5	-0.00010	mg/L	0.000045	-0.00010	mg/L	0.000045	45.49%
Fe 273.955†	-1.1	-0.00141	mg/L	0.002360	-0.00141	mg/L	0.002360	167.13%
K 766.490†	13.4	0.00742	mg/L	0.002481	0.00742	mg/L	0.002481	33.46%
Mg 279.077†	-0.4	-0.00063	mg/L	0.005728	-0.00063	mg/L	0.005728	911.44%
Mn 257.610†	4.8	0.00016	mg/L	0.000154	0.00016	mg/L	0.000154	96.17%
Mo 202.031†	18.2	0.00120	mg/L	0.000379	0.00120	mg/L	0.000379	31.49%
Na 589.592†	101.1	0.00973	mg/L	0.001798	0.00973	mg/L	0.001798	18.48%
Na 330.237†	1.5	0.07298	mg/L	0.649995	0.07298	mg/L	0.649995	890.69%
Ni 231.604†	-2.1	-0.00073	mg/L	0.000964	-0.00073	mg/L	0.000964	132.34%
Pb 220.353†	2.6	0.00038	mg/L	0.000236	0.00038	mg/L	0.000236	62.35%
Sb 206.836†	6.0	0.00261	mg/L	0.000977	0.00261	mg/L	0.000977	37.48%
Se 196.026†	1.9	0.00157	mg/L	0.000633	0.00157	mg/L	0.000633	40.42%
Si 288.158†	0.4	0.00035	mg/L	0.001790	0.00035	mg/L	0.001790	514.74%
Sn 189.927†	0.9	0.00027	mg/L	0.000746	0.00027	mg/L	0.000746	274.61%
Sr 421.552†	58.3	0.00009	mg/L	0.000070	0.00009	mg/L	0.000070	77.98%
Ti 334.903†	-2.5	-0.00015	mg/L	0.000383	-0.00015	mg/L	0.000383	255.57%
Tl 190.801†	0.9	0.00063	mg/L	0.001705	0.00063	mg/L	0.001705	271.81%
V 292.402†	21.3	0.00018	mg/L	0.000091	0.00018	mg/L	0.000091	49.61%
Zn 206.200†	2.9	0.00097	mg/L	0.000312	0.00097	mg/L	0.000312	32.24%

Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix D

Solid-Phase TIE Test Data Sheets

Appendix D.1

10-Day Solid-Phase TIE Test with Hyalella azteca

NewFields

10 DAY ~~POREWATER~~ TEST - OBSERVATIONS

Sediment

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA		*Hyallela*	#REF!

ENDPOINT DATA & OBSERVATIONS

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 2/01 TECHNICIAN JL OBSERVNS.	DATE 2/02 TECHNICIAN JL OBSERVNS.	DATE 2/03 TECHNICIAN JL OBSERVNS.	DATE 2/4 TECHNICIAN MRB OBSERVNS.	DATE 2/5 TECHNICIAN MRB OBSERVNS.	DATE 2/6 TECHNICIAN MK OBSERVNS.	DATE 2/7 TECHNICIAN MK OBSERVNS.	DATE 2/08 TECHNICIAN JL OBSERVNS.	DATE 2/09 TECHNICIAN JL OBSERVNS.	DATE 2/10 TECHNICIAN CR OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
Control / .	1		10	N	N	N	N	N	N	N	N	N	N	8	1	208.52	208.95	
	2		10											10	2	206.75	207.29	
	3		10											8	3	208.29	208.68	
	4		10											9	4	205.27	205.79	
WETSED1 / .	1		10										G/H	0	5	207.74	~~210.50~~ ②	
	2		10											0	6	211.50		
	3		10											0	7	204.05		
	4		10											0	8	209.81		
WETSED1-SIR300 / .	1		10										N	4	9	210.20	210.50	
	2		10											10	10	205.78	206.51	
	3		10											6	11	209.42	209.97	
	4		10											7	12	207.15	207.70	
WETSED1-CC / .	1		10										N	9	13	207.33		
	2		10											0	14	209.68		
	3		10											8	15	209.69		
	4		10											0	16	208.29		
R300 Blank / .	1		10										N	7 ①	17	210.18	210.34	
	2		10											8	18	208.00	208.24	
	3		10											10	19	209.79	210.31	
	4		10											8	20	211.29	211.60	
CC-Blank / .	1		10										G,U	1	21	208.22	208.27	
	2		10											8	22	206.61	—	
	3		10											1	23	208.24	208.29	
	4		10											0	24	210.01	—	

① 5 animals in weighboat

② WC. JL 2/13/14.

25 210.44
26 209.02
27 209.24

NewFields 10 DAY ~~POREWATER~~ Sediment - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	USEPA 2000 - 600/R-99/064
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
Control / .	0	WQ	Surr	7	8.9	8	22.0	2	197			8	7.7	KB			
Control / .	1	WQ	Surr	6	6.7 ~~40~~	5	22.2	6	~~239~~ 209	5		5	7.7 20	JL			
Control / .	2	WQ	Surr	6	6.4	5	22.3	6	205			5	7.4	JL			
Control / .	3	WQ	Surr	6	6.0	5	22.1	6	201			5	7.3	JL			
Control / .	4	WQ	Surr	6	5.7	5	22.1	6	202			5	7.7	MMB			
Control / .	5	WQ	Surr	7	6.9	8	21.9	2	200			8	7.2	MMB			
Control / .	6	WQ	Surr	6	6.5	5	21.6	6	203			5	7.8	MK			
Control / .	7	WQ	Surr	7	5.0	8	21.2	2	207			8	7.4	MK			
Control / .	8	WQ	Surr	6	5.0	5	21.7	6	200			5	7.3	JL			
Control / .	9	WQ	Surr	6	6.6	5	22.0	6	198			5	7.4	JL			
Control / .	10	WQ	Surr	6	6.8	5	22.3	6	189			5	7.4	MK			

① wrong page. JL 2/01/14

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1 / .	0	WQ	Surr	7	8.4	7	22.0	2	316			8	6.9	KMB			
WETSED1 / .	1	WQ	Surr	6	7.4	5	22.5	6	326			5	7.0	JL			
WETSED1 / .	2	WQ	Surr	6	5.3	5	22.6	6	257			5	7.1	JL			
WETSED1 / .	3	WQ	Surr	6	~~7.4~~ 7.40	5	~~22.0~~ 22.0 ①	6	~~225~~ 225 ①			5	~~7.1~~ 7.1 ①	JL			
WETSED1 / .	4	WQ	Surr	6	4.8	5	22.0	6	214			5	7.5	MMB			
WETSED1 / .	5	WQ	Surr	7	5.0	8	21.7	2	203			8	6.8	MMB			
WETSED1 / .	6	WQ	Surr	6	5.5	5	21.6	6	201			5	7.6	MK			
WETSED1 / .	7	WQ	Surr	7	4.5	8	20.8	2	203			8	7.0	MK			
WETSED1 / .	8	WQ	Surr	6	5.3	5	21.8	6	192			5	7.3	JL			
WETSED1 / .	9	WQ	Surr	6	4.6	5	22.0	6	196			5	7.4	JL			
WETSED1 / .	10	WQ	Surr	6	4.8	5	22.1	6	186			5	7.3	MK			

① 16. JL 2/03/14.

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

[illegible]	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1-SIR300 / .	0	WQ	Surr	7	8.3	7	22.0	2	430			8	7.1	KMB	—		BH
WETSED1-SIR300 / .	1	WQ	Surr	6	6.7	5	22.5	6	405	5		5	7.1	JL	JL	→	→
WETSED1-SIR300 / .	2	WQ	Surr	6	6.7	5	22.5	6	287	5		5	7.1	JL	JL	→	→
WETSED1-SIR300 / .	3	WQ	Surr	6	5.7	5	22.1	6	231	-		5	7.0	JL	JL	→	→
WETSED1-SIR300 / .	4	WQ	Surr	6	6.9	5	22.0	6	205			5	7.4	MMB	MMB	→	→
WETSED1-SIR300 / .	5	WQ	Surr	7	4.6	8	21.9	2	190			8	6.6	MMB	MMB	→	→
WETSED1-SIR300 / .	6	WQ	Surr	6	5.6	5	21.4	6	187			5	7.4	MK	MK	→	→
WETSED1-SIR300 / .	7	WQ	Surr	7	5.4	8	21.1	2	174			8	6.8	MK	MK	→	→
WETSED1-SIR300 / .	8	WQ	Surr	6	4.8	5	21.9	6	172			5	6.9	JL	JL	→	→
WETSED1-SIR300 / .	9	WQ	Surr	6	6.1	5	21.9	6	175			5	7.0	JL	JL	→	→
WETSED1-SIR300 / .	10	WQ	Surr	6	6.9	5	22.2	6	173			5	7.3	MK			

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1-CC / .	0	WQ	Surr	7	8.5	7	22.0	2	352			8	7.0	KMB			BH
WETSED1-CC / .	1	WQ	Surr	6	6.6	5	22.6	6	399			5	7.2	JL	JL		
WETSED1-CC / .	2	WQ	Surr	6	6.8	5	22.3	6	262	5		5	7.2	JL	JL		
WETSED1-CC / .	3	WQ	Surr	6	~~4.5~~ 5.3	5	22.0	6	243			5	7.2	JL	JL		
WETSED1-CC / .	4	WQ	Surr	6	6.0	5	22.0	6	224			6	7.4	MMB	MMB		
WETSED1-CC / .	5	WQ	Surr	7	4.6	8	21.7	2	209			8	6.9	MMB	MMB		
WETSED1-CC / .	6	WQ	Surr	6	4.6	5	21.6	6	204			5	7.4	MK	MK		
WETSED1-CC / .	7	WQ	Surr	7	3.7	8	21.4	2	201			8	7.0	MK	MK		
WETSED1-CC / .	8	WQ	Surr	6	5.7	5	21.7	6	189			5	7.2	JL	JL		
WETSED1-CC / .	9	WQ	Surr	6	5.1	5	22.0	6	188			5	7.3	JL	JL		
WETSED1-CC / .	10	WQ	Surr	6	5.3	5	22.1	6	184			5	7.2	MK			

①MR. JL 2/03/14.

NewFields **10 DAY ~~PORewater~~ - WATER QUALITY DATA SHEET**

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
SIR300 Blank / .	0	WQ	Surr	7	8.8	7	22.0	2	235			8	7.4	~~KB~~	—		BH
SIR300 Blank / .	1	WQ	Surr	6	1.0 ①	5	22.7	6	220			5	7.0	JL	JL		→
SIR300 Blank / .	2	WQ	Surr	6	8.4	5	22.3	6	175			5	7.7	JL	JL		→
SIR300 Blank / .	3	WQ	Surr	6	8.7	5	22.0	6	160			5	7.9	JL	JL		→
SIR300 Blank / .	4	WQ	Surr	6	8.8	5	22.0	6	152			5	8.1	MMB	MMB		→
SIR300 Blank / .	5	WQ	Surr	7	8.8	8	21.7	2	145			8	7.7	MMB	MMB		→
SIR300 Blank / .	6	WQ	Surr	6	7.8	5	21.7	6	190			5	8.0	MK	MK		→
SIR300 Blank / .	7	WQ	Surr	7	7.3	8	21.5	2	158			8	7.9	MK	MK		→
SIR300 Blank / .	8	WQ	Surr	6	8.5	5	21.5	6	153			5	8.0	JL	JL		→
SIR300 Blank / .	9	WQ	Surr	6	8.6	5	21.9	6	153			5	7.9	JL	JL		→
SIR300 Blank / .	10	WQ	Surr	6	8.5	5	22.1	6	154			5	7.4	MK			

① Aeration initiated to all reps. JL 2/01/14.

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
[illegible]	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
CC-Blank / .	0	WQ	Surr	7	8.9	7	22.0	2	236			5	7.4	KB	→		BH
CC-Blank / .	1	WQ	Surr	6	7.1	6	22.2	6	239			5	7.2	JL	JL →		JL
CC-Blank / .	2	WQ	Surr	6	5.8	5	22.5	6	219			5	7.3	JL	JL →		
CC-Blank / .	3	WQ	Surr	6	5.8	5	22.0	6	202			5	7.3	JL	JL →		
CC-Blank / .	4	WQ	Surr	6	5.2	5	22.0	6	200			5	7.6	MMB	MMB →		S
CC-Blank / .	5	WQ	Surr	7	4.4	8	21.8	2	199			8	7.1	MMB	MMB →		
CC-Blank / .	6	WQ	Surr	6	4.5	5	21.7	6	205			5	7.6	MK	MK →		
CC-Blank / .	7	WQ	Surr	7	5.0	8	21.2	2	206			8	7.3	MK	MK →		
CC-Blank / .	8	WQ	Surr	6	4.8	5	21.7	6	195			5	7.3	JL	JL →		
CC-Blank / .	9	WQ	Surr	6	5.0	5	22.0	6	195			5	7.5	JL	JL →		
CC-Blank / .	10	WQ	Surr	6	6.1	5	22.1	6	188			5	7.4	MK			

NewFields

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Yakima Seal TIE	Hyalella	10

PRETEST / ~~INITIAL~~ / FINAL / ~~OTHER~~ (circle one) DAY of TEST: ____
OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
2/4/14	20.0	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	~~Sal~~ Cond. (ppt) (mS/cm)	Sulf. mg/L
PW WETSED 1	Solid.	2/4/14 MMB	0.315	19.5	2/4/14 MMB	N	5.39	663	X
SW-300 WETSED 1	↓	↓	1.09	↓		↓	4.57	0.00	X
PCC WETSED 1	↓	↓	0.518	↓		↓	5.47	653	X

Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix E

Solid-Phase TIE Test Data Sheets

Appendix E.1

10-Day Solid-Phase TIE Test with Hyalella azteca

NewFields

10 DAY ~~POREWATER~~ TEST - OBSERVATIONS

Sediment

CLIENT	PROJECT	JOB NUMBER	PROJECT MAN.	LABORATORY	PROTOCOL	SPECIES	ACCLM.MORT.
Farallon	Yakima Steel		Bill Gardiner	Port Gamble, WA		*Hyallela*	#REF!

ENDPOINT DATA & OBSERVATIONS

N = normal; B= no burrows; M= dead on surface; A= avoidance; L = anoxic surface; F= fungal patches; D= no air flow (DO?); U= excess food

CLIENT/ NEWFIELDS ID	REP	JAR #	INITIAL #	DATE 2/01 TECHNICIAN JL OBSERVNS.	DATE 2/02 TECHNICIAN JL OBSERVNS.	DATE 2/03 TECHNICIAN JL OBSERVNS.	DATE 2/4 TECHNICIAN MRB OBSERVNS.	DATE 2/5 TECHNICIAN MRB OBSERVNS.	DATE 2/6 TECHNICIAN MK OBSERVNS.	DATE 2/7 TECHNICIAN MK OBSERVNS.	DATE 2/08 TECHNICIAN JL OBSERVNS.	DATE 2/09 TECHNICIAN JL OBSERVNS.	DATE 2/10 TECHNICIAN CR OBSERVNS.	NUMBER REMAINING	WEIGH BOAT NUMBER	TARE WEIGHT (mg)	TOTAL WEIGHT (mg)	ASH FREE DRY WEIGHT (mg)
Control / .	1		10	N	N	N	N	N	N	N	N	N	N	8	1	208.52	208.95	
	2		10											10	2	206.75	207.29	
	3		10											8	3	208.29	208.68	
	4		10											9	4	205.27	205.79	
WETSED1 / .	1		10										G/H	0	5	207.74	~~210.50~~ ②	
	2		10											0	6	211.50		
	3		10											0	7	204.05		
	4		10											0	8	209.81		
WETSED1-SIR300 / .	1		10										N	4	9	210.20	210.50	
	2		10											10	10	205.78	206.51	
	3		10											6	11	209.42	209.97	
	4		10											7	12	207.15	207.70	
WETSED1-CC / .	1		10										N	9	13	207.33		
	2		10											0	14	209.68		
	3		10											8	15	209.69		
	4		10											0	16	208.29		
R300 Blank / .	1		10										N	7 ①	17	210.18	210.34	
	2		10											8	18	208.00	208.24	
	3		10											10	19	209.79	210.31	
	4		10											8	20	211.29	211.60	
CC-Blank / .	1		10										G,U	1	21	208.22	208.27	
	2		10											8	22	206.61	—	
	3		10											1	23	208.24	208.29	
	4		10											0	24	210.01	—	

① 5 animals in weighboat

② WC. JL 2/13/14.

25 210.44
26 209.02
27 209.24

NewFields 10 DAY ~~POREWATER~~ Sediment - WATER QUALITY DATA SHEET

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	USEPA 2000 - 600/R-99/064
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
Control / .	0	WQ	Surr	7	8.9	8	22.0	2	197			8	7.7	KB			
Control / .	1	WQ	Surr	6	6.7 ~~40~~	5	22.2	6	~~239~~ 209	5		5	7.7 20	JL			
Control / .	2	WQ	Surr	6	6.4	5	22.3	6	205			5	7.4	JL			
Control / .	3	WQ	Surr	6	6.0	5	22.1	6	201			5	7.3	JL			
Control / .	4	WQ	Surr	6	5.7	5	22.1	6	202			5	7.7	MMB			
Control / .	5	WQ	Surr	7	6.9	8	21.9	2	200			8	7.2	MMB			
Control / .	6	WQ	Surr	6	6.5	5	21.6	6	203			5	7.8	MK			
Control / .	7	WQ	Surr	7	5.0	8	21.2	2	207			8	7.4	MK			
Control / .	8	WQ	Surr	6	5.0	5	21.7	6	200			5	7.3	JL			
Control / .	9	WQ	Surr	6	6.6	5	22.0	6	198			5	7.4	JL			
Control / .	10	WQ	Surr	6	6.8	5	22.3	6	189			5	7.4	MK			

① wrong page. JL 2/01/14

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1 / .	0	WQ	Surr	7	8.4	7	22.0	2	316			8	6.9	KMB			
WETSED1 / .	1	WQ	Surr	6	7.4	5	22.5	6	326			5	7.0	JL			
WETSED1 / .	2	WQ	Surr	6	5.3	5	22.6	6	257			5	7.1	JL			
WETSED1 / .	3	WQ	Surr	6	~~7.4~~ 7.40	5	~~22.0~~ 22.0 ①	6	~~225~~ 225 ①			5	~~7.1~~ 7.1 ①	JL			
WETSED1 / .	4	WQ	Surr	6	4.8	5	22.0	6	214			5	7.5	MMB			
WETSED1 / .	5	WQ	Surr	7	5.0	8	21.7	2	203			8	6.8	MMB			
WETSED1 / .	6	WQ	Surr	6	5.5	5	21.6	6	201			5	7.6	MK			
WETSED1 / .	7	WQ	Surr	7	4.5	8	20.8	2	203			8	7.0	MK			
WETSED1 / .	8	WQ	Surr	6	5.3	5	21.8	6	192			5	7.3	JL			
WETSED1 / .	9	WQ	Surr	6	4.6	5	22.0	6	196			5	7.4	JL			
WETSED1 / .	10	WQ	Surr	6	4.8	5	22.1	6	186			5	7.3	MK			

① 16. JL 2/03/14.

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10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

[illegible]	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1-SIR300 / .	0	WQ	Surr	7	8.3	7	22.0	2	430			8	7.1	KMB	—		BH
WETSED1-SIR300 / .	1	WQ	Surr	6	6.7	5	22.5	6	405	5		5	7.1	JL	JL	→	→
WETSED1-SIR300 / .	2	WQ	Surr	6	6.7	5	22.5	6	287	5		5	7.1	JL	JL	→	→
WETSED1-SIR300 / .	3	WQ	Surr	6	5.7	5	22.1	6	231	-		5	7.0	JL	JL	→	→
WETSED1-SIR300 / .	4	WQ	Surr	6	6.9	5	22.0	6	205			5	7.4	MMB	MMB	→	→
WETSED1-SIR300 / .	5	WQ	Surr	7	4.6	8	21.9	2	190			8	6.6	MMB	MMB	→	→
WETSED1-SIR300 / .	6	WQ	Surr	6	5.6	5	21.4	6	187			5	7.4	MK	MK	→	→
WETSED1-SIR300 / .	7	WQ	Surr	7	5.4	8	21.1	2	174			8	6.8	MK	MK	→	→
WETSED1-SIR300 / .	8	WQ	Surr	6	4.8	5	21.9	6	172			5	6.9	JL	JL	→	→
WETSED1-SIR300 / .	9	WQ	Surr	6	6.1	5	21.9	6	175			5	7.0	JL	JL	→	→
WETSED1-SIR300 / .	10	WQ	Surr	6	6.9	5	22.2	6	173			5	7.3	MK			

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
WETSED1-CC / .	0	WQ	Surr	7	8.5	7	22.0	2	352			8	7.0	KMB			BH
WETSED1-CC / .	1	WQ	Surr	6	6.6	5	22.6	6	399			5	7.2	JL	JL		
WETSED1-CC / .	2	WQ	Surr	6	6.8	5	22.3	6	262	5		5	7.2	JL	JL		
WETSED1-CC / .	3	WQ	Surr	6	~~4.5~~ 5.3	5	22.0	6	243			5	7.2	JL	JL		
WETSED1-CC / .	4	WQ	Surr	6	6.0	5	22.0	6	224			6	7.4	MMB	MMB		
WETSED1-CC / .	5	WQ	Surr	7	4.6	8	21.7	2	209			8	6.9	MMB	MMB		
WETSED1-CC / .	6	WQ	Surr	6	4.6	5	21.6	6	204			5	7.4	MK	MK		
WETSED1-CC / .	7	WQ	Surr	7	3.7	8	21.4	2	201			8	7.0	MK	MK		
WETSED1-CC / .	8	WQ	Surr	6	5.7	5	21.7	6	189			5	7.2	JL	JL		
WETSED1-CC / .	9	WQ	Surr	6	5.1	5	22.0	6	188			5	7.3	JL	JL		
WETSED1-CC / .	10	WQ	Surr	6	5.3	5	22.1	6	184			5	7.2	MK			

①MR. JL 2/03/14.

