

IN SITU METALS IMMOBILIZATION -  
PILOT STUDY FIELD  
IMPLEMENTATION WORK PLAN

West of 4th Site - Site Unit 1

Prepared for: West of 4th Group

Project No. 050067 • June 15, 2018 Ecology Review Draft



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## Acronyms

ABP	Art Brass Plating
AO	Agreed Order
APS	Applied Professional Services, Inc
ARI	Analytical Resources, Inc.
AS	air sparge
Aspect	Aspect Consulting, LLC
BDC	Blaser Die Casting
bgs	below ground surface
CAP	Cleanup Action Plan
CI	Capital Industries
COC	chain of custody
CVOCs	chlorinated volatile organic compounds
CSM	conceptual site model
D&M	Dames and Moore
DR	dose response
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FIWP	field implementation work plan
FS	feasibility study
gpm	gallons per minute
HASP	Health and Safety Plan
Holt	Holt Services, Inc.
HAS	hollow-stem auger
IDW	investigative-derived waste
LDPE	low-density polyethylene
M	molarity
mg/L	milligrams per liter

## ASPECT CONSULTING

µg/L	micrograms per liter
µL	microliter
PCULs	proposed cleanup levels
PVC	polyvinyl chloride
PLPs	potentially liable parties
QAPP	Quality Assurance Project Plan
ROI	radius of influence
SAP	Sampling Analysis Plan
s.u.	standard units
SU1	Site Unit 1
SU2	Site Unit 2
SVE	soil vapor extraction
TDS	total dissolved solids
UIC	underground injection control
W4	West of 4th Site
WAC	Washington Administrative Code

# 1 Introduction

## 1.1 Purpose

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The “*In Situ* Metals Immobilization – Pilot Study Field Implementation Work Plan” (FIWP) for the West of 4<sup>th</sup> (W4) Site, Site Unit 1 has been prepared by Aspect Consulting, LLC (Aspect) on behalf of potentially liable parties (PLPs) [Art Brass Plating (ABP), Blaser Die Casting (BDC), Capital Industries (CI), and Burlington Environmental <sup>1</sup>], identified by the Washington State Department of Ecology (Ecology) in Agreed Order (AO) No. DE10402 for the W4 Site (the Site). The AO requires the four PLPs (the W4 Group) to complete a feasibility study (FS) and prepare a draft cleanup action plan (CAP) for the Site.

The W4 Site has been divided into two site units, Site Unit 1 (SU1; ABP and Stericycle) and Site Unit 2 (SU2; BDC, CI and Stericycle), as described in the AO. Figure 1 shows the ABP Facility, locations of the four PLPs, and the SU1 and SU2 boundaries.

The SU1 Final FS (Aspect, 2016) developed and evaluated remedial alternatives to address contaminated media at SU1 in accordance with Washington Administrative Code (WAC) 173-340-350(8). Ecology did not agree with the preferred remedy identified for chlorinated volatile organic compounds (CVOCs) in the SU1 FS. Upon further discussion with Ecology, pilot testing of technologies was determined to be an appropriate step to reduce the uncertainties associated with treatment of CVOCs in downgradient groundwater. The use of pH neutralization to immobilize dissolved metals in SU1 groundwater was included in seven of the nine remedial alternatives evaluated in the FS (Aspect, 2016). A pH neutralization pilot test is planned to be conducted concurrent with the CVOC pilot test to evaluate the effectiveness of potential amendments and better define the remedy in the CAP. As discussed in the Final FS, pilot testing of pH neutralization is necessary for full-scale design and will reduce uncertainty in performance and cost of the technology.

A “Final *In Situ* Metals Immobilization Pilot Testing Work Plan” (Work Plan) was submitted on December 21, 2017, describing pilot study activities proposed to evaluate the *in situ* pH neutralization of plating metals in Water Table Interval groundwater (Aspect, 2017). The Work Plan presented the pilot study approach, including monitoring well installation and baseline groundwater monitoring before the final pilot study design. The pilot study location is shown on Figures 2 and 3, and the installed pilot study monitoring well network is presented on Figure 4.

This FIWP presents the results of Phases I and II of the pilot study as presented in the Work Plan. These results include monitoring well installation, baseline groundwater

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<sup>1</sup> Burlington Environmental, LLC is a wholly owned subsidiary of PSC Environmental Services, LLC, which is a wholly owned subsidiary of Stericycle Environmental Solutions, Inc., hereafter referred to in this document as “Stericycle” for simplicity.

monitoring, soil sampling, and the bench-scale pilot testing. These results serve as the basis of the field-scale pilot testing design presented in this FIWP.

## 1.2 Report Organization

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This report is organized as follows:

- **Section 1** describes the purpose and organization of the FIWP.
- **Section 2** describes the completed pilot study activities, including utility clearance, monitoring well installation, baseline soil and groundwater monitoring, titration batch testing, and treatment batch testing.
- **Section 3** presents updates to the conceptual site model (CSM) presented in the Work Plan (Aspect, 2017). Updated CSM elements include hydrogeology, groundwater biogeochemistry, and nature and extent of metals contamination in the pilot study area.
- **Section 4** describes the results of the Phase I and Phase II pilot testing activities and describes how these activities translate to design parameters, including reagent selection, target groundwater pH, and reagent dosing for field-scale pilot testing. This section also presents the objectives for the field-scale pilot testing (Phase III) based on the results of the first two phases.
- **Section 5** describes the final pilot study design and is organized by reagent injections and monitoring. The reagent injections subsection includes injection design, reagent formulation and handling, injection delivery system, injection methods, applied tracer design, and injection permitting. The monitoring subsection is organized according to operational and performance monitoring.
- **Section 6** presents the project roles and responsibilities, plans, and schedule and reporting required for the pilot study.
- **Section 7** provides references used in the preparation of this report.

The text is followed by tables and figures that support the text and illustrate the proposed pilot testing activities.

Appendices to this report provide supporting information referenced within the text. These include existing boring and well construction logs, traffic control plan and street use permit, laboratory analytical and data validation reports from the bench-scale laboratory tests, a Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP), Anchor QEA Bench-Scale Pilot Test Laboratory Report, vendor technical specifications, a Health and Safety Plan (HASP), and example operational logs for field monitoring.

## 2 Completed Pilot Study Activities

### 2.1 Phase I – Field Data Collection

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#### 2.1.1 Monitoring Well Installation

A comprehensive utility survey was performed prior to the monitoring well installation, including a public utility locate through the Washington Utility Notification Center, a private utility locate by Applied Professional Services, Inc (APS), and a review of available public and private as-built drawings. Monitoring well locations were adjusted based on the location of the subsurface air sparge and soil vapor extraction system (AS/SVE) pipes and a sewer line that was extended to a new building at 305 S Lucile Street.

Two injection wells and three monitoring wells were installed on the west side of the ABP Facility for pilot study performance monitoring. The wells were installed January 26 through January 30, 2018. The installed well locations are shown on Figure 4, and boring logs with soil classification and well construction details are provided in Appendix A.

- **Injection Wells.** Two new injection wells (IW-1 and IW-2) were installed on the west side of the ABP Facility as close to the ABP building as possible while avoiding utilities and existing SVE pipes (9 feet west of the building), allowing a sufficient downgradient monitoring footprint. The injection wells will be used for injections of the selected alkaline reagent for field-scale pilot testing.
- **Performance monitoring wells.** Two new monitoring wells (PSW-06 and PSW-07) were installed within the 12-foot design radius of influence (ROI) and will serve as a dose-response (DR) monitoring wells to supplement existing monitoring well, MW-3. PSW-08 was installed outside of the ROI (16 feet west of IW-2) and will serve as a downgradient monitoring well.

All injection and monitoring wells were installed by Holt Services, Inc (Holt) using hollow-stem auger (HSA) drilling methods described in the Work Plan. The new monitoring wells were constructed of 2-inch Schedule 40 polyvinyl chloride (PVC) and 10-slot PVC 10-foot screened sections. All monitoring wells were completed at 20 feet below ground surface. The two injection wells, IW-1 and IW-2 were constructed using a 4-inch PVC casing and 4-inch stainless-steel wire-wrapped, 10-foot screened section.

Upon completion, Holt developed all new injection and monitoring wells via surge and purge, and removed a minimum of 25 gallons from each location during development. Well elevations were surveyed by PLS, Inc., and well coordinates were collected with a submeter GPS unit by an Aspect field technician. Each new monitoring well has a metal plate affixed to the well monument with the well ID. A summary of well construction details for all new and previously existing monitoring wells that will be used for performance monitoring is presented in Table 1.

Investigative-derived waste (IDW) was disposed of as outlined in the Work Plan (Aspect, 2017). A City of Seattle street-use permit was obtained (Appendix B). A traffic control plan was required to obtain the street-use permit and was implemented diligently to ensure worker safety and minimize disruptions to local traffic and businesses (Appendix B).

### **2.1.2 Baseline Soil Sampling**

Soil core samples were collected from the two injection wells (IW-1 and IW-2) during drilling using a split-spoon sample device. Core samples were collected continuously between 10 and 20.5 feet in seven 18-inch segments with a Dames and Moore (D&M) sampler (depending on recovery). Each 18-inch sample was divided into three 6-inch cores, one of which was used in the field for recording lithology and field-measuring soil pH, and the other two were sealed with vinyl duct tape, placed in Mylar bags with oxygen absorbing packets, and delivered to the Anchor QEA lab in Portland, OR, on blue ice for bench-scale pilot testing. The chain of custody (COC) for the soil cores is included in Appendix C. Twelve cores in total were collected from each injection well, due to limited recovery at some of the sample intervals. A soil core inventory with field-measured soil pH and recovery are shown in Table 2.

### **2.1.3 Baseline Groundwater Sampling**

Groundwater monitoring data was collected to inform the field-scale pilot testing injection design and establish baseline conditions for performance evaluation. Groundwater samples and water levels were collected at the five new wells, existing wells MW-3 and MW-3-30, existing well MW-8 downgradient of the pilot test area, and existing well MW-1 upgradient in the ABP facility. Groundwater monitoring was conducted using low-flow sampling methods using a peristaltic pump and flow-through cell in accordance with the SAP (Appendix D). Completed groundwater monitoring field logs and water level measurements are included in Appendix E.

The baseline groundwater analytical results from Analytical Resources Inc. (ARI) are shown in Table 3. Water levels and groundwater elevations are presented in Table 4. The analytical method for acidity was listed as U.S. Environmental Protection Agency (EPA) 310.2 in the Work Plan, which is the analytical method for alkalinity. The actual method used by ESC Lab Sciences for acidity was SM 2310B. All other groundwater sampling activities were conducted as described in the Work Plan.

Data was validated following the QAPP (Aspect, 2008; Appendix D) by Lea Beard, Senior Staff Data Scientist at Aspect and data validation reports are included with the analytical laboratory reports in Appendix C.

In addition, 2.5 gallons of unfiltered and unpreserved groundwater was collected from MW-3 (after well stabilization) for the bench-scale pilot test. The groundwater was delivered on blue ice to the Anchor QEA lab in Portland, OR, in a collapsible low-density polyethylene (LDPE) container sealed in a Mylar bag with oxygen absorbing packets (COC in Appendix C).