NewFields **10 DAY ~~PORewater~~ - WATER QUALITY DATA SHEET**

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE / TIME**	**TEST END DATE / TIME**	
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
SIR300 Blank / .	0	WQ	Surr	7	8.8	7	22.0	2	235			8	7.4	~~KB~~	—		BH
SIR300 Blank / .	1	WQ	Surr	6	1.0 ①	5	22.7	6	220			5	7.0	JL	JL		→
SIR300 Blank / .	2	WQ	Surr	6	8.4	5	22.3	6	175			5	7.7	JL	JL		→
SIR300 Blank / .	3	WQ	Surr	6	8.7	5	22.0	6	160			5	7.9	JL	JL		→
SIR300 Blank / .	4	WQ	Surr	6	8.8	5	22.0	6	152			5	8.1	MMB	MMB		→
SIR300 Blank / .	5	WQ	Surr	7	8.8	8	21.7	2	145			8	7.7	MMB	MMB		→
SIR300 Blank / .	6	WQ	Surr	6	7.8	5	21.7	6	190			5	8.0	MK	MK		→
SIR300 Blank / .	7	WQ	Surr	7	7.3	8	21.5	2	158			8	7.9	MK	MK		→
SIR300 Blank / .	8	WQ	Surr	6	8.5	5	21.5	6	153			5	8.0	JL	JL		→
SIR300 Blank / .	9	WQ	Surr	6	8.6	5	21.9	6	153			5	7.9	JL	JL		→
SIR300 Blank / .	10	WQ	Surr	6	8.5	5	22.1	6	154			5	7.4	MK			

① Aeration initiated to all reps. JL 2/01/14.

NewFields

10 DAY ~~POREWATER~~ - WATER QUALITY DATA SHEET

Sediment

CLIENT	PROJECT	SPECIES	LABORATORY	PROTOCOL
Farallon	Yakima Steel	*Hyallela*	Port Gamble, WA	[illegible]
JOB NUMBER	**PROJECT MANAGER**	**TEST START DATE** / **TIME**	**TEST END DATE**	**TIME**
	Bill Gardiner	31Jan14	10Feb14	

WATER QUALITY DATA #1

	DO (mg/L)	TEMP (C)	COND.(µS/cm)	pH	DILUTION WATER BATCH	TEMP.RECDR./HOBO#
[illegible]	> 2.5	23±1	vary < 50%	7.8-8.2	0	0

CLIENT/NEWFIELDS ID	DAY	REP	JAR #	D.O. meter	D.O. mg/L	TEMP meter	TEMP °C	CONDUCTIVITY meter	CONDUCTIVITY µS/cm	Salinity meter	Salinity ppt	pH meter	pH unit	TECHNICIAN	WATER RENEWAL AM	WATER RENEWAL PM	FEEDING
CC-Blank / .	0	WQ	Surr	7	8.9	7	22.0	2	236			5	7.4	KB	→		BH
CC-Blank / .	1	WQ	Surr	6	7.1	6	22.2	6	239			5	7.2	JL	JL →		JL
CC-Blank / .	2	WQ	Surr	6	5.8	5	22.5	6	219			5	7.3	JL	JL →		
CC-Blank / .	3	WQ	Surr	6	5.8	5	22.0	6	202			5	7.3	JL	JL →		
CC-Blank / .	4	WQ	Surr	6	5.2	5	22.0	6	200			5	7.6	MMB	MMB →		S
CC-Blank / .	5	WQ	Surr	7	4.4	8	21.8	2	199			8	7.1	MMB	MMB →		
CC-Blank / .	6	WQ	Surr	6	4.5	5	21.7	6	205			5	7.6	MK	MK →		
CC-Blank / .	7	WQ	Surr	7	5.0	8	21.2	2	206			8	7.3	MK	MK →		
CC-Blank / .	8	WQ	Surr	6	4.8	5	21.7	6	195			5	7.3	JL	JL →		
CC-Blank / .	9	WQ	Surr	6	5.0	5	22.0	6	195			5	7.5	JL	JL →		
CC-Blank / .	10	WQ	Surr	6	6.1	5	22.1	6	188			5	7.4	MK			

NewFields

Ammonia and Sulfide Analysis Record

Client/Project:	Organism:	Test Duration (days):
Yakima Seal TIE	Hyalella	10

PRETEST / ~~INITIAL~~ / FINAL / ~~OTHER~~ (circle one) DAY of TEST: ____
OVERLYING (OV) / POREWATER (PW) (circle one)

Comments: _____

Calibration Standards Temperature		Sample temperature should be within ±1°C of standards temperature at time and date of analysis.
Date:	Temperature:	
2/4/14	20.0	

Sample ID or Description	Conc. or Rep	Date of Sampling and Initials	Ammonia Value (mg/L)	Temp °C	Date of Reading and Initials	Sample Preserved (Y/N)	pH	~~Sal~~ Cond. (ppt) (mS/cm)	Sulf. mg/L
PW WETSED 1	Solid.	2/4/14 MMB	0.315	19.5	2/4/14 MMB	N	5.39	663	X
SW-300 WETSED 1	↓	↓	1.09	↓		↓	4.57	0.00	X
PCC WETSED 1	↓	↓	0.518	↓		↓	5.47	653	X

Agri-Tech/Yakima Steel Wetland Sediment Evaluation

Appendix F

Sediment Chemistry

Appendix F.1

Whole Sediment Chemistry

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WETSED 1
SAMPLE

Lab Sample ID: XQ27A
LIMS ID: 13-26633
Matrix: Sediment
Data Release Authorized:
Reported: 12/06/13

QC Report No: XQ27-Newfields Northwest
Project: AT/YS

Date Sampled: 12/04/13
Date Received: 12/05/13

Percent Total Solids: 46.0%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	mg/kg-dry	Q
3050B	12/06/13	6010C	12/06/13	**7440-43-9**	**Cadmium**	0.4	**6.5**	
3050B	12/06/13	6010C	12/06/13	**7439-92-1**	**Lead**	4	**147**	
3050B	12/06/13	6010C	12/06/13	**7439-96-5**	**Manganese**	0.2	**189**	
3050B	12/06/13	6010C	12/06/13	**7440-66-6**	**Zinc**	2	**2,240**	

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WETSED 2
SAMPLE

Lab Sample ID: XQ27B
LIMS ID: 13-26634
Matrix: Sediment
Data Release Authorized:
Reported: 12/06/13

QC Report No: XQ27-Newfields Northwest
Project: AT/YS

Date Sampled: 12/04/13
Date Received: 12/05/13

Percent Total Solids: 46.4%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	mg/kg-dry	Q
3050B	12/06/13	6010C	12/06/13	**7440-43-9**	**Cadmium**	0.4	**7.4**	
3050B	12/06/13	6010C	12/06/13	**7439-92-1**	**Lead**	4	**146**	
3050B	12/06/13	6010C	12/06/13	**7439-96-5**	**Manganese**	0.2	**342**	
3050B	12/06/13	6010C	12/06/13	**7440-66-6**	**Zinc**	2	**2,940**	

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: WETSED 3
SAMPLE

Lab Sample ID: XQ27C
LIMS ID: 13-26635
Matrix: Sediment
Data Release Authorized:
Reported: 12/06/13

QC Report No: XQ27-Newfields Northwest
Project: AT/YS

Date Sampled: 12/04/13
Date Received: 12/05/13

Percent Total Solids: 38.2%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	mg/kg-dry	Q
3050B	12/06/13	6010C	12/06/13	**7440-43-9**	**Cadmium**	0.5	**9.4**	
3050B	12/06/13	6010C	12/06/13	**7439-92-1**	**Lead**	5	**178**	
3050B	12/06/13	6010C	12/06/13	**7439-96-5**	**Manganese**	0.3	**324**	
3050B	12/06/13	6010C	12/06/13	**7440-66-6**	**Zinc**	3	**3,810**	

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
TOTAL METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: XQ27LCS
LIMS ID: 13-26635
Matrix: Sediment
Data Release Authorized:
Reported: 12/06/13

QC Report No: XQ27-Newfields Northwest
Project: AT/YS

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Cadmium	6010C	50.6	50.0	101%	
Lead	6010C	197	200	98.5%	
Manganese	6010C	47.5	50.0	95.0%	
Zinc	6010C	49	50	98.0%	

Reported in mg/kg-dry

N-Control limit not met
NA-Not Applicable, Analyte Not Spiked
Control Limits: 80-120%

ANALYTICAL RESOURCES INCORPORATED

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

Lab Sample ID: XQ27MB
LIMS ID: 13-26635
Matrix: Sediment
Data Release Authorized:
Reported: 12/06/13

QC Report No: XQ27-Newfields Northwest
Project: AT/YS

Date Sampled: NA
Date Received: NA

Percent Total Solids: NA

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	mg/kg-dry	Q
3050B	12/06/13	6010C	12/06/13	7440-43-9	Cadmium	0.2	0.2	U
3050B	12/06/13	6010C	12/06/13	7439-92-1	Lead	2	2	U
3050B	12/06/13	6010C	12/06/13	7439-96-5	Manganese	0.1	0.1	U
3050B	12/06/13	6010C	12/06/13	7440-66-6	Zinc	1	1	U

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

Table of Contents: ARI Job XQ29

Client: Newfields Northwest Project: AT/YS

BC
Signature

December-17-2013
Date

Chain of Custody Documentation

ARI Job ID: XQ29

Appendix F.2

AVS/SEM Chemistry, Dilution Series,

and Sediment Conventionals

Agri-Tech/Yakima Steel Wetland Sediment Chemistry - Dilution Series

ARI ID	Client ID	Sampled	Rec	Prep	Analyzed	Method	CAS	Compound	Value	Q	Units
13-27104-XR07A	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	10.5		mg/kg
13-27104-XR07ADP	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	9.2		mg/kg
13-27104-XR07AMS	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	132		mg/kg
13-27104-XR07A	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	173		mg/kg
13-27104-XR07ADP	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	176		mg/kg
13-27104-XR07AMS	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	631		mg/kg
13-27104-XR07A	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	318		mg/kg
13-27104-XR07ADP	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	320		mg/kg
13-27104-XR07AMS	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	432		mg/kg
13-27104-XR07A	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	4,050		mg/kg
13-27104-XR07ADP	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	3,820		mg/kg
13-27104-XR07AMS	9	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	3,840		mg/kg
13-27105-XR07B	6	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	5.1		mg/kg
13-27105-XR07B	6	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	97		mg/kg
13-27105-XR07B	6	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	436		mg/kg
13-27105-XR07B	6	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	2,150		mg/kg
13-27106-XR07C	3	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	2.9		mg/kg
13-27106-XR07C	3	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	48		mg/kg
13-27106-XR07C	3	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	571		mg/kg
13-27106-XR07C	3	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	1,140		mg/kg
13-27107-XR07D	1	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	1.1		mg/kg
13-27107-XR07D	1	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	20		mg/kg
13-27107-XR07D	1	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	560		mg/kg
13-27107-XR07D	1	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	451		mg/kg
13-27108-121313MB	Method Blank			12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	0.2	U	mg/kg
13-27108-121313LCS	Lab Control			12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	51.4		mg/kg
13-27108-XR07E	0	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-43-9	Cadmium	0.4	U	mg/kg
13-27108-121313MB	Method Blank			12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	2	U	mg/kg
13-27108-121313LCS	Lab Control			12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	199		mg/kg
13-27108-XR07E	0	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-92-1	Lead	4	U	mg/kg
13-27108-121313MB	Method Blank			12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	0.1	U	mg/kg
13-27108-121313LCS	Lab Control			12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	48.4		mg/kg
13-27108-XR07E	0	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7439-96-5	Manganese	507		mg/kg
13-27108-121313MB	Method Blank			12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	3		mg/kg
13-27108-121313LCS	Lab Control			12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	50		mg/kg
13-27108-XR07E	0	12/10/13	12/12/13	12/13/13	12/17/13	SW6010C-Total	7440-66-6	Zinc	48		mg/kg

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Cooler Receipt Form

ARI Client: New Fields Project Name: AT145

COC No(s): _____ NA Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: XL701 Tracking No: 7977 1463 5 570 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) 2.6

Time: 1216

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: 90870557

Cooler Accepted by: TC Date: 12-5-13 Time: 1626

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	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: _____

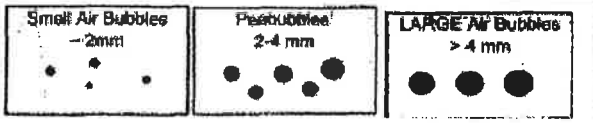
Samples Logged by: TC Date: 12-5-13 Time: 1611

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

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

By: Date:



Small → "sm" (< 2 mm)
Peabubbles → "pb" (2 to < 4 mm)
Large → "lg" (4 to < 6 mm)
Headspace → "hs" (> 6 mm)

ANALYTICAL
RESOURCES
INCORPORATED

Case Narrative

Client: Newfields
Project: AT/YS
ARI Job No.: XQ29

Sample Receipt

Three sediment samples were received on December 5, 2013 under ARI job XQ29. The cooler temperature measured by IR thermometer following ARI SOP was 0.6°C. The samples were analyzed for AVS/SEM, TOC, and Grain Size. Total metals results have been reported under a separate cover. For further details regarding sample receipt, please refer to the Cooler Receipt Form.

AVS/SEM Metals by SW6010C

The samples were digested and analyzed within the method recommended holding times.

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

The samples were prepared and analyzed within method recommended holding times.

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

The SRM percent recovery was in control.

The matrix spike percent recoveries of Acid Volatile Sulfide and Total Organic Carbon were outside the control limits for sample **WETSED 1**. All other quality control parameters were met for these analyses. No corrective action was taken.

Geotechnical Parameters

A laboratory-specific narrative follows this page.

Sample ID Cross Reference Report

ANALYTICAL RESOURCES INCORPORATED

ARI Job No: XQ29
Client: Newfields Northwest
Project Event: N/A
Project Name: AT/YS

	Sample ID	ARI Lab ID	ARI LIMS ID	Matrix	Sample Date/Time	VTSR
1.	WETSED 1	XQ29A	13-26636	Sediment	12/04/13 14:00	12/05/13 10:20
2.	WETSED 2	XQ29B	13-26637	Sediment	12/04/13 14:00	12/05/13 10:20
3.	WETSED 3	XQ29C	13-26638	Sediment	12/04/13 14:00	12/05/13 10:20

XQ29:00009

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%

XQ29 : 00010

Cover Page

INORGANIC ANALYSIS DATA PACKAGE

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: AT/YS

SDG: XQ29

CLIENT ID	ARI ID	ARI LIMS ID	REPREP
WETSED 1	XQ29A	13-26636	
WETSED 1D	XQ29ADUP	13-26636	
WETSED 1S	XQ29ASPK	13-26636	
WETSED 2	XQ29B	13-26637	
PBS	XQ29MB1	13-26637	
LCSS	XQ29MB1SPK	13-26637	
WETSED 3	XQ29C	13-26638	

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: 12/17/13 Title: Inorganics Director

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
AVS/SEM METALS
Page 1 of 1

Sample ID: WETSED 2
SAMPLE

Lab Sample ID: XQ29B
LIMS ID: 13-26637
Matrix: Sediment
Data Release Authorized:
Reported: 12/17/13

QC Report No: XQ29-Newfields Northwest
Project: AT/YS

Date Sampled: 12/04/13
Date Received: 12/05/13

Percent Total Solids: 47.2%

Prep Meth	Prep Date	Analysis Method	Analysis Date	CAS Number	Analyte	LOQ	mg/kg-dry	Q
6010C	12/13/13	6010C	12/16/13	**7440-43-9**	**Cadmium**	0.2	**8.4**	
6010C	12/13/13	6010C	12/16/13	**7439-92-1**	**Lead**	2	**149**	
6010C	12/13/13	6010C	12/16/13	**7439-96-5**	**Manganese**	0.1	**160**	
6010C	12/13/13	6010C	12/16/13	**7440-66-6**	**Zinc**	1	**3,240**	

U-Analyte undetected at given LOQ
LOQ-Limit of Quantitation

ANALYTICAL RESOURCES INCORPORATED

INORGANICS ANALYSIS DATA SHEET
AVS/SEM METALS
Page 1 of 1

Sample ID: WETSED 1
MATRIX SPIKE

Lab Sample ID: XQ29A
LIMS ID: 13-26636
Matrix: Sediment
Data Release Authorized:
Reported: 12/17/13

QC Report No: XQ29-Newfields Northwest
Project: AT/YS

Date Sampled: 12/04/13
Date Received: 12/05/13

MATRIX SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Sample	Spike	Spike Added	% Recovery	Q
Cadmium	6010C	6.6	66.4	52.7	113%	
Lead	6010C	183	391	211	98.6%	
Manganese	6010C	80.9	141	52.7	114%	
Zinc	6010C	4,790	5,490	52.7	1330%	H

Reported in mg/kg-dry

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
AVS/SEM METALS
Page 1 of 1

Sample ID: LAB CONTROL

Lab Sample ID: XQ29LCS
LIMS ID: 13-26637
Matrix: Sediment
Data Release Authorized:
Reported: 12/17/13

QC Report No: XQ29-Newfields Northwest
Project: AT/YS

Date Sampled: NA
Date Received: NA

BLANK SPIKE QUALITY CONTROL REPORT

Analyte	Analysis Method	Spike Found	Spike Added	% Recovery	Q
Cadmium	6010C	28.0	25.0	112%	
Lead	6010C	109	100	109%	
Manganese	6010C	25.6	25.0	102%	
Zinc	6010C	27.9	25.0	112%	

Reported in mg/kg-dry

N-Control limit not met
NA-Not Applicable, Analyte Not Spiked
Control Limits: 80-120%

Calibration Verification

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: AT/YS

SDG: XQ29

UNITS: ug/L

ANALYTE	EL	M	RUN	ICVTV	ICV	%R	CCVTV	CCV1	%R	CCV2	%R	CCV3	%R	CCV4	%R	CCV5	%R
Cadmium	CD	ICP	IP121671	1000.0	1030.59	**103.1**	1000.0	1027.39	**102.7**	1034.17	**103.4**	1023.32	**102.3**	1012.87	**101.3**		
Lead	PB	ICP	IP121671	2000.0	2015.66	**100.8**	2000.0	2068.85	**103.4**	2032.30	**101.6**	2011.05	**100.6**	2052.37	**102.6**		
Manganese	MN	ICP	IP121671	1000.0	978.39	**97.8**	1000.0	973.11	**97.3**	981.98	**98.2**	965.65	**96.6**	978.40	**97.8**		
Zinc	ZN	ICP	IP121671	1000.0	1010.11	**101.0**	1000.0	1021.82	**102.2**	1024.40	**102.4**	1012.97	**101.3**	1029.67	**103.0**		

Control Limits: Mercury 80-120; Other Metals 90-110

Calibration Blanks

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: AT/YS

SDG: XQ29

UNITS:ug/L

ANALYTE	EL	METH	RUN	CRDL	IDL	ICB	C	CCB1	C	CCB2	C	CCB3	C	CCB4	C	CCB5	C
Cadmium	CD	ICP	IP121671	5.0	2.0	2.0	U	2.0	U	2.0	U	2.0	U	2.0	U		
Lead	PB	ICP	IP121671	3.0	20.0	20.0	U	20.0	U	20.0	U	20.0	U	20.0	U		
Manganese	MN	ICP	IP121671	15.0	1.0	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U		
Zinc	ZN	ICP	IP121671	20.0	10.0	10.0	U	10.0	U	10.0	U	10.0	U	10.0	U		

XQ29:00022

IDLs and ICP Linear Ranges

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: AT/YS

SDG: XQ29 UNITS: ug/L

ANALYTE	EL	METH	INSTRUMENT	WAVELENTH (nm)	GFA BACK-GROUND	CLP CRDL	RL	RL DATE	ICP LINEAR RANGE (ug/L)	ICP LR DATE
Cadmium	CD	ICP	OPTIMA ICP 2	228.80		5	2.0	4/1/2012	20000.0	6/10/2013
Lead	PB	ICP	OPTIMA ICP 2	220.35		3	20.0	4/1/2012	300000.0	6/10/2013
Manganese	MN	ICP	OPTIMA ICP 2	257.61		15	1.0	4/1/2012	30000.0	6/10/2013
Zinc	ZN	ICP	OPTIMA ICP 2	213.86		20	10.0	4/1/2012	100000.0	6/10/2013

ICP Interelement Correction Factors

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: AT/YS

SDG: XQ29

IEC DATE: 10/22/1913

INSTRUMENT ID: OPTIMA ICP 2

ANALYTE	WAVELENGTH	MG	MN	MO	NI	PB	SB	TI	TL	V	ZN
Aluminum	308.22	0.0000000	0.0000000	16.0812590	0.0000000	0.0000000	0.0000000	1.9531650	0.0000000	15.6704600	0.0000000
Antimony	206.84	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.8263670	0.0000000	-3.8485090	0.0000000
Arsenic	188.98	0.0000000	0.0000000	3.4165090	0.0000000	0.0000000	0.0000000	-32.1596340	0.0000000	0.0000000	0.0000000
Barium	233.53	0.0000000	0.0000000	0.0000000	0.1266550	0.0000000	0.0000000	0.0000000	0.0000000	0.2235440	0.0000000
Beryllium	313.04	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0102770	0.0000000	0.2401990	0.0000000
Boron	249.67	0.0000000	0.0000000	-1.0759410	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Cadmium	228.80	0.0000000	0.0000000	0.0000000	-0.9387840	0.0000000	0.0000000	0.0000000	0.0000000	0.0597550	0.0000000
Calcium	317.93	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Chromium	267.72	0.0679630	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.3212800	0.0000000
Cobalt	228.62	0.0000000	0.0000000	-0.1256200	0.1682020	0.0000000	0.0000000	1.7253070	0.0000000	0.0000000	0.0000000
Copper	324.75	0.0064738	0.0000000	0.3004190	0.0000000	0.0000000	0.0000000	0.1851800	0.0000000	0.0000000	0.0000000
Iron	273.96	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	7.2530080	0.0000000
Lead	220.35	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Magnesium	279.08	0.0000000	0.0000000	-5.2138260	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Manganese	257.61	0.0021200	0.0000000	0.0000000	0.0000000	-0.1832430	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Molybdenum	202.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Nickel	231.60	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.5439300	0.0000000	0.4201630	0.0000000	0.0000000
Potassium	766.49	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Selenium	196.03	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.5911140	0.0000000
Silicon	288.16	-0.1473260	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Silver	328.07	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	-0.2887870	0.0000000
Sodium	589.59	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	287.1603720	0.0000000	0.0000000	306.9999840
Thallium	190.80	0.0000000	0.0000000	-1.5891790	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	3.6439390	0.0000000
Tin	189.93	0.0000000	0.0000000	0.0000000	0.0000000	-0.0384380	-0.4873020	-0.2074990	0.0000000	0.0000000	0.0000000
Titanium	334.90	0.0000000	0.0000000	0.9474070	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000
Vanadium	292.40	0.0000000	-0.1525200	-0.5409400	0.0000000	0.0000000	0.0000000	0.5527510	0.0000000	0.0000000	0.0000000
Zinc	206.20	0.0000000	0.0000000	0.2376970	0.0000000	-0.0608720	0.0000000	0.0000000	0.0000000	0.0000000	0.0000000

XQ29 : 22925

FORM XI

Analysis Run Log

ANALYTICAL RESOURCES INCORPORATED

CLIENT: Newfields Northwest

PROJECT: AT/YS | INSTRUMENT ID: OPTIMA ICP 2 | START DATE: 12/16/2013

SDG: XQ29 | RUNID: IP121671 | METHOD: ICP | END DATE: 12/16/2013

CLIENT ID	ARI ID	DIL.	TIME	%R	AG	AL	AS	B	BA	BE	CA	CD	CO	CR	CU	FE	HG	K	MG	MN	MO	NA	NI	PB	SB	SE	SI	SN	TI	TL	U	V	ZN
S0	S0	1.00	08332									X								X				X									X
S2	S2	1.00	08373									X								X													
S3	S3	1.00	08392																					X									X
S4	S4	1.00	08420																														
S5	S5	1.00	08441																														
ICV	ICV	1.00	08520									X								X				X									X
ICB	ICB	1.00	08561									X								X				X									X
CRI	CRII	1.00	09002									X								X				X									X
ICSA	ICSAI	1.00	09044									X								X				X									X
ICSAB	ICSABI	1.00	09085									X								X				X									X
ZZZZZZ	DICHECK	1.00	09142																														
CCV	CCV1	1.00	09183									X								X				X									X
CCB	CCB1	1.00	09224									X								X				X									X
PBW	XQ29MB1	1.00	09265									X								X				X									X
WETSED 2	XQ29B	1.00	09311									X								X				X									X
WETSED 3	XQ29C	1.00	09351									X								X				X									X
WETSED 1D	XQ29ADUP	1.00	09393									X								X				X									X
WETSED 1	XQ29A	1.00	09433									X								X				X									X
WETSED 1S	XQ29ASPK	1.00	09473									X								X				X									X
LCSW	XQ29MB1SPK	1.00	09513																														
CCV	CCV2	1.00	09553									X								X				X									X
CCB	CCB2	1.00	09593									X								X				X									X
ZZZZZZ	XQ82MB	1.00	10035																														
ZZZZZZ	XQ47MB	5.00	10081																														
ZZZZZZ	XQ47ADUP	5.00	10124																														
ZZZZZZ	XQ47A	5.00	10170																														
ZZZZZZ	XQ47ASPK	5.00	10211																														
ZZZZZZ	XQ82ADUP	1.00	10253																														
ZZZZZZ	XQ82A	1.00	10295																														
ZZZZZZ	XQ82ASPK	1.00	10341																														
ZZZZZZ	XQ82MBSPK	1.00	10383																														
CCV	CCV3	1.00	10423									X								X				X									X
CCB	CCB3	1.00	10463									X								X				X									X
ZZZZZZ	XQ85MB	1.00	10505																														
ZZZZZZ	XQ85A	1.00	10550																														

FORM XIV

XQ29: 88829

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Sulfide Digestion Log

Balance ID:	Pretreatment Data							Sample Extraction Data						
Sample ID	Date	Sample Weight	Extract Method*	Acid	Required pH	mL DI Water	Observed mL acid	Date	Sample Weight	mL Acid Required	mL DI Water Required	Trap Volume (mL)	Spike ID	Spike Volume
BLK	NA	NA	PSEP	HCl+Al	<3	NA	NA	12/4/13	N.A	NA	100 mL	100mL	NA	NA
LCS													60149-10	1mL
XQ734 1									5.159				NA	NA
A1 dup									5.022					
A1 MS									5.057				60150-10	1mL
B1									5.068				NA	NA
C1									5.068					
14:35 BLK	NA	NA	AVS/SEM	1:1 6mole HCl	<1	NA	NA	12/4/13	N/A	NA	100 mL		NA	NA
LCS													60149-10	1mL
XQ729 A1									5.134				NA	NA
A1 dup									5.088					
A1 MS									5.054				60150-10	1mL
B1									5.056				NA	NA
C1									5.001					
XQ68 A1			AVS						5.009					
B1									5.176					
C1									5.214					

APD 12/11/13

* Extract Methods: **PSEP** = PSEP; **9030A** = 9030A Acid Soluble; **9030AI** = 9030A acid insoluble; **AVS** = Acid Volatile; **Reactive** = SW-846 reactive

Analyst Name: APD Date: 12/11/13 Time: 11:05

00796 : 6171F

ANALYTICAL RESOURCES INCORPORATED

Metals Data Review Checklist

Method: (ICP) ICP-MS GFA CVA **Analysis Date:** 12-16-13

ICP2	Analyst BA 12-17-13	Peer 12/17/13	Comment
Logbook:			
Analyst, Date, Method info	✓	✓	
Sample ID's	✓	✓	
Standard/QC solution ID's recorded	✓	✓	
Prep codes	✓	✓	
Dilution factors	✓	✓	
Crossouts/Corrections/Deletions	✓	✓	
Calibration:			
Blank & Standard intensities	✓	✓	
Standard deviations	✓	✓	
Curve fit	✓	✓	
Calibration Verification:			
ICV/CCV	✓	✓	
ICB/CCB	✓	✓	
Samples:			
RSD's & SD's	✓	✓	See log ↓
Internal Standards	✓	✓	
Carry-over	✓	✓	
Method QC:			
CRI/CRA	✓	✓	
ICSA/ICSAB	✓	✓	
Post Spikes/Serial Dilutions	✓	✓	
Analytic Spikes	—	—	
Matrix QC:			
SRM/LCS	✓	✓	
Matrix Spikes	✓	✓	
Matrix Duplicates	✓	✓	
Method Blanks	✓	✓	XR09
Data Distribution:			
Requested elements/isotope identified	✓	✓	
Correct samples identified for distribution	✓	✓	
Raw data match distributed data	✓	✓	
Data filename correct	✓	✓	
Necessary Analysts Notes and CAF's	✓		AN-XR09

XQ29 : 00093

Analytical Resources, Incorporated
Analytical Chemists and Consultants

SAMPLE RUN LOG-ICP-OES-02
Perkin Elmer OPTIMA 7300
Serial No. – 077C8121202

IEC Date: — Analysis Date: 12-16-13 Analyst: BA

LR Date: _____ Page: 2 of 5

All corrections made by analyst unless otherwise noted.

Edit Label	Delete Data	ARI Sample ID	Prep. Code	Dilution	Comments
		XQ47 ADUP	LEN	5	✓
		A	↓	↓	
		ASPK	↓	↓	✓
		XQ82 ADUP	TWC		✓
		A	↓		
		ASPK			✓
		MBSPK	↓		✓
		CCV3			
		CCB3			
		XQ85 MB	TWC		
	✓	A	↓		Mg, Na, Sr > LR
	✓	B			Mg, Na > LR Sr-B noisy
	✓	C			Mg, Na, Sr > LR
	✓	D			↓
		MBSPK			✓
		MBSPD	↓		✓
		XQ29 MBISPK	WMN		✓ 0.08 mL ICP SpK
		CCV4			
		CCB4			End XQ29
		XR01 MBI	SWC	2	
		B	↓	↓	
		A-L	BA	12/17/13	
		A		2	✓
		ADUP	↓	↓	

XQ29 : 00094

Analysis Begun

Start Time: 12/16/2013 8:33:20 AM
Logged In Analyst: Metals
Spectrometer: Optima 7300 DV, S/N 077C8121202

Plasma On Time: 12/16/2013 7:13:48 AM
Technique: ICP Continuous
Autosampler: ESI

Sample Information File: C:\pe\metals\Sample Information\BLKS.sif
Batch ID:
Results Data Set: I2131216
Results Library: C:\Documents and Settings\All Users\PerkinElmer\ICP\Data\Results\Results.mdb

Sequence No.: 1
Sample ID: Calib Blank 1

Autosampler Location: 1
Date Collected: 12/16/2013 8:33:22 AM
Data Type: Original

Nebulizer Parameters: Calib Blank 1

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: Calib Blank 1

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc.	Calib Units
ScA 357.253	2762037.1	12153.35	0.44%	100.0	%
ScR 361.383	272684.3	1430.72	0.52%	100.0	%
Ag 328.068†	612.2	34.00	5.55%	[0.00]	mg/L
Al 308.215†	114.9	3.82	3.32%	[0.00]	mg/L
As 188.979†	-15.3	2.35	15.29%	[0.00]	mg/L
B 249.677†	56.4	3.22	5.70%	[0.00]	mg/L
Ba 233.527†	32.8	2.98	9.10%	[0.00]	mg/L
Be 313.042†	777.6	9.51	1.22%	[0.00]	mg/L
Ca 317.933†	-165.5	5.96	3.60%	[0.00]	mg/L
Cd 228.802†	252.0	2.83	1.12%	[0.00]	mg/L
Co 228.616†	-104.7	2.42	2.31%	[0.00]	mg/L
Cr 267.716†	-57.9	5.89	10.18%	[0.00]	mg/L
Cu 324.752†	3705.6	23.10	0.62%	[0.00]	mg/L
Fe 273.955†	-43.7	0.97	2.23%	[0.00]	mg/L
K 766.490†	480.6	24.06	5.01%	[0.00]	mg/L
Mg 279.077†	-60.3	4.29	7.10%	[0.00]	mg/L
Mn 257.610†	154.4	2.48	1.61%	[0.00]	mg/L
Mo 202.031†	72.4	1.51	2.08%	[0.00]	mg/L
Na 589.592†	-219.6	20.37	9.28%	[0.00]	mg/L
Na 330.237†	-101.9	7.72	7.58%	[0.00]	mg/L
Ni 231.604†	4.1	3.79	91.44%	[0.00]	mg/L
Pb 220.353†	16.4	2.19	13.33%	[0.00]	mg/L
Sb 206.836†	65.4	1.50	2.30%	[0.00]	mg/L
Se 196.026†	-38.3	4.75	12.41%	[0.00]	mg/L
Si 288.158†	-20.2	1.78	8.78%	[0.00]	mg/L
Sn 189.927†	-6.8	3.81	55.68%	[0.00]	mg/L
Sr 421.552†	2.7	30.89	>999.9%	[0.00]	mg/L
Ti 334.903†	130.2	3.44	2.64%	[0.00]	mg/L
Tl 190.801†	-36.1	3.94	10.90%	[0.00]	mg/L
V 292.402†	280.3	24.74	8.83%	[0.00]	mg/L
Zn 206.200†	-2.6	2.48	96.93%	[0.00]	mg/L

Sequence No.: 2
Sample ID: STD2

Autosampler Location: 2
Date Collected: 12/16/2013 8:37:38 AM
Data Type: Original

Nebulizer Parameters: STD2

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: STD2

	Mean Corrected				Calib

Mean Data: STD5

Analyte	Mean Corrected Intensity	Std.Dev.	RSD	Conc.	Calib Units
ScA 357.253	2620005.4	13430.31	0.51%	94.86	%
ScR 361.383	271329.3	1131.80	0.42%	99.50	%
Al 308.215†	34622.4	113.98	0.33%	[30]	mg/L
Ca 317.933†	258991.7	959.08	0.37%	[30]	mg/L
Fe 273.955†	107274.4	691.04	0.64%	[100]	mg/L
K 766.490†	224248.3	147.04	0.07%	[100]	mg/L
Mg 279.077†	26308.4	91.40	0.35%	[30]	mg/L
Na 330.237†	2474.7	9.39	0.38%	[100]	mg/L

Calibration Summary

Analyte	Stds.	Equation	Intercept	Slope	Curvature	Corr. Coef.	Reslope
Ag 328.068	1	Lin Thru 0	0.0	215300	0.00000	1.000000	
Al 308.215	1	Lin Thru 0	0.0	1154	0.00000	1.000000	
As 188.979	1	Lin Thru 0	0.0	1555	0.00000	1.000000	
B 249.677	1	Lin Thru 0	0.0	6172	0.00000	1.000000	
Ba 233.527	1	Lin Thru 0	0.0	4420	0.00000	1.000000	
Be 313.042	1	Lin Thru 0	0.0	532800	0.00000	1.000000	
Ca 317.933	1	Lin Thru 0	0.0	8633	0.00000	1.000000	
Cd 228.802	1	Lin Thru 0	0.0	26760	0.00000	1.000000	
Co 228.616	1	Lin Thru 0	0.0	40500	0.00000	1.000000	
Cr 267.716	1	Lin Thru 0	0.0	5927	0.00000	1.000000	
Cu 324.752	1	Lin Thru 0	0.0	275800	0.00000	1.000000	
Fe 273.955	1	Lin Thru 0	0.0	1073	0.00000	1.000000	
K 766.490	1	Lin Thru 0	0.0	2242	0.00000	1.000000	
Mg 279.077	1	Lin Thru 0	0.0	876.9	0.00000	1.000000	
Mn 257.610	1	Lin Thru 0	0.0	38450	0.00000	1.000000	
Mo 202.031	1	Lin Thru 0	0.0	17820	0.00000	1.000000	
Na 589.592	1	Lin Thru 0	0.0	13870	0.00000	1.000000	
Na 330.237	1	Lin Thru 0	0.0	24.75	0.00000	1.000000	
Ni 231.604	1	Lin Thru 0	0.0	3763	0.00000	1.000000	
Pb 220.353	1	Lin Thru 0	0.0	8158	0.00000	1.000000	
Sb 206.836	1	Lin Thru 0	0.0	3038	0.00000	1.000000	
Se 196.026	1	Lin Thru 0	0.0	1401	0.00000	1.000000	
Si 288.158	1	Lin Thru 0	0.0	1449	0.00000	1.000000	
Sn 189.927	1	Lin Thru 0	0.0	3402	0.00000	1.000000	
Sr 421.552	1	Lin Thru 0	0.0	887800	0.00000	1.000000	
Ti 334.903	1	Lin Thru 0	0.0	19350	0.00000	1.000000	
Tl 190.801	1	Lin Thru 0	0.0	1961	0.00000	1.000000	
V 292.402	1	Lin Thru 0	0.0	142600	0.00000	1.000000	
Zn 206.200	1	Lin Thru 0	0.0	3597	0.00000	1.000000	

Sequence No.: 2
Sample ID: ICB

Autosampler Location: 1
Date Collected: 12/16/2013 8:56:12 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2807388.3	101.6	%	0.19				0.19%
ScR 361.383	280575.7	102.9	%	0.24				0.24%
Ag 328.068†	47.0	0.00022	mg/L	0.000095	0.00022	mg/L	0.000095	43.67%
Al 308.215†	-8.7	-0.00751	mg/L	0.003412	-0.00751	mg/L	0.003412	45.43%
As 188.979†	-0.2	-0.00011	mg/L	0.000875	-0.00011	mg/L	0.000875	826.95%
B 249.677†	13.6	0.00220	mg/L	0.000421	0.00220	mg/L	0.000421	19.19%
Ba 233.527†	-1.7	-0.00038	mg/L	0.000201	-0.00038	mg/L	0.000201	53.52%
Be 313.042†	1.5	0.00000	mg/L	0.000039	0.00000	mg/L	0.000039	>999.9%
Ca 317.933†	1.1	0.00013	mg/L	0.000894	0.00013	mg/L	0.000894	694.87%
Cd 228.802†	-0.5	-0.00002	mg/L	0.000019	-0.00002	mg/L	0.000019	111.13%
Co 228.616†	-2.7	-0.00007	mg/L	0.000126	-0.00007	mg/L	0.000126	190.27%
Cr 267.716†	7.6	0.00129	mg/L	0.000755	0.00129	mg/L	0.000755	58.50%
Cu 324.752†	-60.7	-0.00022	mg/L	0.000167	-0.00022	mg/L	0.000167	75.88%
Fe 273.955†	1.4	0.00134	mg/L	0.000316	0.00134	mg/L	0.000316	23.51%
K 766.490†	-10.6	-0.00471	mg/L	0.021961	-0.00471	mg/L	0.021961	466.52%
Mg 279.077†	7.0	0.00801	mg/L	0.002564	0.00801	mg/L	0.002564	32.01%
Mn 257.610†	-4.8	-0.00012	mg/L	0.000066	-0.00012	mg/L	0.000066	52.58%
Mo 202.031†	-0.8	-0.00005	mg/L	0.000339	-0.00005	mg/L	0.000339	741.69%
Na 589.592†	2.4	0.00017	mg/L	0.001460	0.00017	mg/L	0.001460	844.85%
Na 330.237†	-0.8	-0.03391	mg/L	0.274989	-0.03391	mg/L	0.274989	810.92%
Ni 231.604†	1.6	0.00044	mg/L	0.001607	0.00044	mg/L	0.001607	365.28%
Pb 220.353†	4.9	0.00061	mg/L	0.000431	0.00061	mg/L	0.000431	71.10%
Sb 206.836†	5.7	0.00185	mg/L	0.001727	0.00185	mg/L	0.001727	93.38%
Se 196.026†	0.1	0.00005	mg/L	0.001022	0.00005	mg/L	0.001022	>999.9%
Si 288.158†	-0.4	-0.00028	mg/L	0.004375	-0.00028	mg/L	0.004375	>999.9%
Sn 189.927†	1.3	0.00039	mg/L	0.000742	0.00039	mg/L	0.000742	191.59%
Sr 421.552†	32.9	0.00004	mg/L	0.000014	0.00004	mg/L	0.000014	38.05%
Ti 334.903†	2.5	0.00013	mg/L	0.000295	0.00013	mg/L	0.000295	225.02%
Tl 190.801†	-2.8	-0.00141	mg/L	0.000530	-0.00141	mg/L	0.000530	37.53%
V 292.402†	-13.1	-0.00009	mg/L	0.000033	-0.00009	mg/L	0.000033	38.19%
Zn 206.200†	2.4	0.00067	mg/L	0.000405	0.00067	mg/L	0.000405	60.74%