## 2.2 Phase II- Bench-Scale Pilot Testing

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Bench-scale pilot testing is summarized in the following sections and in detail in Appendix F.

### 2.2.1 Sample Processing

For the initial titration tests, soil from IW-01 and IW-02 was homogenized as described in the Work Plan. The field pH results were much higher than anticipated based on the supplemental investigation results (Aspect, 2016); therefore, Anchor QEA analyzed pH in the laboratory using two methods (pH was measured in a 1.0 molarity (M) potassium chloride slurry and a water slurry). All pH results are presented in Table 2.

As described in the Work Plan, the soil cores from each injection well were homogenized and an aliquot of each of the homogenized soil samples was collected and submitted to ARI Laboratory for the analyses outlined in the Work Plan. The baseline soil analytical results from the homogenized soil cores are shown in Table 5. The cores from the deepest intervals that were not homogenized were frozen at the Anchor QEA laboratory (Table 2).

### 2.2.2 Titration Batch Testing

The IW-02 homogenate was selected for subsequent laboratory testing based on the greater nickel concentration in the solid and aqueous phases, and higher aqueous phase pH and acidity in the groundwater sample (Tables 3 and 5). The use of IW-02 for laboratory testing was approved by Ecology in a March 20, 2018, email (Ecology, 2018a). The soil pH was slightly higher in IW-02 and was weighted less heavily as the other basis of selection (total nickel content and aqueous pH and acidity).

The Work Plan included a basis of alkaline reagent selection (Appendix F) and focused on sodium alkaline reagents based on their higher solubility than calcium and magnesium alkaline reagents. During reagent procurement, the only commercially available sodium polysulfide products identified were cost prohibitive. A calcium polysulfide product, Calmet, was proposed to Ecology as an alternative to sodium polysulfide. Ecology approved this change from the Work Plan in their March 20, 2018, email (Ecology, 2018a).

Titrations of groundwater and a slurry of soil and groundwater were conducted with the three alkaline amendments according to the matrix in Table 6. The titration curves are shown on Figure 5 and all titration data included in Appendix F.

### 2.2.3 Treatment Batch Testing

Batch-test reactors were set up in four 100-mL clear-glass bottles, each containing Site soil homogenate (IW-02) and Site groundwater collected from MW-3 (Table 7). Each reactor represented one sampling event (1, 3, 7, and 14 days). The Work Plan described a single 500-mL batch test reactor that would be sampled at each time point; however, this would have resulted in a change of the solid to solution ratio as aqueous samples were removed. The unique, 100-mL batch reactors (for each sampling event) allowed for consistent solid to solution ratios throughout the Treatment Batch Test. This change was approved by Ecology in an email on April 3, 2018 (Ecology, 2018b). The Titration Batch

Testing used several small volume tests to confirm the titration results were consistent using the different reactor volumes before applying this change to the treatment batch testing.

All other Treatment Batch Testing methods were performed as outlined in Section 4.2.3 of the Work Plan. The Treatment Batch Testing analytical results are presented in Table 8 and on Figure 6.

### 3 Updated Conceptual Site Model

A CSM focused on plating metals in SU1 groundwater in the vicinity of the ABP Facility was presented in the Work Plan as an initial basis of pilot test design. This Section presents updated elements of the CSM based on activities described in Section 2.

#### 3.1 Geology/Hydrogeology

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The geologic units encountered in borings completed in the vicinity of ABP prior to pilot testing include a younger alluvium and older alluvium. The upper portion of the younger alluvium has been modified and is referred to as the Fill Unit. The geology observed during drilling of the new monitoring wells is consistent with the geologic summary presented in the Work Plan.

A nomenclature for hydrostratigraphic units has been adopted for Site characterization (groundwater monitoring and sampling intervals). This nomenclature is maintained in describing groundwater at the Site and consists of:

- **Water Table Interval.** This interval includes monitoring wells screened above 20 feet below ground surface (bgs) and reconnaissance groundwater samples collected above 20 feet bgs.
- **Shallow Interval.** This interval includes monitoring wells screened below 20 feet and above 40 feet bgs, and reconnaissance groundwater samples collected between 21 feet and 40 feet bgs.
- **Intermediate Interval.** This interval includes monitoring wells and reconnaissance groundwater samples screened below 40 feet bgs.

All new monitoring wells were screened in the Water Table Interval from 10 to 20 feet bgs. A Shallow Interval monitoring well, MW-03-30, is included in the pilot test performance monitoring. Groundwater at the Site is encountered at a depth of 4 to 7 feet bgs. The depth to groundwater observed at new Water Table Interval monitoring wells ranged from 4.62 to 5.08 feet bgs. Groundwater elevations observed during baseline groundwater monitoring are presented in Table 4.

#### 3.2 Groundwater Geochemistry

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This section updates the understanding of groundwater geochemistry in the pilot study area. As presented in the Work Plan, the groundwater pH was below 4.0 in seven wells in the vicinity of the ABP Facility. By September 2016, all wells were above pH 4.0, with 6

wells between pH 4.0 and 4.5, confirming that acidity in groundwater is naturally attenuating. The baseline monitoring showed that only MW-01 had a pH < 4.5, and only MW-03, PSW-07, and PSW-08 have pH < 5.0 (4.87, 4.97, and 4.94, respectively), as shown on Figure 7. The downgradient well, MW-08, had a pH of 6.24, and the Shallow Interval well, MW-03-30, had a pH of 6.33, confirming that groundwater pH is attenuating with distance and depth. The acidity of groundwater in the pilot test area ranges from <10,000 U to 130,000 milligrams per liter (mg/L) as shown on Figure 7. The bench-scale testing evaluated the buffering of this groundwater acidity and is summarized in Section 4.1.

### 3.3 Nature and Extent of Metals Contamination

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Plating metals (cadmium, copper, nickel, and zinc) exceed groundwater proposed cleanup levels (PCULs) for protection of surface water. The horizontal extent of plating metals impacts appears limited to approximately 400 feet downgradient of the ABP Facility with the greatest extent in the Water Table Interval. Of the plating metals, nickel exhibits the greatest extent and was identified as the driver for remedial actions and this pilot study in the Work Plan. The new injection and monitoring wells were sampled to determine baseline metals concentrations and the results are summarized as:

- Dissolved cadmium concentrations ranged from 0.139 to 0.251 micrograms per liter ( $\mu\text{g/L}$ ) in Water Table Interval injection and monitoring wells in the pilot test area (Figure 8). All baseline concentrations are below the PCUL protective of surface water, 8.8  $\mu\text{g/L}$ .
- Dissolved copper concentrations ranged from 1.06 to 23.1  $\mu\text{g/L}$  in Water Table Interval injection and monitoring wells in the pilot test area (Figure 8). The dissolved copper concentration exceeds the PCUL (3.1  $\mu\text{g/L}$ ) at four of the seven locations in the pilot test area, not including upgradient and downgradient locations MW-1 and MW-8.
- Dissolved nickel concentrations at Water Table Interval injection and monitoring wells ranged from 2,370 to 11,400  $\mu\text{g/L}$  in the pilot test area (Figure 8). The maximum dissolved nickel concentration of 18,600  $\mu\text{g/L}$  is observed at MW-01, consistent with historical results. The nickel PCUL protective of surface water is 8.2  $\mu\text{g/L}$ .
- Dissolved zinc concentrations ranged from 34.1 to 54.8  $\mu\text{g/L}$  in Water Table Interval injection and monitoring wells in the pilot test area (Figure 8). All baseline concentrations are below the PCUL protective of surface water, 81  $\mu\text{g/L}$ .

These baseline results confirm that nickel is the primary driver of plating-metals exceedances in groundwater in the pilot test area. However, the pilot testing approach of pH adjustment will also affect other plating metals concentrations in groundwater and thus those other metals will be monitored.

## 4 Pilot Study Overview

Pilot testing is being conducted to assess the effectiveness and cost of an *in situ* pH-adjustment to immobilize plating metals in ABP source area groundwater. The results will be used to refine the conceptual design of the preferred remedial approach for the CAP. The following sections summarize the completed bench-scale pilot testing and identify the objectives of field-scale pilot testing.

### 4.1 Bench-Scale Pilot Testing Results

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Bench-scale pilot testing was conducted using Site soils and groundwater as presented in the Work Plan and summarized in Section 2.2. The specific objectives of bench-scale pilot testing as presented in the Work Plan are as follows:

- Determine total specific acidity of aquifer (soils and groundwater) and required dosing to achieve greater than pH 6 in field-scale pilot test.
- Demonstrate plating metals precipitation through pH adjustment.
- Compare performance of alkaline reagents as pH adjustment.
- Collect design parameters (i.e., calculate dosing, evaluate secondary effects of elevated pH on metals mobility) necessary for implementation of field-scale pilot test.

The results are evaluated in this Section and serve as the primary basis of field-scale pilot testing.

#### 4.1.1 Titration Batch Testing

The titration batch tests were conducted to evaluate the buffering potential of each selected reagent in the presence of groundwater (alone) and a slurry of soil and groundwater. The six titration curves are presented on Figure 5 and allowed the laboratory to determine how much reagent was necessary to achieve the target pH in treatment batch testing, and provide an estimate of soil acidity that can be scaled to field application. The soil acidity is represented by the difference in the groundwater titration curve and the slurry titration curve. The titrations for each reagent are summarized as follows.

- The 1.0 M sodium bicarbonate reagent buffered both groundwater and slurry batches to a maximum pH of approximately 8.8 and 8.5 standard units (s.u.), respectively. The pH shift decreased substantially after approximately 2,000  $\mu\text{L}$  of reagent were added and was largely asymptotic for the remainder of the titration ( $>14,000 \mu\text{L}$ ). The maximum pH observed is consistent with the known properties of the weak base, sodium bicarbonate. Additionally, the laboratory observed a stable pH in both groundwater and soil/groundwater slurry titrations (Appendix F).
- The 0.1 M sodium hydroxide reagent buffered both groundwater and slurry batches to a maximum pH of approximately 10 s.u. The slurry required

approximately twice the reagent than the groundwater to achieve this maximum pH. The titration of groundwater achieved pH >8 after approximately 1,200 µL at which point the groundwater pH stabilized. The slurry pH adjustment occurred gradually and at a relatively consistent rate. Unlike for sodium bicarbonate, acidic pH rebound was observed with sodium hydroxide, requiring additional reagent after 24 and 48 hours.

- The 30 percent Calmet reagent buffered groundwater and slurry batches to a maximum pH of approximately 9.5 s.u. The slurry required approximately 3 times the reagent that the groundwater required to achieve this maximum pH. The titration of groundwater achieved pH >9 after approximately 80 µL; at which point, the groundwater pH was asymptotic for the remainder of the titration. Unlike the sodium bicarbonate and similar to the sodium hydroxide, acidic pH rebound was observed requiring additional reagent after 24 and 48 hours.

All reagents successfully neutralized the pH in the presence of groundwater and in the presence of the slurry of soil and groundwater. However, as expected based on the reagent properties, there were significant differences in the quantity of reagent required and in the titration curves.