Sequence No.: 4
Sample ID: ICSA

Autosampler Location: 302
Date Collected: 12/16/2013 9:04:43 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: ICSA

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: ICSA

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2673580.6	96.80	%	0.485				0.50%
ScR 361.383	268883.7	98.61	%	0.247				0.25%
Ag 328.068†	-299.7	-0.00069	mg/L	0.000245	-0.00069	mg/L	0.000245	35.71%
Al 308.215†	232480.9	201.4	mg/L	0.23	201.4	mg/L	0.23	0.11%
As 188.979†	51.6	0.02629	mg/L	0.001167	0.02629	mg/L	0.001167	4.44%
B 249.677†	47.3	0.00766	mg/L	0.001398	0.00766	mg/L	0.001398	18.26%
Ba 233.527†	114.5	-0.00534	mg/L	0.000775	-0.00534	mg/L	0.000775	14.51%
Be 313.042†	20.0	0.00003	mg/L	0.000005	0.00003	mg/L	0.000005	14.11%
Ca 317.933†	877265.9	101.6	mg/L	0.36	101.6	mg/L	0.36	0.35%
Cd 228.802†	29.0	-0.00109	mg/L	0.000217	-0.00109	mg/L	0.000217	19.92%
Co 228.616†	79.2	0.00194	mg/L	0.000121	0.00194	mg/L	0.000121	6.25%
Cr 267.716†	14.3	0.00441	mg/L	0.000886	0.00441	mg/L	0.000886	20.08%
Cu 324.752†	-2512.3	0.00015	mg/L	0.000132	0.00015	mg/L	0.000132	87.23%
Fe 273.955†	214120.5	199.6	mg/L	0.71	199.6	mg/L	0.71	0.35%
K 766.490†	18.8	0.00840	mg/L	0.010363	0.00840	mg/L	0.010363	123.40%
Mg 279.077†	91232.1	103.9	mg/L	1.69	103.9	mg/L	1.69	1.63%
Mn 257.610†	68.1	0.00004	mg/L	0.000268	0.00004	mg/L	0.000268	652.68%
Mo 202.031†	81.6	0.00325	mg/L	0.000723	0.00325	mg/L	0.000723	22.27%
Na 589.592†	144.6	0.01043	mg/L	0.002763	0.01043	mg/L	0.002763	26.50%
Na 330.237†	-7.0	-0.2789	mg/L	0.17709	-0.2789	mg/L	0.17709	63.49%
Ni 231.604†	4.0	0.00108	mg/L	0.001586	0.00108	mg/L	0.001586	146.69%
Pb 220.353†	-378.9	-0.00588	mg/L	0.002552	-0.00588	mg/L	0.002552	43.39%
Sb 206.836†	56.3	0.01830	mg/L	0.003012	0.01830	mg/L	0.003012	16.46%
Se 196.026†	39.0	0.02230	mg/L	0.009765	0.02230	mg/L	0.009765	43.80%
Si 288.158†	-8.3	0.00960	mg/L	0.002335	0.00960	mg/L	0.002335	24.32%
Sn 189.927†	-91.3	-0.01248	mg/L	0.000859	-0.01248	mg/L	0.000859	6.88%
Sr 421.552†	4867.1	0.00548	mg/L Conts.	0.000045	0.00548	mg/L	0.000045	0.83%
Ti 334.903†	185.7	0.00263	mg/L	0.000333	0.00263	mg/L	0.000333	12.64%
Tl 190.801†	-31.7	0.00811	mg/L	0.008585	0.00811	mg/L	0.008585	105.85%
V 292.402†	1546.6	-0.00089	mg/L	0.000292	-0.00089	mg/L	0.000292	32.82%
Zn 206.200†	3.2	-0.00094	mg/L	0.000654	-0.00094	mg/L	0.000654	69.52%

Sequence No.: 6
Sample ID: DI CHECK

Autosampler Location: 304
Date Collected: 12/16/2013 9:14:23 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: DI CHECK

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: DI CHECK

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2842886.1	102.9	%	0.39				0.38%
ScR 361.383	283818.0	104.1	%	0.84				0.80%
Ag 328.068†	11.5	0.00005	mg/L	0.000152	0.00005	mg/L	0.000152	286.06%
Al 308.215†	-3.7	-0.00316	mg/L	0.006317	-0.00316	mg/L	0.006317	199.83%
As 188.979†	5.4	0.00345	mg/L	0.003215	0.00345	mg/L	0.003215	93.16%
B 249.677†	3.9	0.00064	mg/L	0.000088	0.00064	mg/L	0.000088	13.78%
Ba 233.527†	-0.1	-0.00002	mg/L	0.000813	-0.00002	mg/L	0.000813	>999.9%
Be 313.042†	6.2	0.00001	mg/L	0.000009	0.00001	mg/L	0.000009	73.30%
Ca 317.933†	21.5	0.00249	mg/L	0.000863	0.00249	mg/L	0.000863	34.68%
Cd 228.802†	5.5	0.00019	mg/L	0.000124	0.00019	mg/L	0.000124	66.47%
Co 228.616†	16.6	0.00041	mg/L	0.000168	0.00041	mg/L	0.000168	40.88%
Cr 267.716†	7.1	0.00119	mg/L	0.000862	0.00119	mg/L	0.000862	72.21%
Cu 324.752†	-57.9	-0.00021	mg/L	0.000059	-0.00021	mg/L	0.000059	28.28%
Fe 273.955†	7.7	0.00719	mg/L	0.001319	0.00719	mg/L	0.001319	18.34%
K 766.490†	11.5	0.00514	mg/L	0.003079	0.00514	mg/L	0.003079	59.86%
Mg 279.077†	10.7	0.01216	mg/L	0.001306	0.01216	mg/L	0.001306	10.74%
Mn 257.610†	-9.5	-0.00025	mg/L	0.000090	-0.00025	mg/L	0.000090	36.22%
Mo 202.031†	-12.2	-0.00069	mg/L	0.000163	-0.00069	mg/L	0.000163	23.84%
Na 589.592†	30.7	0.00221	mg/L	0.004352	0.00221	mg/L	0.004352	196.90%
Na 330.237†	0.8	0.03339	mg/L	0.409354	0.03339	mg/L	0.409354	>999.9%
Ni 231.604†	3.5	0.00094	mg/L	0.000803	0.00094	mg/L	0.000803	85.45%
Pb 220.353†	2.3	0.00029	mg/L	0.000800	0.00029	mg/L	0.000800	278.18%
Sb 206.836†	-7.6	-0.00252	mg/L	0.000563	-0.00252	mg/L	0.000563	22.37%
Se 196.026†	13.7	0.00981	mg/L	0.001220	0.00981	mg/L	0.001220	12.43%
Si 288.158†	-6.2	-0.00427	mg/L	0.000975	-0.00427	mg/L	0.000975	22.84%
Sn 189.927†	2.8	0.00081	mg/L	0.000400	0.00081	mg/L	0.000400	49.26%
Sr 421.552†	-15.2	-0.00002	mg/L	0.000023	-0.00002	mg/L	0.000023	135.09%
Ti 334.903†	-3.9	-0.00020	mg/L	0.000242	-0.00020	mg/L	0.000242	119.50%
Tl 190.801†	11.7	0.00598	mg/L	0.001202	0.00598	mg/L	0.001202	20.08%
V 292.402†	5.2	0.00004	mg/L	0.000094	0.00004	mg/L	0.000094	231.11%
Zn 206.200†	1.7	0.00047	mg/L	0.000858	0.00047	mg/L	0.000858	181.17%

Sequence No.: 8
Sample ID: CB

Autosampler Location: 1
Date Collected: 12/16/2013 9:22:42 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2787226.8	100.9	%	0.35				0.34%
ScR 361.383	275164.3	100.9	%	0.35				0.35%
Ag 328.068†	-4.5	-0.00002	mg/L	0.000050	-0.00002	mg/L	0.000050	239.62%
Al 308.215†	-4.0	-0.00345	mg/L	0.001494	-0.00345	mg/L	0.001494	43.37%
As 188.979†	-0.9	-0.00058	mg/L	0.001354	-0.00058	mg/L	0.001354	231.48%
B 249.677†	11.6	0.00188	mg/L	0.000484	0.00188	mg/L	0.000484	25.71%
Ba 233.527†	0.1	0.00002	mg/L	0.001074	0.00002	mg/L	0.001074	>999.9%
Be 313.042†	8.0	0.00002	mg/L	0.000014	0.00002	mg/L	0.000014	96.12%
Ca 317.933†	-5.2	-0.00061	mg/L	0.001545	-0.00061	mg/L	0.001545	254.28%
Cd 228.802†	0.4	0.00002	mg/L	0.000186	0.00002	mg/L	0.000186	>999.9%
Co 228.616†	-3.5	-0.00009	mg/L	0.000075	-0.00009	mg/L	0.000075	86.66%
Cr 267.716†	2.4	0.00040	mg/L	0.000675	0.00040	mg/L	0.000675	168.27%
Cu 324.752†	30.5	0.00011	mg/L	0.000099	0.00011	mg/L	0.000099	89.51%
Fe 273.955†	1.0	0.00095	mg/L	0.000978	0.00095	mg/L	0.000978	103.21%
K 766.490†	38.9	0.01736	mg/L	0.009271	0.01736	mg/L	0.009271	53.40%
Mg 279.077†	3.3	0.00372	mg/L	0.004625	0.00372	mg/L	0.004625	124.32%
Mn 257.610†	-0.4	-0.00001	mg/L	0.000036	-0.00001	mg/L	0.000036	309.10%
Mo 202.031†	1.0	0.00006	mg/L	0.000297	0.00006	mg/L	0.000297	525.80%
Na 589.592†	15.2	0.00110	mg/L	0.000915	0.00110	mg/L	0.000915	83.40%
Na 330.237†	2.5	0.1010	mg/L	0.14008	0.1010	mg/L	0.14008	138.76%
Ni 231.604†	1.3	0.00035	mg/L	0.000551	0.00035	mg/L	0.000551	159.22%
Pb 220.353†	0.9	0.00011	mg/L	0.000570	0.00011	mg/L	0.000570	536.83%
Sb 206.836†	8.5	0.00279	mg/L	0.001515	0.00279	mg/L	0.001515	54.34%
Se 196.026†	3.4	0.00244	mg/L	0.003980	0.00244	mg/L	0.003980	162.86%
Si 288.158†	0.5	0.00037	mg/L	0.004819	0.00037	mg/L	0.004819	>999.9%
Sn 189.927†	1.8	0.00054	mg/L	0.000620	0.00054	mg/L	0.000620	113.89%
Sr 421.552†	59.7	0.00007	mg/L	0.000019	0.00007	mg/L	0.000019	28.62%
Ti 334.903†	4.0	0.00021	mg/L	0.000135	0.00021	mg/L	0.000135	65.94%
Tl 190.801†	0.9	0.00046	mg/L	0.001519	0.00046	mg/L	0.001519	328.26%
V 292.402†	15.5	0.00011	mg/L	0.000081	0.00011	mg/L	0.000081	74.11%
Zn 206.200†	-1.0	-0.00029	mg/L	0.000115	-0.00029	mg/L	0.000115	39.62%

Sequence No.: 10
Sample ID: XQ29 B WMN

Autosampler Location: 306
Date Collected: 12/16/2013 9:31:14 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ29 B WMN

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ29 B WMN

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2796992.5	101.3	%	0.15				0.15%
ScR 361.383	278577.2	102.2	%	0.22				0.21%
Ag 328.068†	-549.2	-0.00170	mg/L	0.000174	-0.00170	mg/L	0.000174	10.23%
Al 308.215†	45407.6	39.33	mg/L	0.107	39.33	mg/L	0.107	0.27%
As 188.979†	-44.6	0.04236	mg/L	0.001766	0.04236	mg/L	0.001766	4.17%
B 249.677†	293.4	0.04739	mg/L	0.000927	0.04739	mg/L	0.000927	1.96%
Ba 233.527†	4046.1	0.9022	mg/L	0.00215	0.9022	mg/L	0.00215	0.24%
Be 313.042†	2071.6	0.00376	mg/L	0.000025	0.00376	mg/L	0.000025	0.67%
Ca 317.933†	909422.1	105.3	mg/L	0.53	105.3	mg/L	0.53	0.50%
Cd 228.802†	2175.5	0.08062	mg/L	0.000412	0.08062	mg/L	0.000412	0.51%
Co 228.616†	2870.1	0.06657	mg/L	0.000033	0.06657	mg/L	0.000033	0.05%
Cr 267.716†	219.9	0.03925	mg/L	0.001553	0.03925	mg/L	0.001553	3.96%
Cu 324.752†	88532.0	0.3247	mg/L	0.00161	0.3247	mg/L	0.00161	0.49%
Fe 273.955†	92373.8	86.11	mg/L	0.952	86.11	mg/L	0.952	1.11%
K 766.490†	11894.0	5.304	mg/L	0.0066	5.304	mg/L	0.0066	0.12%
Mg 279.077†	15703.3	17.84	mg/L	0.073	17.84	mg/L	0.073	0.41%
Mn 257.610†	58723.6	1.527	mg/L	0.0142	1.527	mg/L	0.0142	0.93%
Mo 202.031†	89.2	0.00363	mg/L	0.000220	0.00363	mg/L	0.000220	6.06%
Na 589.592†	23733.3	1.711	mg/L	0.0031	1.711	mg/L	0.0031	0.18%
Na 330.237†	244.2	1.054	mg/L	0.2644	1.054	mg/L	0.2644	25.07%
Ni 231.604†	270.0	0.07174	mg/L	0.000461	0.07174	mg/L	0.000461	0.64%
Pb 220.353†	11550.6	1.421	mg/L	0.0030	1.421	mg/L	0.0030	0.21%
Sb 206.836†	6.8	0.00525	mg/L	0.004266	0.00525	mg/L	0.004266	81.32%
Se 196.026†	26.0	0.01251	mg/L	0.001562	0.01251	mg/L	0.001562	12.48%
Si 288.158†	46256.4	31.92	mg/L	0.135	31.92	mg/L	0.135	0.42%
Sn 189.927†	-57.8	-0.00157	mg/L	0.001968	-0.00157	mg/L	0.001968	125.60%
Sr 421.552†	282067.9	0.3177	mg/L	0.00119	0.3177	mg/L	0.00119	0.38%
Ti 334.903†	47216.5	2.432	mg/L	0.0136	2.432	mg/L	0.0136	0.56%
Tl 190.801†	18.0	0.01770	mg/L	0.002700	0.01770	mg/L	0.002700	15.25%
V 292.402†	61164.2	0.4229	mg/L	0.00283	0.4229	mg/L	0.00283	0.67%
Zn 206.200†	111446.9	30.99	mg/L	0.209	30.99	mg/L	0.209	0.67%

Sequence No.: 12
Sample ID: XQ29 ADUP WMN

Autosampler Location: 308
Date Collected: 12/16/2013 9:39:32 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ29 ADUP WMN

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ29 ADUP WMN

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2787693.8	100.9	%	0.35				0.34%
ScR 361.383	281188.4	103.1	%	0.81				0.79%
Ag 328.068†	-168.5	-0.00044	mg/L	0.000210	-0.00044	mg/L	0.000210	48.19%
Al 308.215†	23381.7	20.25	mg/L	0.058	20.25	mg/L	0.058	0.29%
As 188.979†	-3.5	0.04570	mg/L	0.002882	0.04570	mg/L	0.002882	6.31%
B 249.677†	148.7	0.02397	mg/L	0.001162	0.02397	mg/L	0.001162	4.85%
Ba 233.527†	2469.1	0.5489	mg/L	0.00513	0.5489	mg/L	0.00513	0.93%
Be 313.042†	1182.4	0.00214	mg/L	0.000034	0.00214	mg/L	0.000034	1.58%
Ca 317.933†	334190.2	38.71	mg/L	0.225	38.71	mg/L	0.225	0.58%
Cd 228.802†	1861.0	0.06897	mg/L	0.000154	0.06897	mg/L	0.000154	0.22%
Co 228.616†	2532.9	0.05976	mg/L	0.000203	0.05976	mg/L	0.000203	0.34%
Cr 267.716†	117.5	0.02182	mg/L	0.000741	0.02182	mg/L	0.000741	3.40%
Cu 324.752†	61561.5	0.2260	mg/L	0.00061	0.2260	mg/L	0.00061	0.27%
Fe 273.955†	66741.1	62.21	mg/L	0.278	62.21	mg/L	0.278	0.45%
K 766.490†	6870.1	3.064	mg/L	0.0081	3.064	mg/L	0.0081	0.26%
Mg 279.077†	9068.3	10.30	mg/L	0.097	10.30	mg/L	0.097	0.94%
Mn 257.610†	29581.3	0.7694	mg/L	0.00253	0.7694	mg/L	0.00253	0.33%
Mo 202.031†	82.8	0.00414	mg/L	0.000189	0.00414	mg/L	0.000189	4.57%
Na 589.592†	19641.7	1.416	mg/L	0.0073	1.416	mg/L	0.0073	0.52%
Na 330.237†	392.3	1.240	mg/L	0.2324	1.240	mg/L	0.2324	18.74%
~~Ni 231.604†~~	~~245.3~~	~~0.06519~~	~~mg/L~~	~~0.001253~~	~~0.06519~~	~~mg/L~~	~~0.001253~~	~~1.92%~~
Pb 220.353†	13258.5	1.627	mg/L	0.0037	1.627	mg/L	0.0037	0.23%
Sb 206.836†	7.1	0.00437	mg/L	0.002798	0.00437	mg/L	0.002798	64.07%
Se 196.026†	16.8	0.00969	mg/L	0.001620	0.00969	mg/L	0.001620	16.71%
Si 288.158†	30243.6	20.87	mg/L	0.058	20.87	mg/L	0.058	0.28%
Sn 189.927†	-22.3	-0.00071	mg/L	0.000726	-0.00071	mg/L	0.000726	101.77%
Sr 421.552†	140184.1	0.1579	mg/L	0.00048	0.1579	mg/L	0.00048	0.30%
Ti 334.903†	30498.2	1.573	mg/L	0.0061	1.573	mg/L	0.0061	0.39%
Tl 190.801†	7.4	0.00998	mg/L	0.002215	0.00998	mg/L	0.002215	22.19%
V 292.402†	38948.9	0.2688	mg/L	0.00095	0.2688	mg/L	0.00095	0.35%
Zn 206.200†	176499.1	49.08	mg/L	0.215	49.08	mg/L	0.215	0.44%

Sequence No.: 14
Sample ID: XQ29 ASPK WMN

Autosampler Location: 310
Date Collected: 12/16/2013 9:47:32 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ29 ASPK WMN