#### **4.1.2 Treatment Batch Testing**

The second phase of pilot testing consisted of treatment batch testing using Site soils and groundwater. The dissolved nickel concentrations and corresponding pH are presented in Figure 6 for each batch and sampling event. The dissolved nickel concentration in the Control batch was 3,790 and 6,300 µg/L on day 1 and day 14, respectively. The following bullets summarize batch testing results by each reagent:

- **Sodium Bicarbonate.** The dissolved nickel concentration was less than 1,000 µg/L in all three sodium bicarbonate batches (1A through 1C) during all events. The dissolved nickel concentrations in Batch 1C (target pH 8) were less than in Batches 1A and 1B (target pH 6) during each sampling event. The dissolved nickel concentration in Batch 1C decreased during each sampling event and the minimum nickel concentration of 109 µg/L was observed on day 14. Batch 1B targeted the same pH as Batch 1A – however, the achieved pH decreased with time and the maximum dissolved nickel concentration was observed on day 14, potentially due to the higher soil to groundwater ratio in Batch 1B.
- **Sodium hydroxide.** The dissolved nickel concentration was less than 1,000 µg/L in all sodium hydroxide batches (2A through 2C) during all events. The dissolved nickel concentrations in Batches 2B and 2C (target pH 8 and 10, respectively) were consistently less than Batch 2A (target pH 6) during each sampling event. The dissolved nickel concentration was less in Batches 2C than 2B on days 1 and 3; however, it was greater on day 7 and comparable on day 14 (119 versus 122 µg/L), suggesting there is no incremental decrease in nickel concentration between pH 8 and 10 with sodium hydroxide.
- **Calmet.** The target pH was not achieved in Batch 3A and dissolved nickel concentrations were comparable to the Control. The target pH was achieved in

Batch 3B; however, the pH decreased with time and by day 14, the result was pH 4.12 with a nickel concentration of 2,080 µg/L. The Batch 3C achieved the lowest dissolved nickel concentrations of any batch (minimum concentration of 33 µg/L), but the adjusted pH decreased from 10.05 on day 1 to 8.59 on day 14.

Additionally, Batches 2B/C and 3A/B/C required additional reagent be added to maintain the target pH throughout the batch tests as detailed in Table 2 of Appendix F. No additional reagent was required for any sodium bicarbonates batches.

The other plating metals were also monitored during these batch tests and are presented as scatter plots on Figure 1 of Appendix F. The only detected concentrations of cadmium were observed at pH<5 and dissolved zinc was only detected at pH < 6.5 s.u. Dissolved copper concentration decreased from baseline pH to approximately pH 6.5, and increased in concentration as pH increased beyond 6.5 with the highest dissolved copper concentrations occurring at roughly pH >9 in the sodium hydroxide batches.

### **4.1.3 Field-Scale Design Parameters**

Bench-scale testing is a critical step in design of this *in situ* treatment approach. This section summarizes the conclusions and how they translate to design parameters for field-scale pilot testing and potentially full-scale implementation.

#### **4.1.3.1 Reagent Selection**

The proposed reagent for field-scale pilot testing is 1.0 M sodium bicarbonate solution, or 0.70 pounds (lbs) sodium bicarbonate per gallon of water and referred to, hereafter, as the “reagent.” The basis of selection for bench-scale testing presented in Appendix F of the Work Plan included it being a weak base, no onerous handling requirements, readily available, and well demonstrated for remedial applications. Additionally, the pH adjustment using the sodium bicarbonate reagent was more predictable and stable over time. This is critically important to effectively adjusting pH in the aquifer.

The sodium hydroxide Batch 2C and Calmet Batch 3C achieved lower nickel concentrations (minimums of 68 and 33 µg/L, respectively) than the lowest achieved nickel concentrations using sodium bicarbonate (109 µg/L). This increased nickel attenuation is due to the difference in target pH (2C and 3C target pH 10; 1C target pH 8) and has unfavorable associated factors such as potential mobilization of copper and other redox/pH sensitive metals at the higher pH and increased reagent quantities and cost. The Batch 1C results achieved a 98 percent reduction in dissolved nickel concentration compared to the Control.

#### **4.1.3.2 Target Groundwater pH**

The bench-scale testing showed a significant reduction in dissolved nickel concentrations when increasing from pH 6 to pH 8. The decrease in dissolved nickel concentration between pH 8 and pH 10 was much less significant (Figure 1 of Appendix F). Based on these results, the field-scale pilot testing is designed to target a pH adjustment of Water Table Interval groundwater to 8.0 s.u. using the selected reagent.

Based on the reagent titration batch testing, after reaching pH 8.0, the pH was generally asymptotic for the remainder of the titration (>14,000  $\mu\text{L}$ ) as illustrated on Figure 5. Any alkalinity applied after reaching pH 8.0 may accumulate and increase the longevity of the pH adjustment, without significant increase of the pH.

#### 4.1.3.3 Reagent Dosing

The bench-scale tests were conducted using a solid-to-solution ratio, which allows aqueous sampling from the batch tests. Therefore, it must be scaled to the solid-to-solution ratio of the aquifer. The calculated minimum percentage of reagent in the subsurface to achieve a pH of 8.0 is 12 percent by volume (as a percentage of total aquifer volume). The calculation of this design parameter is presented in Table 9 and summarized as:

- Volumes of 1,050 and 3,800  $\mu\text{L}$  were interpolated from the titration curves (Figure 5) for the **quantity** of reagent to achieve an adjusted pH of 8.0. The difference in these two quantities, or 2,750  $\mu\text{L}$ , represents the volume of reagent to adjust the soils alone to pH 8.
- Assuming a soil density of 1.80 mg/L, the calculated percentage of solids in the bench-scale reactors is 5.3 percent by volume. Assuming a total porosity of 35 percent of the Water Table interval aquifer, soils represent 65 percent of the total aquifer volume. Therefore, a “scaling factor” of 12 was calculated to scale the volume of reagent used in bench-scale testing to field-scale pilot testing.
- In other **words**, there are 12 times the mass of solids in the aquifer than in batch-scale reactors, on an equivalent unit-volume basis. Therefore, the difference in reagent volume calculated above is multiplied by 12 to linearly scale the reagent demand to the field application. However, the difference in achieved pHs and temporal pH changes in Batches 1A and 1B (both batches targeted pH 6, but Batch 1B had a higher solids-to-solution ratio) suggest that it is a nonlinear function.
- Therefore, an **additional** safety factor of 2 is applied to the calculated reagent dosing to account of any nonlinear increase in acidity with increasing percentage of soils. There are no potential risks to this safety factor, as any excess alkalinity could accumulate and increase the longevity of the pH adjustment. Further, this safety factor ensures that an adequate pH adjustment is achieved.

Based on these calculations, a minimum reagent application of 12 percent by volume to the aquifer is targeted to achieve a pH of 8 in groundwater.

## 4.2 Field-Scale Pilot Testing Objectives

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The pilot study is designed to assess the effectiveness and cost of an *in situ* pH adjustment to immobilize plating metals in ABP source-area groundwater. The results will be used to refine the conceptual design of the preferred remedial approach for the CAP. This pilot study is designed based on the following objectives, which have been updated based on the completed pilot study activities:

1. **Reduce dissolved plating-metals concentrations in groundwater.** Acidic groundwater and associated plating-metals concentrations are naturally attenuating. The bench-scale pilot testing confirms that a pH increase can enhance this attenuation. The field-scale pilot testing will evaluate the ability to enhance attenuation through an engineered *in situ* pH neutralization. The objective will be evaluated based on performance monitoring described in Section 5.2.2
2. **Evaluate the ability to deliver and distribute reagent in Water Table Interval groundwater using permanent injection wells.** This objective will be evaluated based on the ability to achieve targeted injection volumes, reagent breakthrough, and pH adjustment at monitoring wells. This is a critically important objective and the crux of scaling the bench-scale results to the aquifer.
3. **Evaluate the permanence of the pH adjustment and immobilization of plating metals.** The field-scale pilot test will target a small portion of the aquifer with acidic pH and, therefore, once the acidity neutralizes all alkaline reagent, it is expected that the groundwater pH will decrease as acidic groundwater from upgradient returns to the area influenced by injections. Therefore, this objective will evaluate where the groundwater pH stabilizes and the permanence of plating metals immobilization through the longer-term monitoring discussed in Section 5.2.2.
4. **Estimate design parameters for scaling the technology.** The parameters determined from pilot testing would support design of a full-scale application capable of consuming a significant portion of the acidity and significantly enhancing plating metals attenuation. The following parameters will be refined based on the field-scale pilot testing results:
  - a. The reagent dosing (Section 4.1.3.3) required to achieve the target pH
  - b. The injected volume/ROI relationship
  - c. Achievable injection rates and corresponding injection-pressure relationship

These objectives will serve as the basis for performance evaluation during the pilot study. The following section describes the planned field-scale pilot testing activities.

## 5 Field-Scale Pilot Testing Design

### 5.1 Reagent Injections

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#### 5.1.1 Design

The selected reagent will be injected into IW-1 and IW-2 into the Water Table interval to evaluate the objectives presented in Section 4.2. A ROI of 12 feet at each injection well is targeted with the planned injection volume of 5,100 gallons per injection well. This injection volume was calculated based on the targeted ROI, an estimated mobile porosity of 15 percent, and the injection well screened interval length of 10 feet (Table 10).

This planned ROI is depicted on Figure 9 and is greater than the radial distance to performance monitoring wells providing additional assurance of achieving the target pH at performance monitoring wells. This total planned injection volume of 10,200 gallons is equal to 15 percent of the total aquifer in the ROI, by volume, or the estimated mobile porosity. This value is greater than the minimum 12 percent-by-volume reagent dosing calculated in Section 4.1.3.3.

#### 5.1.2 Reagent Formulation and Handling

A Seattle-based vendor, TRI Chemicals, has quoted a sodium bicarbonate product that is planned for field-scale pilot testing (technical sheet included in Appendix G). A 1.0 M sodium bicarbonate solution equals a mass concentration of approximately 0.70 lbs per gallon of water, or a total of approximately 7,100 lbs of sodium bicarbonate for a total injection volume of 10,200 gallons.

Aspect will contract with the chemical vendor to prepare the solution of reagent off-Site and to deliver to the pilot testing location in two batches of approximately 5,100 gallons. Upon delivery to the Site, the solution will be transferred from the shipping tanker to a rented Baker tank with secondary containment, similar to the 6,500-gallon vertical total-drain tank in Appendix G. The approximate location of the tank is depicted on Figure 9, but will be field-modified based on ABP input and operations at the time of injection.

#### 5.1.3 Injection System

Aspect will construct a temporary delivery system to inject the reagent from the Baker tank to the injection wells. A process and instrumentation diagram depicting the planned system is presented on Figure 10. The outlet of the Baker tank will be reduced to 2 inches for piping to the injection wellhead and will be instrumented with a flow totalizer to gauge total injection volume and injection rate. The piping will consist of low-pressure 2-inch hose with quick-connect camlock fittings.

An injection wellhead will be connected to the 4-inch injection well casing using a threaded connection. A four-way 4-inch tee above the ground surface will be utilized to connect to the injection hose using a quick-connect camlock fitting, and reduced to an air-release valve. The air-release valve is necessary to relieve entrained air in the injection piping and well casing preventing reduction of injection capacity, or any off-gassing generated from the pH adjustment. The third side of the four-way tee will be

capped, but available for additional instrumentation, if necessary. The injection manifold will be constructed of schedule 40 PVC materials.

### **5.1.4 Injection Methods**

Injections will be performed one injection well at a time. Thus, one batch of reagent, will be used to deliver the design injection volume of 5,100 gallons to the injection point. Additionally, this will allow DR monitoring at the corresponding DR well, and an accurate estimate of the injected volume/ROI relationship.

Based on the properties of aquifer soils in the Water Table interval, it is not expected that pumping head is necessary to achieve the targeted injection volume. Thus, the injection will be performed without any pumping head and rely on the elevation head in the Baker tank and gravity flow to the injection well. This approach will avoid the risks associated with high pressures, including system leaks, nonporous distribution, and/or potential aquifer formation fracturing.

If pumping head is necessary to deliver the targeted injection volumes in the planned injection time frame, an in-line centrifugal trash pump will be added to the injection piping via quick-connect fittings to increase the injection rate. Ecology would be notified of this need before adding pumping head to the delivery system.

Injections will be performed during standard business hours and Aspect will coordinate with the ABP staff for the space required to implement the injection. Injections will not be conducted when Aspect staff are not on-Site. Additionally, if reagent remains in the Baker tank at the end of the day, all valves will be closed, and the injection piping and injection wellhead disconnected and drained, and injections will be resumed the following business day.

Assuming an average injection rate of 10 gallons per minutes (gpm), a total active injection time of 17 hours is estimated. It is estimated that the injection event will be implemented in less than 1 week.

### **5.1.5 Applied Conservative Tracer**

An applied conservative tracer (tracer) will be used to evaluate the hydraulic properties of the Water Table Interval aquifer. Specifically, the tracer will allow estimates of groundwater flow rate, rate of injection solution “washout,” and to indicate breakthrough at DR monitoring wells during injection (prior to pH breakthrough). It is anticipated that plating-metals concentrations in the treatment area will ultimately return to preinjection baseline concentrations due to migration of acidity and dissolved plating metals into the treatment area from upgradient. Therefore, the tracer will allow the understanding of how much injection solution remains in the pilot study area and how much upgradient groundwater has returned at the time of each sampling event.

There are four general categories of tracers applied to groundwater systems for studies of hydrogeologic properties: salts (ions), dyes, dissolved gases, and stable isotopes. Tracer selection should be based on the test objectives and the aquifer properties that could affect tracer reactivity. The use of salts as tracers in groundwater systems began in the early 20th century (Slichter, 1902; Slichter, 1905). While not ideally conservative as a fluorescent dye or isotopic tracer, the cation of the selected reagent (sodium) will be used

as a tracer of the injection solution during pilot testing. The sodium concentrations measured during the bench-scale pilot testing indicates it is sufficiently nonreactive to achieve tracer objectives. The range in sodium concentrations measured during the Treatment Batch Testing (Table 8) varied little between different sampling events. The estimated sodium concentration is 22,900 mg/L in the 1.0 M reagent solution. This is 520 times greater than the mean sodium concentration during baseline monitoring of 44 mg/L (Table 10).

This “source-to-signal ratio” of 520 is sufficient for pilot test objectives of injection breakthrough monitoring and injection washout. The estimate of groundwater flow rate will be based on the sodium breakthrough trend at PSW-8<sup>2</sup>, shown on Figure 10 as immediately outside the ROI.

Additionally, the use of sodium as injection reagent solution tracer requires no special handling, system mixing or delivery, or additional monitoring requirements. Sodium will be monitored with the general chemistry list presented in Table 11 and according to the frequency presented in Table 12.

### **5.1.6 Injection Permitting**

The proposed injection wells are considered Class V underground injection wells that are subject to the Underground Injection Control Program, WAC 173-218. The Site is being managed pursuant to AO No. DE10402, between Ecology and the W4 Group. In accordance with WAC 173-218-060(5)(b), a permit is not required when injection activity is performed under an AO. However, the injection wells will be registered with Ecology’s underground injection control (UIC) program, using their online registration tool.

## **5.2 Monitoring**

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The monitoring program in this section is designed to evaluate the pilot-study objectives presented in Section 4.2. Monitoring consists of two different monitoring programs and objectives, operational monitoring and performance monitoring, and are described in the following sections.

### **5.2.1 Operational Monitoring**

Operational monitoring will be conducted during the injections to guide the injection operations and modify as necessary. Example operational monitoring logs are included in Appendix H. The operational monitoring elements and objectives consist of:

- **Injection rate and volume.** The injection rate and injected volume will be gauged at the flow totalizer (Figure 10) at a minimum frequency of hourly. As discussed in Section 5.14, injections will be accomplished with tank head and gravity flow and so no pressure is anticipated at the wellhead. If pressures are observed or pumping head is added to the injection system, the four-way tee will

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<sup>2</sup> It is not anticipated that the source-to-signal ratio is sufficient for estimating groundwater flow rate from sodium arrival at downgradient well, MW-8.

be instrumented with a pressure gauge to monitor injection pressure at the same frequency as injection rate and volume.

- **Reagent dosing.** A minimum of one sample will be collected from each batch injection solution will be analyzed for dissolved sodium by ARI Laboratories. Additionally, the pH of each batch injection solution will be measured at the same time as dissolved sodium sample collection.
- **Water level monitoring.** Manual water level monitoring of monitoring wells PSW-06, PSW-07, MW-3, and MW-3-30 will be conducted at least twice daily while injections are occurring. Additionally, manual water levels will be collected from the injection well not actively being injected.
- **Dose-response (DR) monitoring.** DR monitoring will be conducted at the following locations according to the active injection well:
  - **IW-1:** Monitoring of PSW-06, MW-3, and MW-3-30.
  - **IW-2:** Monitoring of PSW-07, MW-3, and MW-3-30.

DR monitoring will consist of the following:

- **Tracer.** A sample will be collected from each location for analysis of dissolved sodium. Additionally, the total dissolved solids (TDS) will be measured with a multiparameter meter and from a flow-through cell. A TDS breakthrough curve will be constructed to determine which dissolved-sodium samples to submit for laboratory analysis to construct the dissolved-sodium breakthrough curve.

At the planned frequency, approximately ten samples will be collected and a minimum of five will be submitted for laboratory analysis.

- **pH:** The pH will be measured with a multiparameter meter and from a flow-through cell at the same time as tracer breakthrough sampling.

DR monitoring will be conducted approximately every 500 gallons injected, which corresponds to a frequency of 50 minutes for an assumed injection rate of 10 gpm. These operational monitoring activities will be conducted in accordance with the SAP/QAPP (Appendix D).

### **5.2.2 Performance Monitoring**

Performance monitoring will be initiated at the end of the field-scale pilot testing injections to evaluate the objectives described in Section 4.2. The analytes to be evaluated are listed in Table 11, and the locations and frequency presented in Table 12. There are two changes to the monitoring program from that outlined in the Work Plan:

- Separating the dissolved-sodium analysis as the tracer (Table 11).
- Replacing the Month 4 event with a Week 1 postinjection monitoring event. This change is based on the rapid kinetics observed in the bench-scale pilot testing.

The performance monitoring schedule may be modified if observations warrant a change. Any modifications to the schedule in Table 12 will be discussed with Ecology. The performance monitoring program consists of:

- **Short-term monitoring.** Samples will be collected from the two injection wells, the DR monitoring wells, and PSW-08 immediately following injection completion (0 days elapsed), Week 1, Week 2, Week 4, Month 2, and Month 3 (Table 12). Additionally, samples will be collected from Shallow Interval well MW-3-30 at 0 days, Week 4, Month 2, and Month 3.
- **Long-term monitoring.** Following the first quarter, monitoring will be conducted at Month 6 and Month 12 at all monitoring locations (Table 12).

These performance monitoring activities will be conducted in accordance with the SAP/QAPP (Appendix D).

## 6 Project Organization

### 6.1 Roles and Responsibilities

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The project organization is led by Aspect, who will engage the necessary subcontractors to complete the planned activities. All team members are responsible for execution of work in accordance with the final Work Plan and FIWP; key individuals and their roles on this project are as follows:

- **Project Manager – Jeremy Porter.** The project manager is responsible for the successful completion of all aspects of this project, including day-to-day management, production of reports, liaison with party and regulatory agencies, and coordination with the project team members. The project manager is also responsible for resolution of nonconformance issues, is the lead author on project plans and reports, and will provide regular, up-to-date progress reports and other requested information to project team and Ecology.
- **Field Manager – Adam Griffin.** The field manager is responsible for overseeing the pilot study outlined in this plan, including oversight and management of field personnel and subcontractors, ensuring conformance with Work Plan and the FIWP. The field manager will manage procurement of necessary field supplies, assure that monitoring equipment is operational and calibrated in accordance with the specifications provided herein, and act as the Site Health and Safety Officer.
- **Subcontractors.** Numerous subcontractors are necessary to complete the pilot testing activities, including Anchor QEA EGL, analytical laboratories (ARI Laboratories and ESC Land Sciences), IDW disposal, and the reagent vendor, TRI Chemical. The subcontractors are responsible for conforming to the Work Plan and the agreed-to-scope with Aspect.

## 6.2 Project Plans

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A SAP/Supplemental QAPP is included as Appendix D. This SAP/QAPP includes specific QA/QC elements unique to the pilot study, such as the applied tracer field and laboratory methods, low-flow sampling using a peristaltic pump, and methods related to reagent handling and mixing.

Safe and effective traffic control is paramount to pilot study field activities. The traffic control plan used for the monitoring well installation activities is presented in Appendix B. This plan will be revisited and updated for reagent injections. A HASP for the pilot study activities is presented in Appendix I.

## 6.3 Schedule and Reporting

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A detailed estimated schedule of pilot study activities is presented on Figure 11. It is estimated that the FIWP will be issued 30 days after receipt of Ecology comments.

Subcontracting, permitting, and adjacent business coordination will require an estimated 2 months, and it is anticipated that the Field-Scale Pilot Testing activities will occur the week of August 27, 2018. If so, postinjection performance monitoring will be implemented on the dates presented on Figure 11, and the completion of 1 year of performance monitoring would be in August 2019. If performance monitoring beyond 1-year postinjection is determined necessary, monitoring would be conducted beyond Q3 2019.

As required by the Amended AO, pilot study deliverables consist of the final Work Plan (Aspect, 2018), a final FIWP, and a Pilot Study Completion Report. Data collected during the pilot study, including injection results and postinjection performance monitoring, and recommendations for modifications to the monitoring program, if warranted, will be included in quarterly progress reports.

The Pilot Study Completion Report will be prepared and submitted draft to Ecology within 45 days of receiving all analytical data. The Pilot Study Completion Report will include conclusions regarding the pilot testing and recommendations regarding full-scale application of engineered *in situ* pH neutralization for plating metals in groundwater.

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**ASPECT CONSULTING**

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Washington State Department of Ecology (Ecology), 2018b, Email correspondence between Ed Jones and Dana Cannon of Aspect Consulting, April 3, 2018.

## 8 Limitations

Work for this project was performed for the West of 4th Group (Client), and this report was prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. This report does not represent a legal opinion. No other warranty, expressed or implied, is made.