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ29 ASPK WMN

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2780144.4	100.7	%	0.34				0.34%
ScR 361.383	278800.5	102.2	%	0.50				0.49%
Ag 328.068†	109941.2	0.5112	mg/L	0.00075	0.5112	mg/L	0.00075	0.15%
Al 308.215†	30886.3	26.75	mg/L	0.110	26.75	mg/L	0.110	0.41%
As 188.979†	3375.1	2.223	mg/L	0.0081	2.223	mg/L	0.0081	0.36%
B 249.677†	426.0	0.06779	mg/L	0.001303	0.06779	mg/L	0.001303	1.92%
Ba 233.527†	12055.0	2.715	mg/L	0.0193	2.715	mg/L	0.0193	0.71%
Be 313.042†	258996.2	0.4859	mg/L	0.00148	0.4859	mg/L	0.00148	0.30%
Ca 317.933†	428853.3	49.68	mg/L	0.215	49.68	mg/L	0.215	0.43%
Cd 228.802†	17182.2	0.6297	mg/L	0.00269	0.6297	mg/L	0.00269	0.43%
Co 228.616†	23734.2	0.5827	mg/L	0.00203	0.5827	mg/L	0.00203	0.35%
Cr 267.716†	3219.0	0.5448	mg/L	0.00175	0.5448	mg/L	0.00175	0.32%
Cu 324.752†	208037.1	0.7578	mg/L	0.00224	0.7578	mg/L	0.00224	0.30%
Fe 273.955†	83104.4	77.46	mg/L	0.191	77.46	mg/L	0.191	0.25%
K 766.490†	30396.0	13.55	mg/L	0.055	13.55	mg/L	0.055	0.40%
Mg 279.077†	19301.1	21.96	mg/L	0.064	21.96	mg/L	0.064	0.29%
Mn 257.610†	51365.3	1.336	mg/L	0.0022	1.336	mg/L	0.0022	0.17%
Mo 202.031†	89.1	0.00432	mg/L	0.000178	0.00432	mg/L	0.000178	4.11%
Na 589.592†	230646.2	16.63	mg/L	0.039	16.63	mg/L	0.039	0.23%
Na 330.237†	822.2	17.76	mg/L	0.190	17.76	mg/L	0.190	1.07%
Ni 231.604†	2109.4	0.5597	mg/L	0.00214	0.5597	mg/L	0.00214	0.38%
Pb 220.353†	30209.3	3.706	mg/L	0.0156	3.706	mg/L	0.0156	0.42%
Sb 206.836†	22.1	0.00449	mg/L	0.002713	0.00449	mg/L	0.002713	60.40%
Se 196.026†	3389.6	2.415	mg/L	0.0145	2.415	mg/L	0.0145	0.60%
Si 288.158†	39329.8	27.14	mg/L	0.077	27.14	mg/L	0.077	0.28%
Sn 189.927†	-35.0	-0.00278	mg/L	0.000394	-0.00278	mg/L	0.000394	14.19%
Sr 421.552†	598297.7	0.6739	mg/L	0.00219	0.6739	mg/L	0.00219	0.33%
Ti 334.903†	34371.0	1.772	mg/L	0.0080	1.772	mg/L	0.0080	0.45%
Tl 190.801†	4058.4	2.072	mg/L	0.0001	2.072	mg/L	0.0001	0.01%
V 292.402†	117551.5	0.8212	mg/L	0.00156	0.8212	mg/L	0.00156	0.19%
Zn 206.200†	187090.0	52.02	mg/L	0.312	52.02	mg/L	0.312	0.60%

Sequence No.: 16
Sample ID: CV 2

Autosampler Location: 7
Date Collected: 12/16/2013 9:55:35 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CV

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: CV

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2722937.1	98.58	%	0.340				0.34%
ScR 361.383	268451.1	98.45	%	0.646				0.66%
Ag 328.068†	232446.5	1.080	mg/L	0.0105	1.080	mg/L	0.0105	0.97%
Al 308.215†	2432.6	2.074	mg/L	0.0092	2.074	mg/L	0.0092	0.44%
As 188.979†	3158.0	2.059	mg/L	0.0135	2.059	mg/L	0.0135	0.66%
B 249.677†	6308.4	1.021	mg/L	0.0052	1.021	mg/L	0.0052	0.51%
Ba 233.527†	4570.7	1.034	mg/L	0.0019	1.034	mg/L	0.0019	0.19%
Be 313.042†	528543.8	0.9918	mg/L	0.00401	0.9918	mg/L	0.00401	0.40%
Ca 317.933†	18543.9	2.148	mg/L	0.0068	2.148	mg/L	0.0068	0.32%
Cd 228.802†	27955.9	1.034	mg/L	0.0118	1.034	mg/L	0.0118	1.15%
Co 228.616†	40925.6	1.009	mg/L	0.0113	1.009	mg/L	0.0113	1.12%
Cr 267.716†	6222.4	1.049	mg/L	0.0049	1.049	mg/L	0.0049	0.47%
Cu 324.752†	282410.5	1.024	mg/L	0.0025	1.024	mg/L	0.0025	0.25%
Fe 273.955†	2283.9	2.123	mg/L	0.0011	2.123	mg/L	0.0011	0.05%
K 766.490†	45979.0	20.50	mg/L	0.064	20.50	mg/L	0.064	0.31%
Mg 279.077†	1794.8	2.053	mg/L	0.0057	2.053	mg/L	0.0057	0.28%
Mn 257.610†	37743.4	0.9820	mg/L	0.00333	0.9820	mg/L	0.00333	0.34%
Mo 202.031†	17858.5	1.002	mg/L	0.0133	1.002	mg/L	0.0133	1.33%
Na 589.592†	700143.5	50.47	mg/L	0.025	50.47	mg/L	0.025	0.05%
Na 330.237†	1303.8	52.66	mg/L	0.418	52.66	mg/L	0.418	0.79%
~~Ni 231.604†~~	~~3889.2~~	~~1.034~~	~~mg/L~~	~~0.0051~~	~~1.034~~	~~mg/L~~	~~0.0051~~	~~0.50%~~
Pb 220.353†	16572.5	2.032	mg/L	0.0301	2.032	mg/L	0.0301	1.48%
Sb 206.836†	6528.6	2.149	mg/L	0.0142	2.149	mg/L	0.0142	0.66%
Se 196.026†	2851.2	2.033	mg/L	0.0133	2.033	mg/L	0.0133	0.65%
Si 288.158†	3108.8	2.150	mg/L	0.0070	2.150	mg/L	0.0070	0.32%
Sn 189.927†	3454.3	1.017	mg/L	0.0094	1.017	mg/L	0.0094	0.93%
Sr 421.552†	897983.2	1.011	mg/L	0.0012	1.011	mg/L	0.0012	0.12%
Ti 334.903†	19729.5	1.018	mg/L	0.0011	1.018	mg/L	0.0011	0.11%
Tl 190.801†	4146.2	2.106	mg/L	0.0099	2.106	mg/L	0.0099	0.47%
V 292.402†	145848.9	1.027	mg/L	0.0116	1.027	mg/L	0.0116	1.13%
Zn 206.200†	3683.5	1.024	mg/L	0.0020	1.024	mg/L	0.0020	0.20%

Sequence No.: 18
Sample ID: XQ82 MB TWC

Autosampler Location: 312
Date Collected: 12/16/2013 10:03:55 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ82 MB TWC

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ82 MB TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2780593.6	100.7	%	0.52				0.51%
ScR 361.383	275205.4	100.9	%	0.12				0.12%
Ag 328.068†	-5.3	-0.00002	mg/L	0.000160	-0.00002	mg/L	0.000160	655.21%
Al 308.215†	-6.2	-0.00537	mg/L	0.003305	-0.00537	mg/L	0.003305	61.53%
As 188.979†	0.9	0.00059	mg/L	0.002908	0.00059	mg/L	0.002908	492.57%
B 249.677†	2.9	0.00047	mg/L	0.001553	0.00047	mg/L	0.001553	327.05%
Ba 233.527†	0.4	0.00010	mg/L	0.000575	0.00010	mg/L	0.000575	603.77%
Be 313.042†	0.7	0.00000	mg/L	0.000013	0.00000	mg/L	0.000013	>999.9%
Ca 317.933†	16.4	0.00190	mg/L	0.000660	0.00190	mg/L	0.000660	34.81%
Cd 228.802†	2.0	0.00007	mg/L	0.000076	0.00007	mg/L	0.000076	108.01%
Co 228.616†	-6.7	-0.00017	mg/L	0.000129	-0.00017	mg/L	0.000129	77.76%
Cr 267.716†	5.4	0.00091	mg/L	0.000309	0.00091	mg/L	0.000309	33.84%
Cu 324.752†	53.3	0.00019	mg/L	0.000087	0.00019	mg/L	0.000087	45.11%
Fe 273.955†	1.2	0.00116	mg/L	0.002517	0.00116	mg/L	0.002517	216.39%
K 766.490†	32.9	0.01465	mg/L	0.009143	0.01465	mg/L	0.009143	62.41%
Mg 279.077†	4.6	0.00521	mg/L	0.001834	0.00521	mg/L	0.001834	35.16%
Mn 257.610†	0.2	0.00000	mg/L	0.000068	0.00000	mg/L	0.000068	>999.9%
Mo 202.031†	1.2	0.00007	mg/L	0.000080	0.00007	mg/L	0.000080	115.58%
Na 589.592†	161.5	0.01164	mg/L	0.004727	0.01164	mg/L	0.004727	40.61%
Na 330.237†	2.8	0.1109	mg/L	0.22947	0.1109	mg/L	0.22947	206.99%
Ni 231.604†	2.9	0.00078	mg/L	0.001487	0.00078	mg/L	0.001487	190.61%
Pb 220.353†	4.2	0.00051	mg/L	0.000392	0.00051	mg/L	0.000392	76.96%
Sb 206.836†	0.7	0.00023	mg/L	0.000719	0.00023	mg/L	0.000719	314.97%
Se 196.026†	1.3	0.00093	mg/L	0.002061	0.00093	mg/L	0.002061	222.53%
Si 288.158†	5.9	0.00409	mg/L	0.004957	0.00409	mg/L	0.004957	121.28%
Sn 189.927†	1.3	0.00038	mg/L	0.000238	0.00038	mg/L	0.000238	62.55%
Sr 421.552†	22.2	0.00002	mg/L	0.000004	0.00002	mg/L	0.000004	14.93%
Ti 334.903†	-2.1	-0.00011	mg/L	0.000524	-0.00011	mg/L	0.000524	473.00%
Tl 190.801†	-4.0	-0.00203	mg/L	0.001678	-0.00203	mg/L	0.001678	82.57%
V 292.402†	-0.9	-0.00000	mg/L	0.000099	-0.00000	mg/L	0.000099	>999.9%
Zn 206.200†	11.9	0.00331	mg/L	0.000494	0.00331	mg/L	0.000494	14.90%

Sequence No.: 20
Sample ID: XQ47 ADUP LEN

Autosampler Location: 314
Date Collected: 12/16/2013 10:12:44 AM
Data Type: Original

Dilution: 5.000000X

Nebulizer Parameters: XQ47 ADUP LEN

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: XQ47 ADUP LEN

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2710515.8	98.13	%	0.474				0.48%
ScR 361.383	271036.4	99.40	%	0.893				0.90%
Ag 328.068†	-6.3	0.00022	mg/L	0.000188	0.00108	mg/L	0.000939	87.38%
Al 308.215†	116.1	0.1005	mg/L	0.00525	0.5024	mg/L	0.02624	5.22%
As 188.979†	31.8	0.01811	mg/L	0.001700	0.09053	mg/L	0.008498	9.39%
B 249.677†	236.4	0.03830	mg/L	0.000525	0.1915	mg/L	0.00263	1.37%
Ba 233.527†	504.9	0.1143	mg/L	0.00068	0.5717	mg/L	0.00339	0.59%
Be 313.042†	14.3	0.00003	mg/L	0.000020	0.00013	mg/L	0.000102	76.38%
Ca 317.933†	304374.5	35.26	mg/L	0.109	176.3	mg/L	0.55	0.31%
Cd 228.802†	20.4	0.00065	mg/L	0.000060	0.00327	mg/L	0.000300	9.16%
Co 228.616†	175.0	0.00430	mg/L	0.000072	0.02151	mg/L	0.000358	1.66%
Cr 267.716†	26.6	0.00413	mg/L	0.000122	0.02064	mg/L	0.000611	2.96%
Cu 324.752†	6451.7	0.02341	mg/L	0.000384	0.1171	mg/L	0.00192	1.64%
Fe 273.955†	760.4	0.7089	mg/L	0.00328	3.544	mg/L	0.0164	0.46%
K 766.490†	10980.9	4.897	mg/L	0.0053	24.48	mg/L	0.026	0.11%
Mg 279.077†	2139.2	2.434	mg/L	0.0185	12.17	mg/L	0.093	0.76%
Mn 257.610†	22656.3	0.5891	mg/L	0.00255	2.946	mg/L	0.0127	0.43%
Mo 202.031†	74.8	0.00374	mg/L	0.000169	0.01868	mg/L	0.000846	4.53%
Na 589.592†	4116762.7	296.7	mg/L	2.33	1484	mg/L	11.64	0.78%
Na 330.237†	7516.4	303.5	mg/L	1.10	1518	mg/L	5.48	0.36%
Ni 231.604†	44.4	0.01179	mg/L	0.000600	0.05897	mg/L	0.003002	5.09%
Pb 220.353†	453.7	0.05557	mg/L	0.001599	0.2779	mg/L	0.00799	2.88%
Sb 206.836†	14.7	0.00467	mg/L	0.000445	0.02337	mg/L	0.002226	9.53%
Se 196.026†	2.6	-0.00009	mg/L	0.002325	-0.00046	mg/L	0.011627	>999.9%
Si 288.158†	1667.5	1.151	mg/L	0.0321	5.754	mg/L	0.1604	2.79%
Sn 189.927†	-45.4	-0.00837	mg/L	0.001541	-0.04184	mg/L	0.007706	18.42%
Sr 421.552†	307099.2	0.3459	mg/L	0.00073	1.730	mg/L	0.0036	0.21%
Ti 334.903†	96.1	0.00255	mg/L	0.000803	0.01275	mg/L	0.004017	31.52%
Tl 190.801†	20.4	0.01048	mg/L	0.001428	0.05239	mg/L	0.007140	13.63%
V 292.402†	110.3	0.00084	mg/L	0.000178	0.00419	mg/L	0.000891	21.24%
Zn 206.200†	2407.1	0.6688	mg/L	0.00570	3.344	mg/L	0.0285	0.85%

Sequence No.: 22
Sample ID: XQ47 ASPK LEN

Autosampler Location: 316
Date Collected: 12/16/2013 10:21:19 AM
Data Type: Original

Dilution: 5.000000X

Nebulizer Parameters: XQ47 ASPK LEN

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ47 ASPK LEN

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2683268.5	97.15	%	0.550				0.57%
ScR 361.383	270462.1	99.19	%	0.372				0.38%
Ag 328.068†	45812.3	0.2131	mg/L	0.00124	1.066	mg/L	0.0062	0.58%
Al 308.215†	1056.2	0.9120	mg/L	0.00284	4.560	mg/L	0.0142	0.31%
As 188.979†	1341.7	0.8599	mg/L	0.00716	4.300	mg/L	0.0358	0.83%
B 249.677†	233.7	0.03742	mg/L	0.000564	0.1871	mg/L	0.00282	1.51%
Ba 233.527†	4097.6	0.9270	mg/L	0.00184	4.635	mg/L	0.0092	0.20%
Be 313.042†	98177.8	0.1842	mg/L	0.00086	0.9211	mg/L	0.00430	0.47%
Ca 317.933†	335226.1	38.83	mg/L	0.067	194.2	mg/L	0.33	0.17%
Cd 228.802†	5970.5	0.2185	mg/L	0.00162	1.092	mg/L	0.0081	0.74%
Co 228.616†	8409.8	0.2075	mg/L	0.00175	1.038	mg/L	0.0087	0.84%
Cr 267.716†	1232.4	0.2072	mg/L	0.00081	1.036	mg/L	0.0040	0.39%
Cu 324.752†	65489.4	0.2375	mg/L	0.00225	1.188	mg/L	0.0112	0.95%
Fe 273.955†	1611.5	1.501	mg/L	0.0089	7.505	mg/L	0.0444	0.59%
K 766.490†	20330.8	9.066	mg/L	0.0038	45.33	mg/L	0.019	0.04%
Mg 279.077†	5685.1	6.478	mg/L	0.0080	32.39	mg/L	0.040	0.12%
Mn 257.610†	29850.5	0.7763	mg/L	0.00186	3.882	mg/L	0.0093	0.24%
Mo 202.031†	78.9	0.00391	mg/L	0.000095	0.01953	mg/L	0.000477	2.44%
Na 589.592†	4111587.9	296.4	mg/L	1.39	1482	mg/L	6.97	0.47%
Na 330.237†	7762.6	313.4	mg/L	0.81	1567	mg/L	4.03	0.26%
Ni 231.604†	801.2	0.2126	mg/L	0.00061	1.063	mg/L	0.0030	0.28%
Pb 220.353†	7257.5	0.8898	mg/L	0.00826	4.449	mg/L	0.0413	0.93%
Sb 206.836†	21.1	0.00479	mg/L	0.001733	0.02395	mg/L	0.008667	36.18%
Se 196.026†	1193.8	0.8494	mg/L	0.00863	4.247	mg/L	0.0432	1.02%
Si 288.158†	1711.5	1.183	mg/L	0.0248	5.914	mg/L	0.1239	2.09%
Sn 189.927†	-50.0	-0.00919	mg/L	0.001050	-0.04595	mg/L	0.005249	11.42%
Sr 421.552†	482529.2	0.5435	mg/L	0.00092	2.718	mg/L	0.0046	0.17%
Ti 334.903†	83.3	0.00160	mg/L	0.000370	0.00802	mg/L	0.001850	23.06%
Tl 190.801†	1610.9	0.8196	mg/L	0.00305	4.098	mg/L	0.0152	0.37%
V 292.402†	28842.3	0.2031	mg/L	0.00172	1.016	mg/L	0.0086	0.85%
Zn 206.200†	3072.9	0.8539	mg/L	0.00493	4.270	mg/L	0.0246	0.58%

Sequence No.: 24
Sample ID: XQ82 A TWC

Autosampler Location: 318
Date Collected: 12/16/2013 10:29:55 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ82 A TWC

Analyte	Back Pressure	Flow
All	211.0 kPa	0.75 L/min

Mean Data: XQ82 A TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2728002.7	98.77	%	0.106				0.11%
ScR 361.383	270513.9	99.20	%	0.304				0.31%
Ag 328.068†	-53.9	-0.00015	mg/L	0.000083	-0.00015	mg/L	0.000083	56.16%
Al 308.215†	34.0	0.02935	mg/L	0.005130	0.02935	mg/L	0.005130	17.48%
As 188.979†	14.9	0.00856	mg/L	0.000713	0.00856	mg/L	0.000713	8.33%
B 249.677†	14116.5	2.287	mg/L	0.0142	2.287	mg/L	0.0142	0.62%
Ba 233.527†	10.2	0.00238	mg/L	0.000859	0.00238	mg/L	0.000859	36.10%
Be 313.042†	20.6	0.00004	mg/L	0.000024	0.00004	mg/L	0.000024	63.14%
Ca 317.933†	128263.7	14.86	mg/L	0.056	14.86	mg/L	0.056	0.38%
Cd 228.802†	2.5	0.00004	mg/L	0.000017	0.00004	mg/L	0.000017	38.89%
Co 228.616†	7.5	0.00018	mg/L	0.000035	0.00018	mg/L	0.000035	18.99%
Cr 267.716†	2.1	0.00014	mg/L	0.000325	0.00014	mg/L	0.000325	233.75%
Cu 324.752†	17734.4	0.06429	mg/L	0.000263	0.06429	mg/L	0.000263	0.41%
Fe 273.955†	60.6	0.05646	mg/L	0.002166	0.05646	mg/L	0.002166	3.84%
K 766.490†	18472.3	8.237	mg/L	0.0612	8.237	mg/L	0.0612	0.74%
Mg 279.077†	1626.9	1.853	mg/L	0.0076	1.853	mg/L	0.0076	0.41%
Mn 257.610†	61.0	0.00152	mg/L	0.000082	0.00152	mg/L	0.000082	5.35%
Mo 202.031†	101.5	0.00550	mg/L	0.000562	0.00550	mg/L	0.000562	10.22%
Na 589.592†	1793793.5	129.3	mg/L	0.33	129.3	mg/L	0.33	0.26%
Na 330.237†	3277.0	132.4	mg/L	1.22	132.4	mg/L	1.22	0.92%
Ni 231.604†	5.4	0.00144	mg/L	0.001033	0.00144	mg/L	0.001033	71.93%
Pb 220.353†	6.3	0.00069	mg/L	0.000519	0.00069	mg/L	0.000519	75.60%
Sb 206.836†	4.9	0.00154	mg/L	0.000398	0.00154	mg/L	0.000398	25.79%
Se 196.026†	2.0	0.00064	mg/L	0.001729	0.00064	mg/L	0.001729	269.85%
Si 288.158†	3040.3	2.098	mg/L	0.0049	2.098	mg/L	0.0049	0.24%
Sn 189.927†	-22.8	-0.00461	mg/L	0.001379	-0.00461	mg/L	0.001379	29.89%
Sr 421.552†	173817.0	0.1958	mg/L	0.00064	0.1958	mg/L	0.00064	0.33%
Ti 334.903†	25.7	0.00030	mg/L	0.000246	0.00030	mg/L	0.000246	80.92%
Tl 190.801†	4.4	0.00226	mg/L	0.001398	0.00226	mg/L	0.001398	61.92%
V 292.402†	55.6	0.00039	mg/L	0.000055	0.00039	mg/L	0.000055	14.05%
Zn 206.200†	40.8	0.01143	mg/L	0.000330	0.01143	mg/L	0.000330	2.89%

Sequence No.: 26
Sample ID: XQ82 MBSPK TWC

Autosampler Location: 320
Date Collected: 12/16/2013 10:38:30 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ82 MBSPK TWC

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ82 MBSPK TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2758115.7	99.86	%	0.589				0.59%
ScR 361.383	272076.8	99.78	%	0.369				0.37%
Ag 328.068†	112328.3	0.5220	mg/L	0.00331	0.5220	mg/L	0.00331	0.63%
Al 308.215†	2401.8	2.073	mg/L	0.0192	2.073	mg/L	0.0192	0.92%
As 188.979†	3160.6	2.031	mg/L	0.0120	2.031	mg/L	0.0120	0.59%
B 249.677†	48.4	0.00679	mg/L	0.000938	0.00679	mg/L	0.000938	13.81%
Ba 233.527†	9092.1	2.057	mg/L	0.0207	2.057	mg/L	0.0207	1.01%
Be 313.042†	244076.2	0.4580	mg/L	0.00143	0.4580	mg/L	0.00143	0.31%
Ca 317.933†	87787.4	10.17	mg/L	0.031	10.17	mg/L	0.031	0.31%
Cd 228.802†	13905.5	0.5088	mg/L	0.00227	0.5088	mg/L	0.00227	0.45%
Co 228.616†	20046.0	0.4947	mg/L	0.00091	0.4947	mg/L	0.00091	0.18%
Cr 267.716†	3102.3	0.5226	mg/L	0.00459	0.5226	mg/L	0.00459	0.88%
Cu 324.752†	139839.1	0.5072	mg/L	0.00088	0.5072	mg/L	0.00088	0.17%
Fe 273.955†	2241.4	2.086	mg/L	0.0108	2.086	mg/L	0.0108	0.52%
K 766.490†	22973.4	10.24	mg/L	0.050	10.24	mg/L	0.050	0.49%
Mg 279.077†	9287.9	10.59	mg/L	0.082	10.59	mg/L	0.082	0.78%
Mn 257.610†	18738.1	0.4876	mg/L	0.00133	0.4876	mg/L	0.00133	0.27%
Mo 202.031†	29.6	0.00150	mg/L	0.000330	0.00150	mg/L	0.000330	21.95%
Na 589.592†	140630.3	10.14	mg/L	0.049	10.14	mg/L	0.049	0.48%
Na 330.237†	268.7	10.70	mg/L	0.365	10.70	mg/L	0.365	3.41%
Ni 231.604†	1934.0	0.5131	mg/L	0.00412	0.5131	mg/L	0.00412	0.80%
Pb 220.353†	16503.4	2.024	mg/L	0.0036	2.024	mg/L	0.0036	0.18%
Sb 206.836†	16.0	0.00010	mg/L	0.000505	0.00010	mg/L	0.000505	529.62%
Se 196.026†	2795.0	1.993	mg/L	0.0094	1.993	mg/L	0.0094	0.47%
Si 288.158†	7.5	0.00903	mg/L	0.006773	0.00903	mg/L	0.006773	75.03%
Sn 189.927†	-16.2	-0.00325	mg/L	0.000881	-0.00325	mg/L	0.000881	27.10%
Sr 421.552†	442496.0	0.4984	mg/L	0.00207	0.4984	mg/L	0.00207	0.42%
Ti 334.903†	22.4	0.00036	mg/L	0.000329	0.00036	mg/L	0.000329	91.18%
Tl 190.801†	3955.4	2.012	mg/L	0.0085	2.012	mg/L	0.0085	0.42%
V 292.402†	71830.9	0.5058	mg/L	0.00090	0.5058	mg/L	0.00090	0.18%
Zn 206.200†	1829.9	0.5087	mg/L	0.00305	0.5087	mg/L	0.00305	0.60%

XQ29 : 88851

Sequence No.: 28
Sample ID: CB 3

Autosampler Location: 1
Date Collected: 12/16/2013 10:46:36 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
ScA 357.253	2751312.6	99.61	%	0.402				0.40%
ScR 361.383	275380.3	101.0	%	0.22				0.22%
Ag 328.068†	40.0	0.00019	mg/L	0.000179	0.00019	mg/L	0.000179	96.36%
Al 308.215†	-1.3	-0.00113	mg/L	0.001360	-0.00113	mg/L	0.001360	119.89%
As 188.979†	-0.8	-0.00051	mg/L	0.002941	-0.00051	mg/L	0.002941	576.50%
B 249.677†	23.4	0.00379	mg/L	0.000971	0.00379	mg/L	0.000971	25.64%
Ba 233.527†	1.5	0.00034	mg/L	0.000508	0.00034	mg/L	0.000508	151.43%
Be 313.042†	31.2	0.00006	mg/L	0.000027	0.00006	mg/L	0.000027	45.98%
Ca 317.933†	3.5	0.00040	mg/L	0.000270	0.00040	mg/L	0.000270	67.25%
Cd 228.802†	5.9	0.00022	mg/L	0.000058	0.00022	mg/L	0.000058	26.21%
Co 228.616†	-0.9	-0.00002	mg/L	0.000178	-0.00002	mg/L	0.000178	767.54%
Cr 267.716†	-0.6	-0.00010	mg/L	0.000296	-0.00010	mg/L	0.000296	282.38%
Cu 324.752†	33.9	0.00012	mg/L	0.000213	0.00012	mg/L	0.000213	173.27%
Fe 273.955†	2.0	0.00187	mg/L	0.000715	0.00187	mg/L	0.000715	38.33%
K 766.490†	-0.8	-0.00037	mg/L	0.011949	-0.00037	mg/L	0.011949	>999.9%
Mg 279.077†	3.1	0.00350	mg/L	0.004659	0.00350	mg/L	0.004659	133.00%
Mn 257.610†	0.1	0.00000	mg/L	0.000064	0.00000	mg/L	0.000064	>999.9%
Mo 202.031†	1.9	0.00011	mg/L	0.000243	0.00011	mg/L	0.000243	226.04%
Na 589.592†	320.6	0.02311	mg/L	0.005549	0.02311	mg/L	0.005549	24.01%
Na 330.237†	-8.0	-0.3244	mg/L	0.47312	-0.3244	mg/L	0.47312	145.87%
Ni 231.604†	3.8	0.00102	mg/L	0.001629	0.00102	mg/L	0.001629	160.43%
Pb 220.353†	6.4	0.00079	mg/L	0.000320	0.00079	mg/L	0.000320	40.58%
Sb 206.836†	10.1	0.00334	mg/L	0.001740	0.00334	mg/L	0.001740	52.14%
Se 196.026†	-0.2	-0.00012	mg/L	0.001838	-0.00012	mg/L	0.001838	>999.9%
Si 288.158†	-0.3	-0.00019	mg/L	0.004646	-0.00019	mg/L	0.004646	>999.9%
Sn 189.927†	3.3	0.00097	mg/L	0.000563	0.00097	mg/L	0.000563	58.31%
Sr 421.552†	90.1	0.00010	mg/L	0.000033	0.00010	mg/L	0.000033	32.59%
Ti 334.903†	11.3	0.00058	mg/L	0.000152	0.00058	mg/L	0.000152	25.95%
Tl 190.801†	-0.2	-0.00012	mg/L	0.002846	-0.00012	mg/L	0.002846	>999.9%
V 292.402†	-6.7	-0.00005	mg/L	0.000265	-0.00005	mg/L	0.000265	555.68%
Zn 206.200†	-1.2	-0.00035	mg/L	0.000130	-0.00035	mg/L	0.000130	37.53%

Sequence No.: 30
Sample ID: XQ85 A TWC

Dilution: 1.000000X

Del

Autosampler Location: 322
Date Collected: 12/16/2013 10:55:08 AM
Data Type: Original

Nebulizer Parameters: XQ85 A TWC

Analyte	Back Pressure	Flow
All	209.0 kPa	0.75 L/min

Mean Data: XQ85 A TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2157093.3	78.10	%	0.394				0.51%
ScR 361.383	236446.5	86.71	%	1.236				1.43%
Ag 328.068†	-542.0	0.00043	mg/L	0.000265	0.00043	mg/L	0.000265	62.00%
Al 308.215†	3393.8	2.940	mg/L	0.0250	2.940	mg/L	0.0250	0.85%
As 188.979†	102.0	0.04217	mg/L	0.002584	0.04217	mg/L	0.002584	6.13%
B 249.677†	16414.4	2.659	mg/L	0.0261	2.659	mg/L	0.0261	0.98%
Ba 233.527†	737.9	0.1690	mg/L	0.00134	0.1690	mg/L	0.00134	0.79%
Be 313.042†	106.6	0.00020	mg/L	0.000024	0.00020	mg/L	0.000024	12.41%
Ca 317.933†	3668679.4	425.0	mg/L	4.45	425.0	mg/L	4.45	1.05%
Cd 228.802†	27.2	0.00063	mg/L	0.000229	0.00063	mg/L	0.000229	36.22%
Co 228.616†	142.5	0.00315	mg/L	0.000140	0.00315	mg/L	0.000140	4.45%
Cr 267.716†	514.1	0.02124	mg/L	0.001067	0.02124	mg/L	0.001067	5.02%
Cu 324.752†	4781.4	0.01147	mg/L	0.000414	0.01147	mg/L	0.000414	3.61%
Fe 273.955†	3566.4	3.325	mg/L	0.0252	3.325	mg/L	0.0252	0.76%
K 766.490†	681153.4	303.7	mg/L	1.43	303.7	mg/L	1.43	0.47%
Mg 279.077†	810798.7	924.5	mg/L	1.45	924.5	mg/L	1.45	0.16%
Mn 257.610†	5905.6	0.1499	mg/L	0.00140	0.1499	mg/L	0.00140	0.94%
Mo 202.031†	395.6	0.01663	mg/L	0.000528	0.01663	mg/L	0.000528	3.18%
Na 589.592†	Saturated3							
Na 330.237†	199115.6	8046	mg/L	22.78	8046	mg/L	22.78	0.28%
~~Ni 231.604†~~	~~37.0~~	~~0.00982~~	~~mg/L~~	~~0.000564~~	~~0.00982~~	~~mg/L~~	~~0.000564~~	~~5.75%~~
Pb 220.353†	-26.5	-0.00255	mg/L	0.001302	-0.00255	mg/L	0.001302	51.09%
Sb 206.836†	32.1	0.00921	mg/L	0.004180	0.00921	mg/L	0.004180	45.36%
Se 196.026†	47.6	0.01086	mg/L	0.005886	0.01086	mg/L	0.005886	54.20%
Si 288.158†	15034.4	10.51	mg/L	0.334	10.51	mg/L	0.334	3.18%
Sn 189.927†	-144.2	0.01762	mg/L	0.003073	0.01762	mg/L	0.003073	17.44%
Sr 421.552†	5166484.4	5.819	mg/L	0.0709	5.819	mg/L	0.0709	1.22%
Ti 334.903†	4078.5	0.1816	mg/L	0.00141	0.1816	mg/L	0.00141	0.77%
Tl 190.801†	34.2	0.01781	mg/L	0.002596	0.01781	mg/L	0.002596	14.57%
V 292.402†	1254.2	0.00886	mg/L	0.000079	0.00886	mg/L	0.000079	0.90%
Zn 206.200†	32.9	0.00332	mg/L	0.000205	0.00332	mg/L	0.000205	6.18%

Sequence No.: 32
Sample ID: XQ85 C TWC

Dilution: 1.000000X

Autosampler Location: 324
Date Collected: 12/16/2013 11:03:58 AM
Data Type: Original

Nebulizer Parameters: XQ85 C TWC

Analyte	Back Pressure	Flow
All	210.0 kPa	0.75 L/min

Mean Data: XQ85 C TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Units	Std.Dev.	Sample Conc.	Units	Std.Dev.	RSD
ScA 357.253	2327045.7	84.25	%	0.664				0.79%
ScR 361.383	247119.6	90.62	%	0.614				0.68%
Ag 328.068†	-486.9	0.00032	mg/L	0.000135	0.00032	mg/L	0.000135	42.24%
Al 308.215†	4797.5	4.156	mg/L	0.0383	4.156	mg/L	0.0383	0.92%
As 188.979†	91.9	0.04000	mg/L	0.003873	0.04000	mg/L	0.003873	9.68%
B 249.677†	14761.6	2.392	mg/L	0.0312	2.392	mg/L	0.0312	1.30%
Ba 233.527†	4872.0	1.103	mg/L	0.0116	1.103	mg/L	0.0116	1.05%
Be 313.042†	65.0	0.00012	mg/L	0.000029	0.00012	mg/L	0.000029	24.39%
Ca 317.933†	3215354.2	372.4	mg/L	1.27	372.4	mg/L	1.27	0.34%
Cd 228.802†	12.6	0.00008	mg/L	0.000223	0.00008	mg/L	0.000223	274.82%
Co 228.616†	112.8	0.00230	mg/L	0.000082	0.00230	mg/L	0.000082	3.58%
Cr 267.716†	469.8	0.02400	mg/L	0.000831	0.02400	mg/L	0.000831	3.46%
Cu 324.752†	3690.7	0.00866	mg/L	0.000344	0.00866	mg/L	0.000344	3.97%
Fe 273.955†	8314.0	7.750	mg/L	0.1228	7.750	mg/L	0.1228	1.58%
K 766.490†	471398.2	210.2	mg/L	0.97	210.2	mg/L	0.97	0.46%
Mg 279.077†	686030.9	782.2	mg/L	0.67	782.2	mg/L	0.67	0.09%
Mn 257.610†	228923.6	5.951	mg/L	0.0906	5.951	mg/L	0.0906	1.52%
Mo 202.031†	212.7	0.00705	mg/L	0.000526	0.00705	mg/L	0.000526	7.46%
Na 589.592†	Saturated3							
Na 330.237†	136953.7	5534	mg/L	86.63	5534	mg/L	86.63	1.57%
~~Ni 231.604†~~	~~49.8~~	~~0.01322~~	~~mg/L~~	~~0.002011~~	~~0.01322~~	~~mg/L~~	~~0.002011~~	~~15.21%~~
Pb 220.353†	-28.4	-0.00269	mg/L	0.000469	-0.00269	mg/L	0.000469	17.44%
Sb 206.836†	12.2	0.00283	mg/L	0.002855	0.00283	mg/L	0.002855	100.85%
Se 196.026†	45.3	0.01209	mg/L	0.001800	0.01209	mg/L	0.001800	14.88%
Si 288.158†	28318.6	19.65	mg/L	0.285	19.65	mg/L	0.285	1.45%
Sn 189.927†	-134.3	0.01312	mg/L	0.000599	0.01312	mg/L	0.000599	4.56%
Sr 421.552†	4835106.5	5.446	mg/L	0.0175	5.446	mg/L	0.0175	0.32%
Ti 334.903†	4415.2	0.2026	mg/L	0.00361	0.2026	mg/L	0.00361	1.78%
Tl 190.801†	28.3	0.01533	mg/L	0.002943	0.01533	mg/L	0.002943	19.20%
V 292.402†	1564.3	0.01161	mg/L	0.000120	0.01161	mg/L	0.000120	1.03%
Zn 206.200†	27.9	0.00445	mg/L	0.000947	0.00445	mg/L	0.000947	21.29%

Sequence No.: 34
Sample ID: XQ85 MBSPK TWC

Autosampler Location: 326
Date Collected: 12/16/2013 11:12:33 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ85 MBSPK TWC

Analyte	Back Pressure	Flow
All	211.0 kPa	0.75 L/min

Mean Data: XQ85 MBSPK TWC

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2892595.4	104.7	%	0.34				0.33%
ScR 361.383	286379.0	105.0	%	0.63				0.60%
Ag 328.068†	112592.6	0.5232	mg/L	0.00165	0.5232	mg/L	0.00165	0.31%
Al 308.215†	2369.9	2.046	mg/L	0.0246	2.046	mg/L	0.0246	1.20%
As 188.979†	3190.7	2.051	mg/L	0.0072	2.051	mg/L	0.0072	0.35%
B 249.677†	42.2	0.00578	mg/L	0.000354	0.00578	mg/L	0.000354	6.12%
Ba 233.527†	9047.5	2.047	mg/L	0.0188	2.047	mg/L	0.0188	0.92%
Be 313.042†	247394.7	0.4642	mg/L	0.00025	0.4642	mg/L	0.00025	0.05%
Ca 317.933†	89589.2	10.38	mg/L	0.032	10.38	mg/L	0.032	0.31%
Cd 228.802†	14007.1	0.5125	mg/L	0.00187	0.5125	mg/L	0.00187	0.36%
Co 228.616†	20289.1	0.5007	mg/L	0.00100	0.5007	mg/L	0.00100	0.20%
Cr 267.716†	3133.6	0.5278	mg/L	0.00525	0.5278	mg/L	0.00525	1.00%
Cu 324.752†	140331.8	0.5090	mg/L	0.00193	0.5090	mg/L	0.00193	0.38%
Fe 273.955†	2276.4	2.119	mg/L	0.0220	2.119	mg/L	0.0220	1.04%
K 766.490†	23558.5	10.51	mg/L	0.090	10.51	mg/L	0.090	0.86%
Mg 279.077†	9430.9	10.75	mg/L	0.122	10.75	mg/L	0.122	1.14%
Mn 257.610†	18897.7	0.4918	mg/L	0.00143	0.4918	mg/L	0.00143	0.29%
Mo 202.031†	19.4	0.00092	mg/L	0.000007	0.00092	mg/L	0.000007	0.76%
Na 589.592†	163210.4	11.76	mg/L	0.286	11.76	mg/L	0.286	2.43%
Na 330.237†	295.6	11.79	mg/L	0.301	11.79	mg/L	0.301	2.55%
Ni 231.604†	1938.2	0.5143	mg/L	0.00706	0.5143	mg/L	0.00706	1.37%
Pb 220.353†	16694.8	2.047	mg/L	0.0029	2.047	mg/L	0.0029	0.14%
Sb 206.836†	15.3	-0.00019	mg/L	0.001488	-0.00019	mg/L	0.001488	764.09%
Se 196.026†	2812.8	2.006	mg/L	0.0038	2.006	mg/L	0.0038	0.19%
Si 288.158†	159.2	0.1137	mg/L	0.02379	0.1137	mg/L	0.02379	20.92%
Sn 189.927†	-16.8	-0.00339	mg/L	0.000491	-0.00339	mg/L	0.000491	14.49%
Sr 421.552†	444961.3	0.5012	mg/L	0.00091	0.5012	mg/L	0.00091	0.18%
Ti 334.903†	28.6	0.00066	mg/L	0.000184	0.00066	mg/L	0.000184	27.77%
Tl 190.801†	3961.4	2.015	mg/L	0.0061	2.015	mg/L	0.0061	0.30%
V 292.402†	72755.6	0.5123	mg/L	0.00190	0.5123	mg/L	0.00190	0.37%
Zn 206.200†	1851.1	0.5147	mg/L	0.00526	0.5147	mg/L	0.00526	1.02%

Sequence No.: 36
Sample ID: XQ29 MB1SPK WMN

Autosampler Location: 328
Date Collected: 12/16/2013 11:20:35 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: XQ29 MB1SPK WMN