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# TABLES

**Table 1. Well Construction Summary**

Project No. 050067, Art Brass Plating, Seattle, WA

Monitoring Well ID	Well Type	Installation Date	Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Casing Diameter (inches)	Screen Material	Screen Length (feet)	Screen Depth (feet bgs)			Groundwater Monitoring Interval
IW-1	Injection Well	1/29/2018	15.42	14.98	4	SS	10	10	to	20	Water Table
IW-2	Injection Well	1/29/2018	15.12	14.78	4	SS	10	10	to	20	Water Table
PSW-6	Performance Monitoring Well	1/30/2018	15.02	14.50	2	PVC	10	10	to	20	Water Table
PSW-7	Performance Monitoring Well	1/26/2018	14.91	14.67	2	PVC	10	10	to	20	Water Table
MW-3	Performance Monitoring Well	10/5/2005	15.30	14.89	2	PVC	10	4.2	to	14.2	Water Table
PSW-8	Performance Monitoring Well	1/26/2018	14.91	14.70	2	PVC	10	10	to	20	Water Table
MW-3-30	Performance Monitoring Well	3/26/2012	15.26	14.83	2	PVC	10	20	to	30	Shallow
MW-8 (downgradient)	Downgradient Performance Well	5/8/2007	15.39	14.99	2	PVC	10	5	to	15	Water Table
MW-1 (upgradient)	Upgradient Performance Well	10/5/2005	16.71	16.22	2	PVC	10	3.75	to	13.75	Water Table

**Notes:**

- Elevation datum is NGVD88.
- SS - Stainless-steel wire-wrapped
- PVC - Polyvinyl chloride
- bgs - below ground surface
- ROI - radius of influence
- IW-1 and IW-2 have 2-foot sumps.

**Table 2. Soil Core Inventory**

Project No. 050067, Art Brass Plating, Seattle, Washington

Boring	Interval (feet)	Sample Time	Field pH	Lab pH (1M KCl)	Lab pH (H2O)	Recovery (feet)	Sample ID	Start Depth (feet)	End Depth (feet)
IW-1	10-11.5	9:30	--	4.11	5.89	0.5	IW-1-11-11.5	11	11.5
	11.5-13	9:50	6.81	3.98	4.76	1.5	IW-1-11.5-12	11.5	12
				3.84	4.43		IW-1-12.5-13	12.5	13
	13-14.5	10:05	6.07	3.96	4.43	0.8	IW-1-13-13.5	13	13.5
				3.94	4.33		IW-1-14-14.5	14	14.5
	14.5-16	10:25	6.39	3.84	4.49	1.1	IW-1-14.5-15	14.5	15
				3.9	4.57		IW-1-15.5-16	15.5	16
	16-17.5	10:45	6.97	3.92	4.7	1.1	IW-1-16-16.5	16	16.5
				3.92	4.49		IW-1-16.5-17	16.5	17
	17.5-19	10:55	6.73	3.94	4.93	0.4	IW-1-17.5-18	17.5	18
19-20.5	11:10	6.84	--	--	1.25	IW-1-19.5-20	19.5	20	
			--	--		IW-1-20-20.5	20	20.5	
IW-2	10-11.5	13:55	5.95	3.96	4.96	0.5	IW-2-10-10.5	10	10.5
				3.8	4.29		IW-2-11-11.5	11	11.5
	11.5-13	14:20	6.82	3.98	4.57	1.0	IW-2-12.5-13	12.5	13
				4.31	4.66	1.0	IW-2-13.5-14	13.5	14
	13-14.5	14:35	6.71	3.92	4.39		1.1	IW-2-14-14.5	14
				4.08	4.42	IW-2-15-15.5		15	15.5
	14.5-16	14:45	6.65	3.89	4.46	1.3	IW-2-15.5-16	15.5	16
				4.01	4.51		IW-2-16-16.5	16	16.5
	16-17.5	15:00	6.73	4.08	4.64	1.1	IW-2-17-17.5	17	17.5
				4.09	4.63		IW-2-17.5-18	17.5	18
17.5-19	15:15	6.77	--	--	0.5	IW-2-18.5-19	18.5	19	
			--	--		IW-2-19.5-20	19.5	20	

**Notes:**

Red box indicates sample intervals that were selected for the bench-scale tests.

pH was measured by the lab in a 1.0 M potassium chloride (KCl) slurry and in a water slurry.

**Table 3. Baseline Groundwater Analytical Results**

Project No. 050067, Art Brass Plating, Seattle, Washington

Analyte	Units	Water Table Interval								Shallow Interval
		Injection Wells		Performance Monitoring Wells				Downgradient Well	Upgradient Well	Performance Well
		IW-01 02/01/2018 IW-1-020118	IW-02 02/01/2018 IW-2-020118	MW-03 01/29/2018 MW-3-012918	PSW-06 02/01/2018 PSW-6-020118	PSW-07 02/01/2018 PSW-7-020118	PSW-08 02/01/2018 PSW-8-020118	MW-08 01/31/2018 MW-8-013118	MW-01 01/31/2018 MW-1-013118	MW-03-30 01/31/2018 MW-3-30-013118
<b>Plating Metals (Dissolved)</b>										
Cadmium	ug/L	0.176	0.139	0.216	0.171	0.251	0.223	< 0.100 U	0.456	< 0.100 U
Copper	ug/L	23.1	10.2	15.5	1.06	2.55	3.25	1.72	16.2	< 0.500 U
Nickel	ug/L	2370	4570	11400	4600	8850	7510	6740	18600	4.62
Zinc	ug/L	34.1	35.8	46.6	50.2	52.4	54.8	7.56	44.4	< 4.00 U
<b>Redox-Sensitive Metals (Dissolved)</b>										
Arsenic	mg/L	< 0.0500 U	0.0054 J	0.0060 J	0.0059 J	0.0058 J	< 0.0500 U			
Barium	mg/L	0.0287	0.0265	0.0084	0.0487	0.0319	0.0359			
Manganese	mg/L	0.561	0.469	0.356	0.906	0.596	0.601			
<b>General Chemistry Parameters</b>										
Aluminum	mg/L	0.433	0.313	1.25	0.794	0.838	0.869	0.0418 J	0.823	< 0.0500 U
Calcium	mg/L	28.2	20.5	26	44.5	30	30.5	51.1	20.2	14.4
Iron	mg/L	3.05	5.79	0.0791	6.37	6.3	4.73	3.54	0.413	8.68
Magnesium	mg/L	9.53	6.28	7.14	14.8	8.93	9.13	13.1	6.76	20.9
Potassium	mg/L	8.65	6.12	6.79	12.5	7.98	8.33	11.1	9.2	7.22
Sodium	mg/L	33.8	38.8	37	54.3	46.8	38.4	41.5	75.9	30.1
Acidity	ug/L	20000	24000	26000	130000	20000	80000	< 10000 U	40000	< 10000 U
Alkalinity, Total	mg/L	4.45	3.64	< 1.00 U	6.68	< 1.00 U	< 1.00 U	58.7	< 1.00 U	158
Chloride	mg/L	33.7	19.3	23.7	49.6	27.6	32.9	33.5	49.2	22.2
Sulfate	mg/L	143	145	163	247	215	188	187	219	18.6
Total Organic Carbon	mg/L	1.88	1.97	1.88	1.7	1.6	1.43	1.99	1.91	3.96
<b>Field Parameters</b>										
Temperature	deg C	13.9	14.3	13.6	14.7	14.4	14.7	13.4	17.2	14.8
Specific Conductance	uS/cm	377.1	376	320	593	495.6	436.1	502	520	271.6
Dissolved Oxygen	mg/L	0.3	0.26	2.67	0.14	0.16	0.11	0.27	0.66	0.1
pH	pH units	5.25	5.19	4.87	5.27	4.97	4.94	6.24	4.18	6.33
Oxidation Reduction Potential	mV	179.7	182.2	93.9	174.5	205.1	245.4	61.4	266.9	29.6
Turbidity	NTU	37	10	41.9	7	3	11	6	13	8

**Notes:**

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

## Table 4. Groundwater Elevations

Project No. 050067, Art Brass Plating, Seattle, WA

Location	Date	TOC Elevation (ft amsl)	Depth to Water (ft bTOC)	Groundwater Elevation (ft amsl)
IW-1	1/31/2018	14.98	5.08	9.9
IW-2	1/31/2018	14.78	4.89	9.89
MW-1	1/31/2018	16.22	6.28	9.94
MW-3	1/31/2018	14.89	4.95	9.94
MW-3-30	1/31/2018	14.83	4.86	9.97
MW-8	1/31/2018	14.99	5.09	9.9
PSW-6	1/31/2018	14.5	4.62	9.88
PSW-7	1/31/2018	14.67	4.79	9.88
PSW-8	1/31/2018	14.7	4.82	9.88

**Notes:**

Elevation datum is NAVD88.

amsl - above mean sea level

bTOC - below top of casing

ft - feet

## Table 4

## Table 5. Soil Core Analytical Results

Project No. 050067, Art Brass Plating, Seattle, Washington

Analyte	Units	IW-01 02/08/2018 8F18_AB_1001	IW-02 02/08/2018 8F18_AB_1002
<b>General Chemistry</b>			
Total Carbon	%	<b>0.21</b>	<b>0.46</b>
Total Inorganic Carbon	%	< 0.0200 U	<b>0.242</b>
Total Organic Carbon	%	<b>0.14 J</b>	<b>0.22 J</b>
Preserved Total Solids	%	<b>74.76</b>	<b>76.91</b>
Total Solids	%	<b>79.18</b>	<b>81.84</b>
Sulfur	%	<b>0.03</b>	<b>0.05</b>
Sulfide	mg/kg	< 1.27 UJ	< 1.20 UJ
pH <sup>1</sup>	s.u.	4.1	4.24
<b>Metals</b>			
Cadmium	mg/kg	<b>0.104 J</b>	<b>0.0880 J</b>
Copper	mg/kg	<b>8.86</b>	<b>7.62</b>
Iron	mg/kg	<b>9700</b>	<b>9500</b>
Manganese	mg/kg	<b>79.9</b>	<b>69.9</b>
Nickel	mg/kg	<b>17.1</b>	<b>35.5</b>
Zinc	mg/kg	<b>20.0</b>	<b>18.9</b>

### Notes:

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected.

1 - pH was measured in Anchor QEA laboratory according to Final Work Plan (Aspect, 2017).

Soil cores from 10 to 17.5 ft were homogenized (see Table 2).

mg/kg - milligrams per kilogram

s.u. - standard units

## Table 6. Titration Batch Test Matrix

Project No. 050067, Art Brass Plating, Seattle, Washington

	Soil Mass (g)	Groundwater Volume (mL)	Reagent
Batch-1	0	200	Sodium Bicarbonate (1.0M NaHCO <sub>3</sub> )
	20	200	
Batch-2	0	200	Sodium Hydroxide (0.1M NaOH)
	20	200	
Batch-3	0	200	Calmet (30% CaS <sub>x</sub> )
	20	200	

**Notes:**

g - grams

mL - milliliters

## Table 7. Treatment Batch Test Matrix

Project No. 050067, Art Brass Plating, Seattle, Washington

### Aqueous Analysis<sup>1</sup>

	Soil Mass (g)	Groundwater Volume (mL)	Reagent	Target pH (s.u.)	1 day	3 days	7 days	14 days
Control-1	10	100	-		1,4	-	-	1,4
Batch-1A	10	100	Sodium Bicarbonate (1.0M NaHCO <sub>3</sub> )	6	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Batch- 1A (DUP)	10	100		6	1,4	1,4	1,4	1,4
Batch-1B	20	100		6	1,2,3,4	1,4	1,4	1,2,3,4
Batch-1C	10	100		8	1,2,3,4	1,4	1,4	1,2,3,4
Batch-2A	10	100	Sodium Hydroxide (0.1M NaOH)	6	1,2,3,4	1,4	1,4	1,2,3,4
Batch-2A (DUP)	10	100		6	1,4	1,4	1,4	1,2,3,4
Batch-2B	10	100		8	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Batch-2C	10	100		10	1,2,3,4	1,4	1,4	1,2,3,4
Batch-3A	10	100	Calmet (30% CaS <sub>x</sub> )	6	1,2,3,4	1,4	1,4	1,2,3,4
Batch-3B	10	100		8	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4
Batch-3C	10	100		10	1,2,3,4	1,4	1,4	1,2,3,4

#### Notes:

#### Aqueous Analytes (see Table 11):

- 1 - Plating Metals
- 2 - Redox-sensitive Metals
- 3 - General Chemistry
- 4 - Field Parameters
- g - grams
- mL - milliliters
- s.u. - standard units

**Table 8. Treatment Batch Test Analytical Results**

Project No. 050067, Art Brass Plating, Seattle, Washington

Analyte	Units	BATCH 1A - Sodium Bicarbonate (NaHCO3)				BATCH 1B - Sodium Bicarbonate (NaHCO3)				BATCH 1C - Sodium Bicarbonate (NaHCO3)				BATCH 2A - Sodium Hydroxide (NaOH)			
		Day 1	Day 3	Day 7	Day 14	Day 1	Day 3	Day 7	Day 14	Day 1	Day 3	Day 7	Day 14	Day 1	Day 3	Day 7	Day 14
		04/04/2018	04/06/2018	04/10/2018	04/17/2018	04/04/2018	04/06/2018	04/10/2018	04/17/2018	04/04/2018	04/06/2018	04/10/2018	04/17/2018	04/04/2018	04/06/2018	04/10/2018	04/17/2018
<b>Plating Metals (Dissolved)</b>																	
Cadmium	µg/L	< 0.1 U	< 0.2 U	< 0.2 U	< 0.1 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.1 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.1 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.1 U
Copper	µg/L	1.48	1.69	2.04 J	2.95	1.09	2.13	1.82	2.85	2.54	2.83	4.09	5.66	2.23	1.59	2.22	3.12
Nickel	µg/L	947	354	286	237	621	454	418	878	215	147	130	109	722	442	479	642
Zinc	µg/L	< 4 U	8.34	< 8 U	< 4 U	< 8 U	< 8 U	< 8 U	5.96	< 8 U	< 8 U	< 8 U	< 4 U	< 8 U	< 8 U	< 8 U	4.19
<b>Redox Sensitive Metals (Dissolved)</b>																	
Arsenic	mg/L	< 0.05 U	0.0069 J	0.0055	< 0.05 U	0.0053 J			< 0.05 U	0.0085 J			0.0114 J	0.0058 J			< 0.05 U
Barium	mg/L	0.0078	0.0066	0.0088	0.0069	0.0079			0.0103	0.0086			0.0082	0.0083			0.007
Manganese	mg/L	0.18	0.0876	0.0738	0.037	0.187			0.227	0.0576			0.0144	0.158			0.139
<b>General Chemistry Parameters</b>																	
Aluminum	mg/L	0.141	0.119	0.169	0.211	0.108			0.133	0.276			0.217	0.134			0.142
Calcium	mg/L	14	10.3	9.92	9.35	11.3			12.9	14.7			10.7	13.9			13
Iron	mg/L	0.109	0.111	0.222	0.218	0.0925			0.149	0.131			0.277	0.167			0.172
Magnesium	mg/L	4.46	3.33	3.27	3.02	3.64			3.74	4.44			3.18	4.28			3.83
Potassium	mg/L	6.06	5.65	5.96	5.28	5.39			6.26	6.23			5.78	5.4			5.66
Sodium	mg/L	84.7	76.1	81.4	85.3	75.9			72.9	368			346	59.3			57.8
Acidity	ug/L	< 125,000 U	1,216,800	< 179000 U	< 25,000 U	665,600			< 31,000 U	< 139,000 U			< 20,000 U	< 156,000 U			< 24,000 U
Alkalinity, Total	mg/L	75.0	57.4	40.3	6.20	44.3			< 3.1 U	724			105	31.7			< 2.4 U
Chloride	mg/L	12.3	11.1	17.9	17.8	10.6			18.3	11.1			17.8	11			17.6
Sulfate	mg/L	96.1	87.9	145	153	87			186	91.6			149	87			150
Total Organic Carbon	mg/L	5.7	5.78	6.81	7.8	5.38			8.96	6.98			10.5	5.19			5.64
<b>Field Parameters</b>																	
Specific Conductance	µS/cm	617	551	542	565	544	515	526	555	1,631	1,538	1,616	1,612	479	465	474	484
Dissolved Oxygen	mg/L	1.97	6.72	6.81	6.93	1.04	5.59	1.85	8.1	0.98	1.76	4.6	7.78	2.65	7.33	3.11	8.32
pH	pH units	6.52	6.58	6.39	6.34	6.39	5.95	5.74	5.61	7.98	7.74	7.73	8.37	5.97	6.04	6.19	5.78
Oxidation Reduction Potential	mV	195.6	222.3	193.3	194.7	181.9	237.6	216.7	241.7	160.5	204.8	188.3	185.6	178.2	223.8	203.3	224.6
Turbidity	NTU	3,880	3,200	3,500	3,960	7,800	10,000	7,050	6,290	3,190	5,020	3,160	3,150	3,290	3,600	2,850	3,590
Total Dissolved Solids	mg/L	0.8543	0.7355	0.7193	0.7607	0.7229	0.6707	0.6905	0.7427	2.6795	2.5121	2.6525	2.6453	0.3027	0.2971	0.3007	0.3047

**Notes:**

Alkalinity and acidity concentrations have been adjusted based on dilution by Anchor to attain minimum sample volumes.

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

µg/L - micrograms per liter

mg/L - milligrams per liter

µS/cm - microsiemen per centimeter

mV - milli volts

NTU - nephelometric turbidity Units

**Table 8. Treatment Batch Test Analytical Results**

Project No. 050067, Art Brass Plating, Seattle, Washington

Analyte	Units	BATCH 2B - Sodium Hydroxide (NaOH)				BATCH 2C - Sodium Hydroxide (NaOH)				BATCH 3A - Calmet				BATCH 3B - Calmet			
		Day 1	Day 3	Day 7	Day 14	Day 1	Day 3	Day 7	Day 14	Day 1	Day 3	Day 7	Day 14	Day 1	Day 3	Day 7	Day 14
		04/06/2018	04/06/2018	04/10/2018	04/17/2018	04/04/2018	04/06/2018	04/10/2018	04/17/2018	04/04/2018	04/06/2018	04/10/2018	04/17/2018	04/04/2018	04/06/2018	04/10/2018	04/17/2018
<b>Plating Metals (Dissolved)</b>																	
Cadmium	µg/L	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	0.48	0.916	< 0.2 U	< 0.2 U	< 0.2 U	0.486
Copper	µg/L	2.63	4.04	4.21 J	7.79	9.3	17.5	23.4	29	1.2	1.16	10.3	64.9	1.54	2.7	3.95 J	11.1
Nickel	µg/L	118	166	98.1	119	68.3	115	116	122	1,990	2,160	4,830	6,060	204	133	102	2,080
Zinc	µg/L	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	< 8 U	14.9	9.46	71.5	149	< 8 U	< 8 U	< 8 U	53.5
<b>Redox Sensitive Metals (Dissolved)</b>																	
Arsenic	mg/L	0.0061 J	0.0073 J	0.0091	0.0072 J	0.017 J			0.0389 J	0.0077 J			0.015 J	0.0141 J	0.0145 J	0.016	0.0179 J
Barium	mg/L	0.0056	0.0043	0.0039	0.006	0.0037			0.0057	0.0115			0.0819	0.0065	0.008	0.0068	0.0365
Manganese	mg/L	0.0192	0.0153	0.0099	0.0084	0.0054			0.0092	0.41			0.877	0.0251	0.0364	0.0198	0.458
<b>General Chemistry Parameters</b>																	
Aluminum	mg/L	0.112	0.124	0.142	0.198	0.444			0.502	0.051			5.6	0.0339 J	0.0564	0.0452	0.869
Calcium	mg/L	6.94	5.02	4.83	4.91	2.91			4.07	29.7			108	66.9	68.2	65.4	163
Iron	mg/L	0.118	0.17	0.182	0.344	0.201			0.681	0.204			0.67	0.0245 J	0.0336 J	0.0443	2.42
Magnesium	mg/L	2.04	1.39	1.44	1.37	0.693			0.848	6.22			10.2	5.75	5.56	5.34	8.07
Potassium	mg/L	5.13	4.3	4.74	4.31	2.88			3.67	5.75			8.38	5.14	5.34	5.67	6.65
Sodium	mg/L	75.7	79	84.9	94.4	118			146	33.5			33.3	30.2	28.7	31.4	30.2
Acidity	ug/L	< 156,000 U	695,000	< 147,000 U	< 21,000 U	< 125,000 U			< 20,000 U	< 139,000 U			< 20,000 U	< 132,000 U	< 132,000 U	< 125,000 U	< 20,000 U
Alkalinity, Total	mg/L	36.2	41.7	43.1	9.2	131			22.8	16.1			< 2 U	37.1	31.9	30.5	< 2 U
Chloride	mg/L	11.5	10.1	17.2	17.4	10.5			16.7	11			16.7	9.99	9.66	15.7	16
Sulfate	mg/L	90.7	83.4	141	152	85.9			162	87.3			427	81.7	79.5	158	505
Total Organic Carbon	mg/L	6.37	8.41	8.71	12.14	13.1			26.71	5.63			3.94	6.58	7.41	7.11	6.87
<b>Field Parameters</b>																	
Specific Conductance	µS/cm	491	519	539	593	713	689	735	727	459	447	696	1,095	621	608	599	1,056
Dissolved Oxygen	mg/L	1.92	3.56	5.87	8.55	5.28	7.26	6.63	8.21	1.46	5.42	4.16	7.83	0.34	7.37	7.13	4.56
pH	pH units	7.89	7.82	8.42	7.75	10.37	10.06	9.73	9.84	5.75	6.06	3.69	3.15	8.52	7.75	7.84	4.12
Oxidation Reduction Potential	mV	159.1	185.3	164.3	197.7	57.1	102.9	112.6	143.2	83.4	204.8	343	540.5	133.1	169.5	204.1	320.9
Turbidity	NTU	3,520	3,530	3,660	3,850	4,000	3,300	3,690	4,350	3,550	3,640	2,940	3,310	4,860	5,510	4,890	6,100
Total Dissolved Solids	mg/L	0.3075	0.3187	0.3267	0.3483	0.3963	0.3867	0.4051	0.4019	0.3642	0.3522	0.6012	1.0002	0.5262	0.5132	0.5042	0.9612

**Notes:**

Alkalinity and acidity concentrations have been adjusted based on dilution by Anchor to attain minimum sample volumes.