Analyte	Back Pressure	Flow
All	212.0 kPa	0.75 L/min

Mean Data: XQ29 MB1SPK WMN

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2921276.2	105.8	%	0.42				0.40%
ScR 361.383	289792.5	106.3	%	0.74				0.70%
Ag 328.068†	114852.1	0.5337	mg/L	0.00545	0.5337	mg/L	0.00545	1.02%
Al 308.215†	2489.9	2.149	mg/L	0.0083	2.149	mg/L	0.0083	0.38%
As 188.979†	3535.6	2.272	mg/L	0.0097	2.272	mg/L	0.0097	0.43%
B 249.677†	30.5	0.00382	mg/L	0.000631	0.00382	mg/L	0.000631	16.53%
Ba 233.527†	9477.7	2.144	mg/L	0.0111	2.144	mg/L	0.0111	0.52%
Be 313.042†	269648.5	0.5060	mg/L	0.00309	0.5060	mg/L	0.00309	0.61%
Ca 317.933†	92248.4	10.69	mg/L	0.051	10.69	mg/L	0.051	0.48%
Cd 228.802†	15297.2	0.5595	mg/L	0.00466	0.5595	mg/L	0.00466	0.83%
Co 228.616†	21552.2	0.5319	mg/L	0.00474	0.5319	mg/L	0.00474	0.89%
Cr 267.716†	3286.5	0.5536	mg/L	0.00229	0.5536	mg/L	0.00229	0.41%
Cu 324.752†	143898.5	0.5219	mg/L	0.00441	0.5219	mg/L	0.00441	0.85%
Fe 273.955†	2386.4	2.221	mg/L	0.0145	2.221	mg/L	0.0145	0.65%
K 766.490†	24301.6	10.84	mg/L	0.037	10.84	mg/L	0.037	0.34%
Mg 279.077†	9714.2	11.08	mg/L	0.082	11.08	mg/L	0.082	0.74%
Mn 257.610†	19658.5	0.5116	mg/L	0.00385	0.5116	mg/L	0.00385	0.75%
Mo 202.031†	6.6	0.00021	mg/L	0.000104	0.00021	mg/L	0.000104	50.53%
Na 589.592†	229802.6	16.56	mg/L	0.042	16.56	mg/L	0.042	0.25%
Na 330.237†	427.2	17.09	mg/L	0.139	17.09	mg/L	0.139	0.81%
Ni 231.604†	1989.5	0.5278	mg/L	0.00491	0.5278	mg/L	0.00491	0.93%
Pb 220.353†	17722.2	2.173	mg/L	0.0137	2.173	mg/L	0.0137	0.63%
Sb 206.836†	7.0	-0.00319	mg/L	0.001241	-0.00319	mg/L	0.001241	38.87%
Se 196.026†	3526.9	2.515	mg/L	0.0052	2.515	mg/L	0.0052	0.21%
Si 288.158†	53.3	0.04093	mg/L	0.002136	0.04093	mg/L	0.002136	5.22%
Sn 189.927†	-17.6	-0.00359	mg/L	0.000117	-0.00359	mg/L	0.000117	3.24%
Sr 421.552†	458116.7	0.5160	mg/L	0.00181	0.5160	mg/L	0.00181	0.35%
Ti 334.903†	28.9	0.00066	mg/L	0.000309	0.00066	mg/L	0.000309	47.04%
Tl 190.801†	4222.0	2.148	mg/L	0.0172	2.148	mg/L	0.0172	0.80%
V 292.402†	75551.0	0.5320	mg/L	0.00557	0.5320	mg/L	0.00557	1.05%
Zn 206.200†	2007.2	0.5580	mg/L	0.00483	0.5580	mg/L	0.00483	0.86%

Sequence No.: 38
Sample ID: CB 4

Autosampler Location: 1
Date Collected: 12/16/2013 11:28:40 AM
Data Type: Original

Dilution: 1.000000X

Nebulizer Parameters: CB

Analyte	Back Pressure	Flow
All	212.0 kPa	0.75 L/min

Mean Data: CB

Analyte	Mean Corrected Intensity	Calib. Conc.	Calib. Units	Std.Dev.	Sample Conc.	Sample Units	Std.Dev.	RSD
ScA 357.253	2867534.1	103.8	%	1.04				1.00%
ScR 361.383	283725.4	104.0	%	1.36				1.30%
Ag 328.068†	7.0	0.00003	mg/L	0.000284	0.00003	mg/L	0.000284	873.78%
Al 308.215†	-8.3	-0.00719	mg/L	0.004668	-0.00719	mg/L	0.004668	64.91%
As 188.979†	-2.2	-0.00141	mg/L	0.000980	-0.00141	mg/L	0.000980	69.61%
B 249.677†	23.6	0.00383	mg/L	0.000535	0.00383	mg/L	0.000535	13.99%
Ba 233.527†	-2.6	-0.00059	mg/L	0.000272	-0.00059	mg/L	0.000272	46.47%
Be 313.042†	-18.6	-0.00003	mg/L	0.000010	-0.00003	mg/L	0.000010	28.74%
Ca 317.933†	11.1	0.00129	mg/L	0.001393	0.00129	mg/L	0.001393	107.87%
Cd 228.802†	-4.9	-0.00017	mg/L	0.000102	-0.00017	mg/L	0.000102	58.53%
Co 228.616†	7.0	0.00017	mg/L	0.000077	0.00017	mg/L	0.000077	44.46%
Cr 267.716†	3.0	0.00051	mg/L	0.000014	0.00051	mg/L	0.000014	2.70%
Cu 324.752†	43.0	0.00016	mg/L	0.000137	0.00016	mg/L	0.000137	87.52%
Fe 273.955†	1.9	0.00179	mg/L	0.002764	0.00179	mg/L	0.002764	154.26%
K 766.490†	150.7	0.06719	mg/L	0.020926	0.06719	mg/L	0.020926	31.14%
Mg 279.077†	5.8	0.00661	mg/L	0.007386	0.00661	mg/L	0.007386	111.78%
Mn 257.610†	-6.5	-0.00017	mg/L	0.000046	-0.00017	mg/L	0.000046	27.14%
Mo 202.031†	-4.0	-0.00022	mg/L	0.000149	-0.00022	mg/L	0.000149	66.20%
Na 589.592†	6413.6	0.4623	mg/L	0.00317	0.4623	mg/L	0.00317	0.69%
Na 330.237†	7.6	0.3068	mg/L	0.20049	0.3068	mg/L	0.20049	65.34%
Ni 231.604†	2.7	0.00072	mg/L	0.001105	0.00072	mg/L	0.001105	153.13%
Pb 220.353†	6.8	0.00083	mg/L	0.000450	0.00083	mg/L	0.000450	53.95%
Sb 206.836†	2.6	0.00086	mg/L	0.000301	0.00086	mg/L	0.000301	35.15%
Se 196.026†	2.5	0.00178	mg/L	0.002593	0.00178	mg/L	0.002593	145.87%
Si 288.158†	17.4	0.01203	mg/L	0.004842	0.01203	mg/L	0.004842	40.24%
Sn 189.927†	2.1	0.00061	mg/L	0.000755	0.00061	mg/L	0.000755	124.76%
Sr 421.552†	54.8	0.00006	mg/L	0.000020	0.00006	mg/L	0.000020	32.32%
Ti 334.903†	-3.2	-0.00017	mg/L	0.000233	-0.00017	mg/L	0.000233	138.57%
Tl 190.801†	-2.0	-0.00101	mg/L	0.001079	-0.00101	mg/L	0.001079	106.35%
V 292.402†	-11.7	-0.00008	mg/L	0.000205	-0.00008	mg/L	0.000205	254.93%
Zn 206.200†	-1.3	-0.00036	mg/L	0.000782	-0.00036	mg/L	0.000782	216.99%

SAMPLE RESULTS-CONVENTIONALS
XQ29-Newfields Northwest

ANALYTICAL RESOURCES INCORPORATED

Matrix: Sediment
Data Release Authorized:
Reported: 12/13/13

Project: AT/YS
Event: NA
Date Sampled: 12/04/13
Date Received: 12/05/13

Client ID: WETSED 1
ARI ID: 13-26636 XQ29A

Analyte	Date	Method	Units	RL	Sample
Total Solids	12/06/13 120613#1	SM2540G	Percent	0.01	46.92
Acid Volatile Sulfide	12/11/13 121113#1	EPA 1991	mg/kg	104	1,570
Total Organic Carbon	12/11/13 121113#1	Plumb,1981	Percent	0.020	5.15

RL Analytical reporting limit
U Undetected at reported detection limit

XQ29:00079

SAMPLE RESULTS-CONVENTIONALS
XQ29-Newfields Northwest

ANALYTICAL RESOURCES INCORPORATED

Matrix: Sediment
Data Release Authorized:
Reported: 12/13/13

Project: AT/YS
Event: NA
Date Sampled: 12/04/13
Date Received: 12/05/13

Client ID: WETSED 3
ARI ID: 13-26638 XQ29C

Analyte	Date	Method	Units	RL	Sample
Total Solids	12/06/13 120613#1	SM2540G	Percent	0.01	38.67
Acid Volatile Sulfide	12/11/13 121113#1	EPA 1991	mg/kg	25.9	231
Total Organic Carbon	12/11/13 121113#1	Plumb,1981	Percent	0.020	4.37

RL Analytical reporting limit
U Undetected at reported detection limit

XQ29:00088

REPLICATE RESULTS-CONVENTIONALS
XQ29-Newfields Northwest

ANALYTICAL RESOURCES INCORPORATED

Matrix: Sediment
Data Release Authorized:
Reported: 12/13/13

Project: AT/YS
Event: NA
Date Sampled: 12/04/13
Date Received: 12/05/13

Analyte	Date	Units	Sample	Replicate(s)	RPD/RSD
ARI ID: XQ29A Client ID: WETSED 1					
Total Solids	12/06/13	Percent	46.92	47.05 45.32	2.1%
Acid Volatile Sulfide	12/11/13	mg/kg	1,570	1,780	12.5%
Total Organic Carbon	12/11/13	Percent	5.15	4.70 5.60	8.7%

XQ29 : 00092

METHOD BLANK RESULTS-CONVENTIONALS
XQ29-Newfields Northwest

ANALYTICAL RESOURCES INCORPORATED

Matrix: Sediment
Data Release Authorized:
Reported: 12/13/13

Project: AT/YS
Event: NA
Date Sampled: NA
Date Received: NA

Analyte	Date	Units	Blank	QC ID
Total Solids	12/06/13	Percent	< 0.01 U	ICB
Acid Volatile Sulfide	12/11/13	mg/kg	< 0.05 U	PREP
Total Organic Carbon	12/11/13	Percent	< 0.020 U	ICB

Geotechnical Analysis
Report and Summary QC Forms

ARI Job ID: XQ29

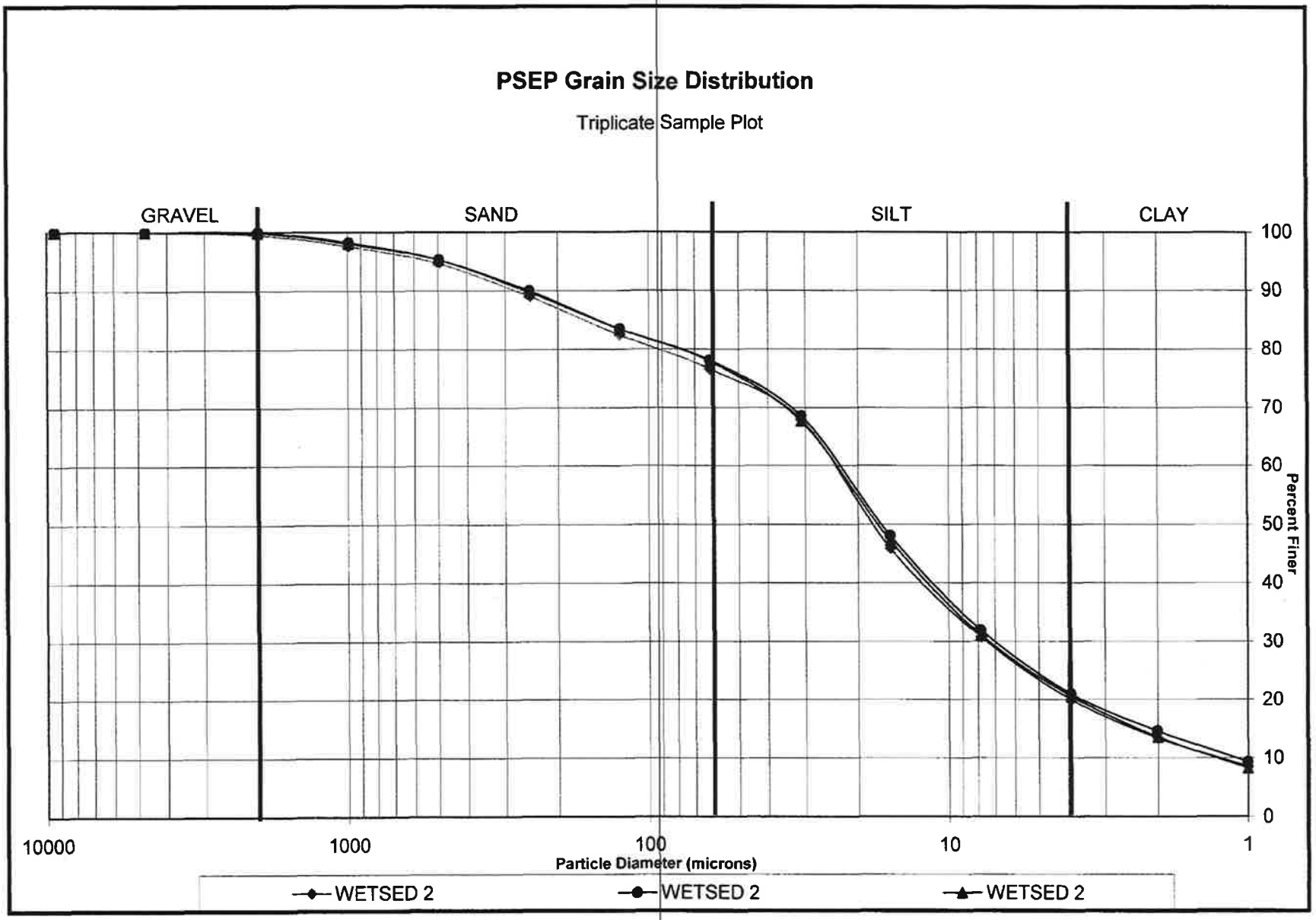
Newfields Northwest
AT/YS

Apparent Grain Size Distribution Summary
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay			Total Fines
Phi Size	< -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	> 10	> 4
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0	<230 (<62)
WETSED 2	0.5	1.9	3.0	5.6	6.6	5.8	8.7	22.0	15.2	10.8	6.7	4.8	8.5	76.6
	0.1	1.8	2.9	5.4	6.5	5.4	9.6	20.4	16.1	11.0	6.4	5.2	9.2	78.0
	0.1	1.8	2.8	5.6	6.3	5.6	10.2	20.5	16.1	10.5	7.0	5.3	8.2	77.8
WETSED 1	1.8	3.8	10.8	20.3	15.5	6.1	4.6	8.8	8.1	6.8	5.0	3.4	5.0	41.8
WETSED 3	0.1	2.9	1.3	1.9	3.0	2.6	7.1	23.3	18.4	14.8	9.3	6.3	9.1	88.2

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.


PSEP Grain Size Distribution
Triplicate Sample Plot
GRAVEL
SAND
SILT
CLAY
100
90
80
70
60
50
40
30
20
10
0
Percent Finer
10000
1000
100
10
1
Particle Diameter (microns)
WETSED 2
WETSED 2
WETSED 2

Total Solids

ARI Job ID: XQ29

TOTAL SOLIDS/VOLATILE SOLIDS (TS / TVS) BENCHSHEET

SOLIDS *(dry at 104 (12-24 hr) then combust at 550 (30 min))*

DATE: 12/6/13 (C)

ANALYST: KE / RR 10:28

Instrumentation ***Drying Ovens:*** 1 ***Analytical Balance:*** 1123230597

Muffle Furnace: N / A

Batch drying time		
record times as mm/dd/yy hh:mm		
12/6/2013 10:28	date/time in oven	KE
12/7/2013 11:00	date/time out	RR
elapsed hrs =	**24.5**	**>24hr**

TS (%) calculated as:
Final dry wt (g) = (Dry Wt - Tare Wt)
TS = (Final Dry Wt)/ (grams Sample-Tare)

TVS (mg/kg dry wt) calculated as:
Final ash wt (g) = (min ash wt - tare wt)
*TVS (mg/kg) = [(Dry wt-Ash wt)/ (dry weight)] *1,000,000*
if ash wt > dry wt, "Chk for Err"
*if dry wt-ash wt < 0.001 g, "< (1/dry wt)*1,000,000*

Cal Weight ID	CV-02	CV-02	CV-02	CV-02		CV-02	CV-02	
Date & Time	12/6/13 8:02 KE	12/6/13 7:40 KE	12/7/13 11:15 RR					
Cal Wt (g) 10.0000	10.0000	10.0000	10.0000					
record weights to 4 places	*Cal OK!*	*Cal OK!*	*Cal OK!*					

SAMPLE ID	DISH #	SAMPLE (grams)	TARE WT (grams)	DRY WT 104C (grams) 1			dry Wt (g)	TS (%)	ASH WT 550C (grams) 1	2		Ash Wt (g)	TVS (mg/kg)	(%)
Blank			1.1840	1.1838			0.00							
XQ29 A3		7.3470	1.1313	4.0479			2.92	**46.92%**						
XQ29 A3 dup		7.4381	1.1111	4.0880			2.98	**47.05%**						
							RPD =	0.27%				RPD =	NA	
XQ29 A3 trp		7.7302	1.1286	4.1204			2.99	**45.32%**						
							RSD =	2.08%				RSD =	NA	
XQ29 B2		8.0765	1.1516	4.4235			3.27	**47.25%**						
XQ29 C2		6.6620	1.1178	3.2617			2.14	**38.67%**						
XQ28 M6		8.1643	1.1593	6.4566			5.30	**75.62%**						
XQ28 N6		8.8053	1.1372	6.1660			5.03	**65.58%**						
XQ28 O6		6.8210	1.1064	3.9186			2.81	**49.21%**						
XQ28 P6		9.4070	1.1242	7.8712			6.75	**81.46%**						
XQ28 Q6		6.3501	1.1208	5.2709			4.15	**79.36%**						
XQ28 R6		8.1509	1.1071	6.7539			5.65	**80.17%**						

XQ29 : 00001

W
12-9-13

TOTAL SOLIDS/VOLATILE SOLIDS (TS / TVS) BENCHSHEET

SOLIDS *(dry at 104 (12-24 hr) then combust at 550 (30 min))*

DATE: 12/6/13 (C)
ANALYST: KE / RR 10:28

Instrumentation
Drying Ovens: 1
Muffle Furnace: N / A
Analytical Balance: 1123230597

Batch drying time
record times as mm/dd/yy hh:mm
12/6/2013 10:28 date/time in oven KE
12/7/2013 11:00 date/time out RR
elapsed hrs = 24.5 >24hr

TS (%) calculated as:
Final dry wt (g) = (Dry Wt - Tare Wt)
TS = (Final Dry Wt)/ (grams Sample-Tare)

TVS (mg/kg dry wt) calculated as:
Final ash wt (g) = (min ash wt - tare wt)
*TVS (mg/kg) = [(Dry wt-Ash wt)/ (dry weight)] *1,000,000*
if ash wt > dry wt, "Chk for Err"
*if dry wt-ash wt < 0.001 g, "< (1/dry wt)*1,000,000*

	Cal Weight ID	CV-02	CV-02	CV-02	CV-02				CV-02	CV-02				
	Date & Time	12/6/13 8:02 KE	12/6/13 7:40 KE	12/7/13 11:15 RR										
Cal Wt (g)	10.0000	10.0000	10.0000	10.0000										
	record weights to 4 places	*Cal OK!*	*Cal OK!*	*Cal OK!*										

SAMPLE ID	DISH #	SAMPLE (grams)	TARE WT (grams)	DRY WT 104C (grams) 1			dry Wt (g)	TS (%)	ASH WT 550C (grams) 1	2		Ash Wt (g)	TVS (mg/kg)	(%)
Blank			1.1840	1.1838			0.00							
XQ29 A3		7.3470	1.1313	4.0479			2.92	46.92%						
XQ29 A3 dup		7.4381	1.1111	4.0880			2.98	47.05%						
							RPD =	0.27%				RPD =	NA	
XQ29 A3 trp		7.7302	1.1286	4.1204			2.99	45.32%						
							RSD =	2.08%				RSD =	NA	
XQ29 B2		8.0765	1.1516	4.4235			3.27	47.25%						
XQ29 C2		6.6620	1.1178	3.2617			2.14	38.67%						
XQ28 M6		8.1643	1.1593	6.4566			5.30	75.62%						
XQ28 N6		8.8053	1.1372	6.1660			5.03	65.68%						
XQ28 O6		6.8210	1.1064	3.9186			2.81	49.21%						
XQ28 P6		9.4070	1.1242	7.8712			6.75	81.46%						
XQ28 Q6		6.3501	1.1208	5.2709			4.15	79.36%						
XQ28 R6		8.1509	1.1071	6.7539			5.65	80.17%						

X 1123230597

W
12-11-13

TOC Solids Prep Log

DATE: 12/6/2013

ANALYST: KE 10:28 (C)

acid purging to remove IC and drying at 70°C for TOC analysis

General notes regarding prep method and samples (identify the acid used)

HCL 10% ID: _____

Balance ID: Mettler Toledo (XS205 DU) SN 123230597

HCL ID: _____

make no entry to shaded cells, they are calculated

Sample ID		IC Test	Gravimetric Data (grams)			%	*Sample description & notes*
ARI #	Client	+ / -	Tare Wt.	Wet wt.	70°C dry wt	Solids	*(homogeneity and exclusions)*
Blank			12.9201		12.9203	0.2 mg	
~~XQ29 A2~~		~~-~~	~~12.9686~~	~~21.0084~~	~~16.8089~~	~~47.77%~~	
XQ29 A2 dup		-	13.2330	21.1975	17.0142	47.48%	RPD = 0.61%
XQ29 A2 trip		-	12.9280	20.7182	16.7306	48.81%	RSD = 1.46%
XQ29 B2		-	13.0108	20.8481	16.9390	50.12%	
XQ29 C2		-	12.9462	21.1884	16.3297	41.05%	
XQ28 M6		-	13.0137	21.7936	19.8318	77.66%	
XQ28 N6		-	12.9509	19.2232	17.1341	66.69%	
XQ28 O6		-	13.3254	19.5459	16.7582	55.19%	
XQ28 P6			12.9647	21.0039	20.0241	87.81%	
XQ28 Q6		-	13.3376	20.7565	19.8558	87.86%	
XQ28 R6			13.3610	21.1279	20.2196	88.31%	

W
12-12-13

TOC, Solids Data Analysis

DATE: 12/11/2013
ANALYST: KE 6:08

Instrument: Apollo 1 *Mode:* NPOC *Inlet:* Boat
Spike Std = 2,500 *ppm C*
Balance ID:

Calibration Data

Cal Curve ID: **11/20/2013** *Conc:* 5,000 *ppm*
Calibration Curve Standard: **00139-03** *Curve Date:* **11/20/13**
CalFact: ***1.550E+05*** *intercept:* **502459** *r2 :* **0.99452**
Curve Range (ppm) 200 *to* 2,500
Curve Range (µgC): **8** *to* **100** *40 µL injections of designated standard*

Verification Standard Source: ***ERA# 0408-13-02*** *Conc:* **5,000** *ppm*
dilution : 10 *mL to* 50 **1,000** *ppm*

Standard Reference Material Source: ***NIST 8704*** *Conc:* **33,510** *ppm*
Source: ***NIST 1941B*** *Conc:* **29,900** *ppm*

Silica Blanks

Replicate determinations						Mean	RSD	condition

Sample Data

*"C corr" (with dilution) = ("C obs" - (Mean silica Blank * %Silica)) * Dilution Factor*

Sample ID	Dilution Data				Spike	Combustion Data			
	Sample wt. (mg)	Final wt. (mg)	Silica (%)	Dilution Factor	(µL Std)	Burn wt. (mg)	C obs (ppm C)	C corr (ppm C)	comments
ICV				1.00		40.0	903	903	*90.30%*
Blank				1.00		40.0	-78.03	-78	*Blank OK*
NIST 1941B				1.00		1.2	28591	28,591	*95.62%*
~~XQ29 A2~~			-	~~1.00~~		~~1.0~~	~~58803~~	~~58,803~~	*~~Range OK!~~*
XQ29 A2				1.00		0.8	50555	50,555	*Range OK!*
XQ29 A2 dup				1.00		0.7	46157	46,157	*RPD=9.1%*
XQ29 A2 trp				1.00		0.9	55011	55,011	*RSD=8.8%*
XQ29 A2 ms				1.00	20	0.8	65427	65,427	*Range OK!*
Spike =	*0.05*	*mg C to*	*0.8*	*mg samp=*	*62,500*	*ppm*		*24%*	
~~XQ29 A2 ms~~			-	~~1.00~~	~~20~~	~~1.1~~	~~54898~~	~~54,898~~	*~~Range OK!~~*
~~Spike =~~	*~~0.05~~*	*~~mg C to~~*	*~~1.1~~*	*~~mg samp=~~*	*~~45,455~~*	*~~ppm~~*		*~~10%~~*	
XQ29 B2				1.00		0.9	35700	35,700	*Range OK!*
XQ29 C2				1.00		0.9	41161	41,161	*Range OK!*
XP31 M7				1.00		3.1	10809	10,809	*Range OK!*
CCV				1.00		40.0	945	945	*94.50%*
Blank				1.00		40.0	-62.32	-62	*Blank OK*

Samples XP31 E7 Had 10% O-Phosphoric Acid added to sample in the boat prior to combution. Amount (how many drops) shown after condition of the run.

XP31 E7				1.00		1.6	16973	16,973	*Range OK!*

7 Drops Acid

Analytical Resources, Incorporated
Analytical Chemists and Consultants

(1) 12-11-13 (W)

TOC Solids Sample Run Log
Apollo 9000

Page 1 of 2

Set-Up Parameters MODE: NPOC			INLET: Boat Sampler		
Standards:	Source	Conc (ppm)	Analyst:	(W)	
Calibration:	ARI - 00137-03	5000	Date:	12-11-13	
Verification:	ERA - 0408-13-02	5000 to 1000 for CVS	Time:	6:08	
SRM:	NBS (1941b) or 8704	Method: PSEP 1986-MOD	Balance ID	B146454145	
Sample Sequence:					

Sample ID	Dilution Data (mg)		Burn Wt	Matrix Spike Data		Comments
	Sample	+ Silica Gel	mg	mg/L	µL added	
ICV			40			
ICB			40			
NBS 1941 B			1.2			
XQ29 A2			1.0			(Prep Not A') Rerun
A2			0.8			
dA2			0.7			
~~dA2~~			~~0.9~~ 0.9	~~2500~~	~~20~~ (1)	
msA2			0.8	2500	20	
msA2			1.1	2500	20	
B2			0.9			
C2			0.9			
XP31 M7			3.1			
CCV			40			
CCB			40			
XP31 E7		Drops 10% Acid	1.6			Acidify in Boat
XQ88 A2			1.5			
dA2			1.4			
dA2			1.5			
msA2			1.2	2500	10	
B2			1.4			
C2			6.2			
XQ41 A1			0.7			
XP58 A7			2.6			
B7			~~2.2~~ 2.1			
CCV			40			
CCB			40			
XP58 D7			2.9			
E7			2.7			
F7			2.1			
G7			2.7			
H7			4.2			
I7			2.9			

12-11-13 (4)

Detailed Analysis Report   Print Date/Time: 2013/12/11 13:21:44

Sample ID: ICV/CCV BOAT
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110352
Timestamp: 2013/12/11 03:57
Sample Type: Cal. Verification

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	903.0636	36.1225	6102406	123.225	124.225	182

Sample ID: ICB/CCB BOAT
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110408
Timestamp: 2013/12/11 04:11
Sample Type: Cal. Verification

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	-78.0344	-3.1214	18564	123.159	123.242	120

Last Message: Low Sample Detected

Sample ID: NBS 1941B
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110419
Timestamp: 2013/12/11 04:26
Sample Type: Cal. Verification

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	28591.1445	34.3094	5821317	123.240	124.235	232

Sample ID: XQ29 A2
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110445
Timestamp: 2013/12/11 04:49
Sample Type: Sample

Top Not over, ml 12-11-13 (4)

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	58802.9141	58.8029	9116002	123.230	124.223	182

Sample ID: XQ29 A2
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110502
Timestamp: 2013/12/11 05:05
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	50555.0195	40.4440	6269889	123.313	124.312	159

Sample ID: XQ29 A2 DP
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110512
Timestamp: 2013/12/11 05:16
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	46157.1016	32.3100	5008897	123.512	124.510	130

Sample ID: XQ29 A2 +P
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 12110523
Timestamp: 2013/12/11 05:26
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time

				Baseline	Baseline	Time
1	-62.3212	-2.4928	116002	132.410	133.407	71

Sample ID: XP31 E7 (Acid in Boat 7 Drops) Mode: TOC
Method: Boat Sampler Filename: 12110746
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 07:52
Operator ID: KE Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	16973.4766	27.1576	4210138	133.085	135.020	300

Last Message: Max Integration Time Reached

Sample ID: XQ88 A2 Mode: TOC
Method: Boat Sampler Filename: 12110756
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 08:06
Operator ID: KE Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	25677.5254	38.5163	5971040	133.836	134.827	155

Sample ID: XQ88 A2 Mode: TOC
Method: Boat Sampler Filename: 12110809
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 08:12
Operator ID: KE Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	23503.4121	32.9048	5101108	134.317	135.316	142

Sample ID: XQ88 A2 TRIP Mode: TOC
Method: Boat Sampler Filename: 12110821
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 08:25
Operator ID: KE Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	25216.7773	37.8252	5863898	134.677	135.674	150

Sample ID: XQ88 A2 MS Mode: TOC
Method: Boat Sampler Filename: 12110829
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 08:33
Operator ID: KE Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	41423.5312	49.7082	7706087	135.097	136.096	161

Sample ID: XQ88 B2 Mode: TOC
Method: Boat Sampler Filename: 12110839
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 08:43
Operator ID: KE Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	20893.6172	29.2511	4534686	135.583	136.582	154

Sample ID: XQ88 C2 Mode: TOC
Method: Boat Sampler Filename: 12110856
Cal. Curve: 112013 BOAT CAL Timestamp: 2013/12/11 09:02
Operator ID: KE Sample Type: Sample

Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Timestamp: 2013/12/11 11:34
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	17207.2480	46.4596	7202458	138.104	139.103	144

Sample ID: XP58 F7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Mode: TOC
Filename: 12111143
Timestamp: 2013/12/11 11:47
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	8610.7373	18.0825	2803272	137.087	138.077	121

Sample ID: XP58 G7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Mode: TOC
Filename: 12111149
Timestamp: 2013/12/11 11:54
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	1902.8452	5.1377	796476	136.496	137.491	85

Sample ID: XP58 H7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Mode: TOC
Filename: 12111159
Timestamp: 2013/12/11 12:02
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	15115.7695	63.4862	9842039	136.183	137.181	169

Sample ID: XP58 I7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Mode: TOC
Filename: 12111213
Timestamp: 2013/12/11 12:17
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	9393.8955	27.2423	4223274	135.758	136.757	152

Sample ID: XP58 J7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Mode: TOC
Filename: 12111226
Timestamp: 2013/12/11 12:29
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	2025.5780	8.3049	1287474	136.072	137.065	104

Sample ID: XP58 K7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE
Mode: TOC
Filename: 12111233
Timestamp: 2013/12/11 12:37
Sample Type: Sample

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1	10364.4580	59.0774	9158556	136.631	137.625	185

Sample ID: XP58 L7
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Mode: TOC
Filename: 12111241
Timestamp: 2013/12/11 12:44

XQ29 : 00109

11-20 (W)

Calibration Report Print Date/Time: 2013/11/20 7:12:11

Cal. Curve ID: 112013 BOAT CAL
Created: 2013/11/20 07:12
Calibration Factor (m): 1.550e+05
Y Intercept (b): 502459
r-squared: 0.99452

Standard ID	Y Raw Data	X Expected ug C	Measured ug C	Message	Date & Time
DI Water	57228	0.000	-2.872	Low Sample De	2013/11/20 03:45
200 ppm	1537968	8.000	6.680		2013/11/20 04:09
500 ppm	3906464	20.000	21.958	Max Integrati	2013/11/20 04:56
2500 ppm	15700260	100.000	98.034		2013/11/20 06:10
1000 ppm	7354804	40.000	44.201		2013/11/20 07:08

XQ29 : 00110

Detailed Analysis Report Print Date/Time: 2013/11/20 7:13:02

11-20-13 (A)

Sample ID: DI Water
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 11200258
Timestamp: 2013/11/20 03:21
Sample Type: TOC Standard

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1			67362	148.946	149.940	46
2			73881	148.851	149.848	59
3			40482	148.907	149.904	42

<<<Statistics>>> Mean: 60575 Std Dev: 17704 RSD: 29.23

11-20-13 (B)

Sample ID: DI Water
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 11200328
Timestamp: 2013/11/20 03:45
Sample Type: TOC Standard

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1			69016	148.696	149.692	46
2			50393	148.725	149.725	45
3			52274	148.992	148.971	120

Last Message: Low Sample Detected
<<<Statistics>>> Mean: 57228 Std Dev: 10252 RSD: 17.91

Sample ID: 200 ppm
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 11200347
Timestamp: 2013/11/20 04:09
Sample Type: TOC Standard

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1			1529311	149.028	150.026	92
2			1599522	149.325	150.324	112
3			1485071	149.798	150.794	92

<<<Statistics>>> Mean: 1537968 Std Dev: 57715 RSD: 3.75

Sample ID: 500 ppm
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 11200412
Timestamp: 2013/11/20 04:56
Sample Type: TOC Standard

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1			3563746	150.330	151.329	170
2			3613394	152.138	153.135	213
3			4542252	154.193	158.302	300

Last Message: Max Integration Time Reached
<<<Statistics>>> Mean: 3906464 Std Dev: 551168 RSD: 14.11

Sample ID: 1000 ppm
Method: Boat Sampler
Cal. Curve: 112013 BOAT CAL
Operator ID: KE

Mode: TOC
Filename: 11200459
Timestamp: 2013/11/20 05:36
Sample Type: TOC Standard

Rep #	ppm C	ug C	Raw Data	Beginning Baseline	Ending Baseline	Integration Time
1			8123309	160.143	165.653	301
2			7574211	168.982	171.911	301
3			8539931	176.210	182.469	300

Last Message: Max Integration Time Reached
<<<Statistics>>> Mean: 8079150 Std Dev: 484372 RSD: 6.00

X029 : 00112

12-13-13

SULFIDE BENCHSHEET (Spectrophotometric, EPA 376.2) | Date Time | Analyst

Soils, sediments and solid phase samples | *Distillation* 12/11/13 14:35 | APD

Finish 12/12/13 14:16 | APD

If distilled, specify Procedure: **AVS** *ZnOAc:* **10398C** *Balance:* **19350128**

1. Standardization of sodium thiosulfate titrant *Buret used for titrations:* **S2**

Thiosulfate ID: **10187C**

Bi-iodate ID: **10096C**

Titration of bi-iodate with thiosulfate

Stock bi-iodate = **0.8116** *grams to* 1000 *mL*

Normality = **0.025**

mL bi-iodate =	3.00	3.00	3.00	
mL thiosulfate =	3.07	3.07	3.07	*nthio*
*Normality thiosulfate = (mL bi-iodate*normbio) / mL thiosulfate =*	0.024	0.024	0.024	**0.024**

2. Normality of Iodine

Iodine ID: **10151C**

Titration of Iodine with thiosulfate

mL Iodine =	3.00	3.00	3.00	
mL thiosulfate =	3.10	3.10	3.11	*ni*
*Normality Iodine = (mL thiosulfate*nthio) / mL Iodine=*	0.025	0.025	0.025	**0.025**

3. Standardization of Sodium Sulfide Stock

Stock ID = **00144-10**

Approx conc in 100ml

g Na2S = 0.7351 *mg /mL =* 0.981

Titration of standard with thiosulfate

mL Standard =	1.00	1.00	1.00	
mL Iodine =	3.00	3.00	3.00	
mL thiosulfate =	1.56	1.53	1.56	*stkconc (mg/mL)*
*Sulfide (mg/mL) = {[(mL Iodine*ni)-(mL thio *nthio)]*16) / mL standard =*	0.603	0.614	0.603	0.607

Intermediate Standard *mL required for for 0.025 mg/mL* 10.3

Add 10.3 *mL stk to* 250 *mL 0.2N ZnOAc =* **0.025** ***mg/mL***

4. Calibration Standard Curve ***spectrophotometer used:*** SPEC #1

Inter Std Volume (mL)	Final Volume (mL)	Calc Conc (mg S/L)	Absorbance @650 nm 1	Absorbance @650 nm 2	AVG ABS	mg/L
0.00	50	0.000	0.000		0.000	*0.004*
0.10	50	0.050	0.025		0.025	*0.046*
0.25	50	0.125	0.071		0.071	*0.123*
0.50	50	0.250	0.149		0.149	*0.254*
1.00	50	0.500	0.294		0.294	*0.498*
2.00	50	1.000	0.593		0.593	*1.000*

RegressionData

intercept = -0.002

slope = 0.595

r = 1.0000

Comment: Calibration OK!

maxabs = 0.593

Calib Verif Std =	1.0	*ml INT to*	50	*ml ZnOAc=*	0.500	*mg/l*	
Distillation Std =	1.0	*ml stk to*	100	=	6.07	*mg/l*	

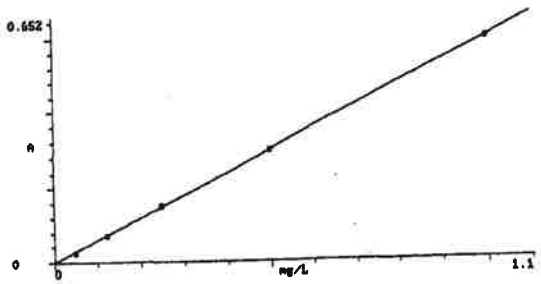
SAMPLE DATA

enter dilution as mL final/mL sample

	Distillation Data			Spectrophotometric Data				SAMPLE DATA	
SAMPLE ID	SAMPLE SIZE	% Solids	TRAP VOLUME (ml)	Dilution Factor	Abs @ 650 nm 0	Abs @ 650 nm Bkg	regressed Conc (mg S/L)	CORR CONC (ppm)	
ICB		na	na	1.00	0.000		0.004	< 0.05	*OK!*
ICV		na	na	1.00	0.286		0.484	0.484	*96.89%*
Distilled samples									
Dist Blk	100	100%	100	1.00	-0.012		-0.016	< 0.05	*OK!*
~~Dist Chk~~	~~100~~	~~100%~~	~~100~~	~~20.00~~	~~0.184~~		~~0.308~~	~~6.157~~	*~~101.50%~~*
Soil Samples	**(grams)**	**% Solids**	**(mL)**		**Sample**	**Bkg**	**(mg/L)**	**mg/kg**	
XQ29 A1	5.134	46.92%	100	50.00	0.449		0.758	1573.587	
XQ29 A1 dup	5.088	46.92%	100	50.00	0.503		0.849	1777.842	*RPD=12.19%*
XQ29 A1 ms	5.054	46.92%	100	50.00	0.557		0.940	1981.110	*159.32%*
		Spike at	*1.00*	*ml stock to*	*2.371*	*g dry wt =*		*255.783*	*mg/kg*
XQ29 B1	5.056	47.25%	100	20.00	0.207		0.352	294.304	
XQ29 C1	5.001	38.67%	100	10.00	0.264		0.447	231.304	
XQ88 A1	5.009	32.63%	100	20.00	0.322		0.545	666.628	
XQ88 B1	5.176	48.87%	100	20.00	0.311		0.526	416.096	
XQ88 C1	5.214	74.86%	100	10.00	0.196		0.333	85.327	
CCB		na	na	1.00	-0.002		0.000	< 0.05	*OK!*
CCV		na	na	1.00	0.289		0.489	0.489	*97.90%*
Dist Chk	100	100%	100	10.00	0.344		0.582	5.817	*95.90%*
CCB		na	na	1.00	-0.004		-0.003	< 0.05	*OK!*
CCV		na	na	1.00	0.294		0.498	0.498	*99.58%*

TEST SETUP
GENESYS 10 v2.021 2G2G048006

Standard Curve	14:16 12Dec13
Test Name	SULFIDE[Saved]
Date Standards Measured	12Dec13
Wavelength	650nm
Ref. Wavelength Correction	Off
Curve Fit	Linear
Number of Standards	6
Units	mg/L
ID# (0=OFF)	Off
Low/High Limits	0.050/1.000
Statistics	Off
Auto Print	On



Curve Fit	Linear
Slope	0.595
Intercept	-0.0022
Std Dev	0.002
Corr Coeff	1.000

Conc. mg/L	Abs 650nm
0.000	0.000
0.050	0.025
0.125	0.071
0.250	0.149
0.500	0.294
1.000	0.593

APD
12/12/13

TEST SETUP
GENESYS 10 v2.021 2G2G048006

Advanced A-%T-C	14:17 12Dec13
Test Name	SULFIDE[Saved]
Measurement Mode	Absorbance
Wavelength	650nm
Ref. Wavelength Correction	Off
Delay Time (min:sec)	0:00
ID# (0=OFF)	1
Low/High Limits	0.000/0.800
Statistics	Off
Auto Print	On

ID#	Abs 650nm
1	0.000
2	0.286
3	-0.012
4	0.181
5	0.449
6	0.503
7	0.557
8	0.207
9	0.264
10	0.322
11	0.311
12	0.196
13	-0.002
14	0.289
~~15~~	~~0.665~~ missprep.
16	0.344
17	-0.004
18	0.294

XQ29:00116

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Corrective Actions
Inorganic Analyses

Criteria Flagged:		ARI Job No.:	XQ29
Unacceptable Blank:	☐	Date of Event:	12/12/13
Unacceptable Duplicate:	☐	Client ID:	Newfields
Unacceptable Spike:	☒	Method/Element:	S-
Unacceptable Reference:	☐	Prep Code:	AVS-SEM

Details of Problem/Recommended Corrective Action:
Matrix Spike recovery unacceptable due to spike level too low relative to sample

Samples Affected: XQ29 A1.

Corrective Action Taken: None

Analyst Initials:	APD	**Supervisor:**	W
Date:	12/13/13	**Date:**	12-17-13