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

µg/L - micrograms per liter

mg/L - milligrams per liter

µS/cm - microsiemen per centimeter

mV - milli volts

NTU - nephelometric turbidity Units

**Table 8. Treatment Batch Test Analytical Results**

Project No. 050067, Art Brass Plating, Seattle, Washington

Analyte	Units	BATCH 3C - Calmet				CONTROL		METHOD BLANK
		Day 1	Day 3	Day 7	Day 14	Day 1	Day 14	Day 1
		04/04/2018	04/06/2018	04/10/2018	04/17/2018	04/06/2018	04/17/2018	04/04/2018
<b>Plating Metals (Dissolved)</b>								
Cadmium	µg/L	< 0.2 U	< 0.2 U	< 0.2 U	< 0.2 U	0.244	0.7	< 0.1 U
Copper	µg/L	< 1 U	1.35	1.28	33.3	2.58	9.8	< 0.5 U
Nickel	µg/L	33.4	66.2	50.7	37.6	3,790	6,300	< 0.5 U
Zinc	µg/L	< 8 U	< 8 U	< 8 U	< 8 U	35.4	81.1	< 4 U
<b>Redox Sensitive Metals (Dissolved)</b>								
Arsenic	mg/L	0.0163 J			0.0206 J			< 0.05 U
Barium	mg/L	0.0073			0.0128			< 0.003 U
Manganese	mg/L	0.0046			0.0083			< 0.001 U
<b>General Chemistry Parameters</b>								
Aluminum	mg/L	0.0419 J			0.0249 J			< 0.05 U
Calcium	mg/L	108			226			0.018 J
Iron	mg/L	0.0033 J			0.0034 J			< 0.05 U
Magnesium	mg/L	4.39			3.05			< 0.05 U
Potassium	mg/L	4.53			5.54			< 0.5 U
Sodium	mg/L	27.4			25.5			0.0509 J
Acidity	ug/L	125,000 J			< 20,000 U			
Alkalinity, Total	mg/L	60.5			10.3			
Chloride	mg/L	8.84			14.2			< 0.1 U
Sulfate	mg/L	72.2			111			< 0.1 U
Total Organic Carbon	mg/L	5.77			9.1			< 0.5 U
<b>Field Parameters</b>								
Specific Conductance	µS/cm	790	818	958	1,229	423	529	
Dissolved Oxygen	mg/L	0.03	5.66	2.01	8.31	1.16	8.35	
pH	pH units	10.05	9.1	9.49	8.59	4.7	4.22	
Oxidation Reduction Potential	mV	-357.3	109.3	74.4	160.6	292.7	357.9	
Turbidity	NTU	4,500	4,500	4,320	4,930	3,080	4,170	
Total Dissolved Solids	mg/L	0.6952	0.7232	0.8632	1.1342	0.4	0.4	

**Notes:**

Alkalinity and acidity concentrations have been adjusted based on dilution by Anchor to attain minimum sample volumes.

J - Analyte was positively identified. The reported result is an estimate.

U - Analyte was not detected at or above the reported result.

µg/L - micrograms per liter

mg/L - milligrams per liter

µS/cm - microsiemen per centimeter

mV - milli volts

NTU - nephelometric turbidity Units

## Table 9. pH Adjustment Calculations

Project No. 050067, Art Brass Plating, Seattle, Washington

Parameter	Value	Units	Notes
<b><u>Laboratory Data - Titration Batch Tests</u></b>			
Groundwater volume	200	mL	
Soil mass	20	g	
Assumed soil density	1.80	g/mL	
Percentage of Soil in Batch	5.3%	by volume	
<b><u>Titration Results - 1.0 M Sodium Bicarbonate</u></b>			
Volume required to pH 8.0 (groundwater)	1,050	μL	
Volume required to pH 8.0 (groundwater and soil)	3,800	μL	
Difference	2,750	μL	Difference represents the soil acidity.
<b><u>Aquifer Properties</u></b>			
Assumed total porosity	0.35		
Percentage of Soil in Aquifer	65%	by volume	
Scaling Factor	12		This represents a factor to scale the soil:groundwater ratio from that used in the laboratory to the aquifer.
Safety Factor	2		A safety factor is applied to account for any additional acidity, prevent an insufficient pH adjustment, and to increase longevity of the pH adjustment during pilot testing.
<b><u>Design Parameters - 1.0 M Sodium Bicarbonate</u></b>			
Total quantity required to achieve pH 8.0 in aquifer	69	mL/200 mL of groundwater	
Equivalent aquifer volume	571	mL/200 mL of groundwater	
<b>1.0 M Sodium Bicarbonate Dose to achieve pH 8</b>	<b>12%</b>	<b>by volume</b>	

### Notes:

% - percent

g - grams

g/mL - grams per milliliter

mL - milliliter

μL - microliter

M - molar solution

## Table 10. Injection Design

Project No. 050067, Art Brass Plating, Seattle, WA

Parameter	Value	Units	Notes
<b>Injection Points</b>			
Number of Injection Wells	2	points	
Distance to Dose-Response MWs	7	feet	
Target ROI	12	feet	ROI beyond dose-response wells targeted to increase footprint and longevity of pH adjustment.
Target Treatment Interval	10-20	feet bgs	
Target Treatment Thickness	10	feet	
Estimated Aquifer Volume in ROI	67,677	gallons	Includes target ROI at both Injection Wells.
<b>Injection Point Hydraulics</b>			
Mobile Porosity	0.15		Estimated for fine to medium sand (Payne et al., 2008).
Estimated Pore Volume	5,100	gallons/target ROI	
<b>Reagent Dosing</b>			
Selected Reagent	1.0M NaHCO <sub>3</sub>		
Dose to achieve pH 8.0	12%	by volume	Calculated in Table 9
Target Dosage	15%	by volume	Based on Injection Point Hydraulics (= Total Injection Volume/ Estimated Aquifer Volume in ROI).
<b>Tracer Design</b>			
Tracer	Sodium		
Injected Sodium Concentration	22900	mg/L	
Mean Sodium Concentration in Groundwater	44	mg/L	
Source:Signal Ratio	520		Indicates the magnitude of sodium as a tracer of the injection solution in groundwater
<b>Total Quantities</b>			
Total Injection Volume	10,200	gallons	
Injection Solution	1.0 M	Sodium Bicarbonate	
Total Sodium Bicarbonate	7,100	lbs	

### Notes:

% - percent  
 lbs - pounds  
 g - grams  
 mg - milligrams  
 mg/L - milligrams per liter  
 ROI - radius of influence

## Table 11. Monitoring Program - Analyte List

Project No. 050067, Art Brass Plating, Seattle, Washington

Analyte	Analytical Method
<b>COCs</b>	
Plating Metals (Cadmium, Copper, Nickel, Zinc) <sup>1</sup>	EPA 200.8
Redox-sensitive Metals (Arsenic, Barium, and Manganese) <sup>1</sup>	EPA 6010
<b>General Chemistry</b>	
Dissolved Cations (Aluminum, Calcium, Iron, Magnesium, Potassium) <sup>1</sup>	EPA 6010
Alkalinity	EPA 310.1
Acidity	SM 2310B <sup>2</sup>
Total Organic Carbon (TOC)	EPA 415.1 (or SW-846 Method 9060)
Chloride	EPA 300.1
Sulfate	EPA 300.0
<b>Tracer</b>	
Dissolved Sodium	EPA 6010
<b>Field Parameters</b>	
Total Dissolved Solids	Multimeter
Specific conductance	Multimeter
Dissolved oxygen	Multimeter
pH	Multimeter
Oxygen Reduction Potential (ORP)	Multimeter
Turbidity	Turbidimeter

### Notes

1. All analyses will be field-filtered using a 0.45 micron filter.
2. The acidity method in the Pilot Testing Work Plan was incorrectly identified as EPA 310.2.

**Table 12. Groundwater Monitoring Program**

Project No. 050067, Art Brass Plating, Seattle, Washington

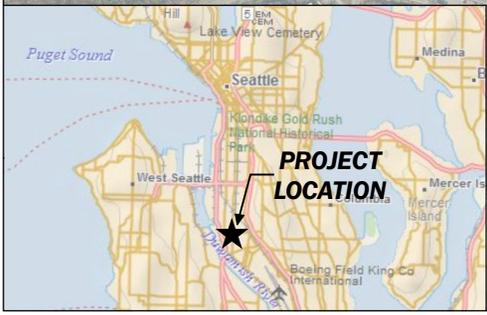
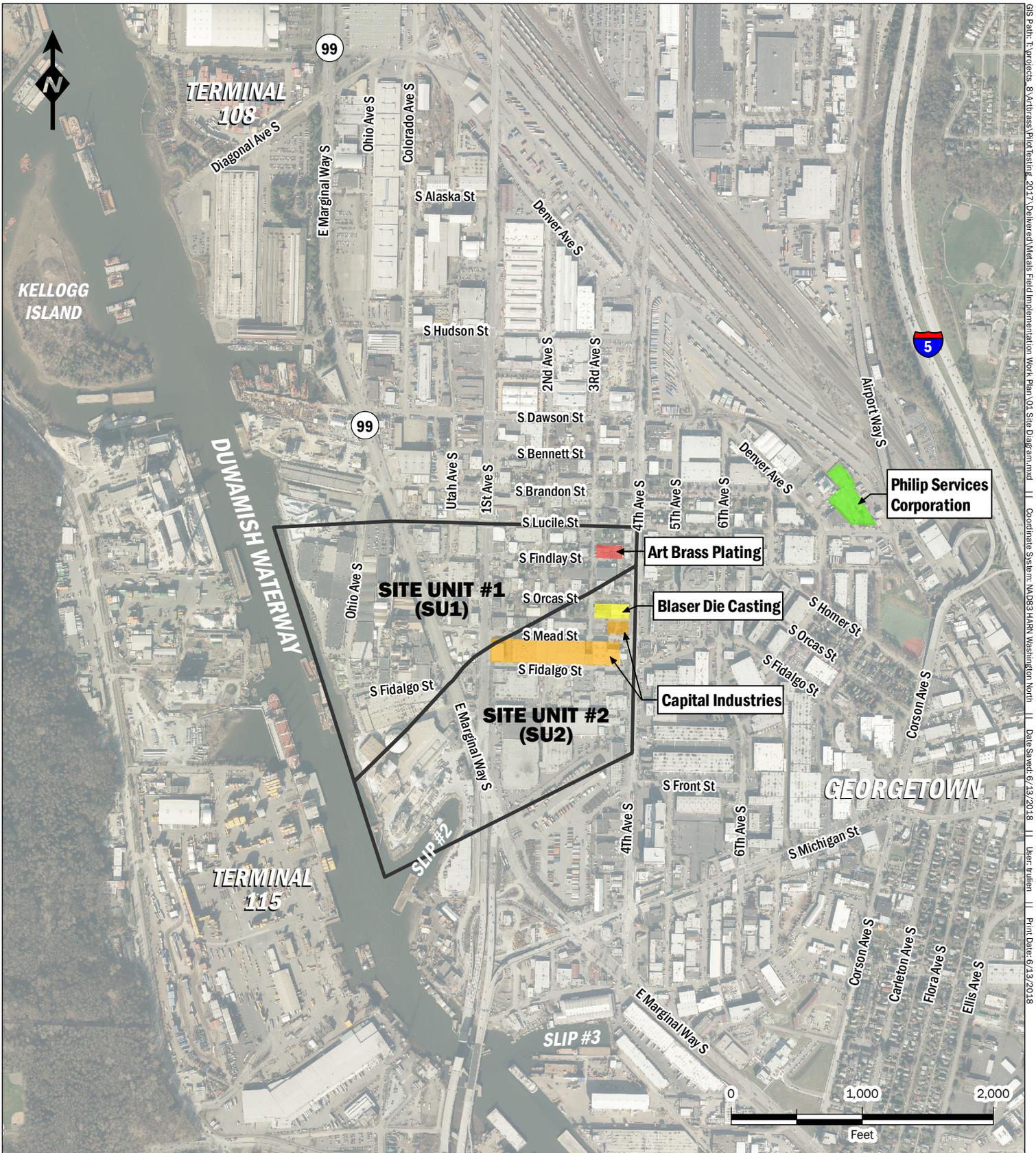
Location	Baseline	Performance Monitoring (Time Elapsed Postinjection)							
	Before Injection	0 days	Week 1	Week 2	Week 4	Month 2	Month 3	Month 6	Month 12
IW-1		1,2,3,4,5	4,5	4,5	1,2,3,4,5	4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
IW-2		1,2,3,4,5	4,5	4,5	1,2,3,4,5	4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
PSW-6	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
PSW-7	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
MW-3	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
PSW-8	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5	1,2,3,4,5
MW-3-30		1,3,4,5			1,3,4,5	1,3,4,5	1,3,4,5	1,3,4,5	1,3,4,5
MW-1 (upgradient)					1,3,5		1,3,5	1,3,5	1,3,5
MW-8 (downgradient)							1,3,5	1,3,5	1,3,5

**Notes:**

**Analytes (see Table 11):**

- 1 - Plating Metals
- 2 - Redox-Sensitive Metals
- 3 - General Chemistry
- 4 - Tracer
- 5 - Field Parameters
- IW - injection wells
- PSW - pilot monitoring wells

# FIGURES



**Site Diagram**  
 In Situ Metals Immobilization - Metals Field Implementation Work Plan  
 Art Brass Plating  
 Seattle, Washington

	JUN-2018	BY: PPW	FIGURE: <b>1</b>
	PROJECT NO. 050067	REVISED BY: DIM / RAP	

S:\Projects - 8\Address\Plotting\2017\Duwamish Metals Field Implementation Work Plan\01 Site Diagram.mxd | Coordinate System: NAD83 HARN Washington North | Date Saved: 6/13/2018 | User: tullen | Print Date: 6/13/2018

**Exploration Locations**

Symbol (Exploration Type)

- Monitoring Well
- Soil Boring/Probe
- △ Porewater

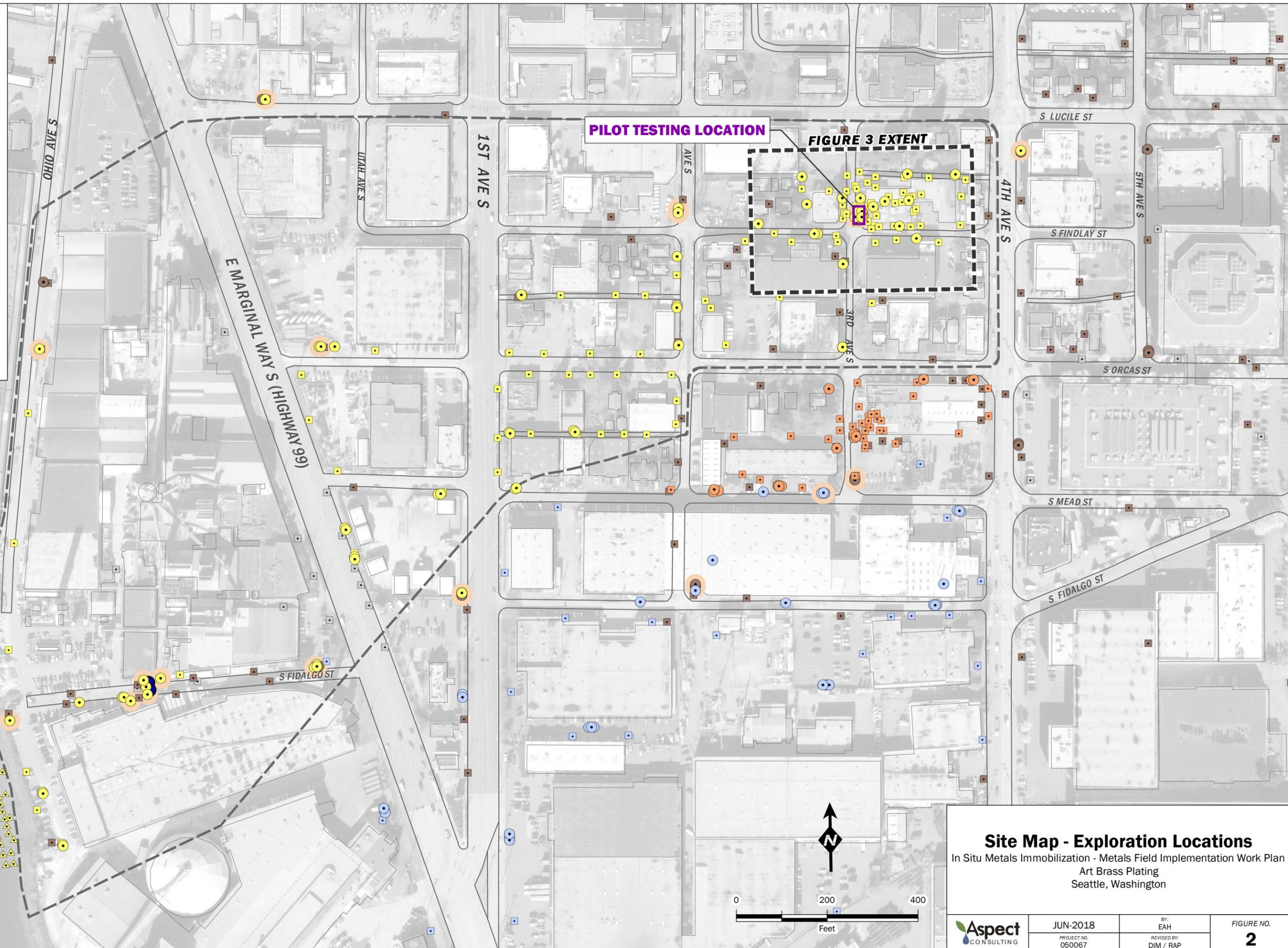
Color (Exploration Sampler)

- Art Brass Plating
- Blaser Die Casting
- Capital Industries
- Philip Services Corporation
- Other Companies

○ Art Brass Plating Study Area

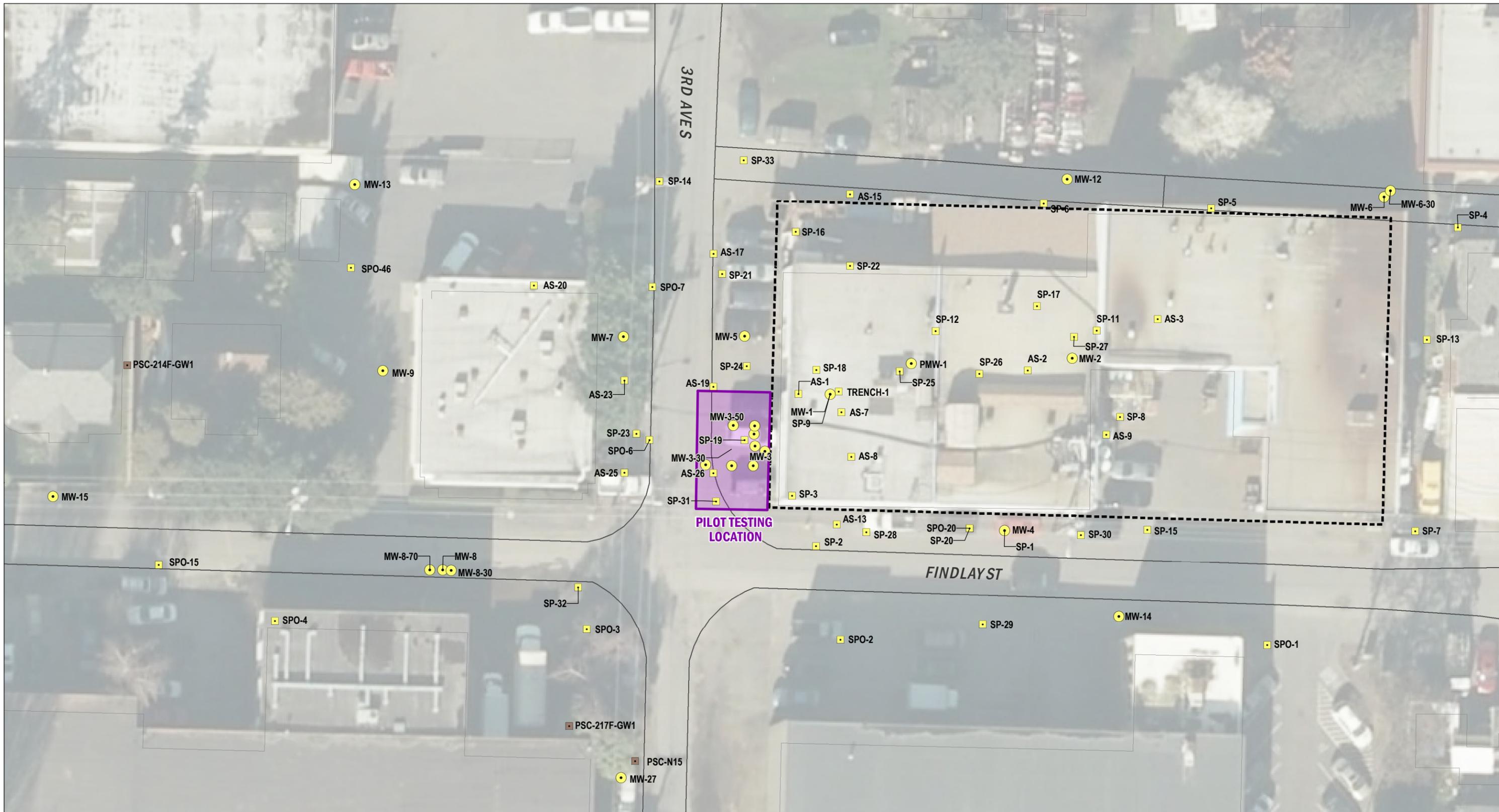
□ Building Outlines (as presented on other figures)

○ An orange halo indicates multiple parties sampled from one location



**Site Map - Exploration Locations**  
 In Situ Metals Immobilization - Metals Field Implementation Work Plan  
 Art Brass Plating  
 Seattle, Washington

	JUN-2018	BY: EAH	FIGURE NO. <b>2</b>
	PROJECT NO. 050067	REVISED BY: DIM / RAP	



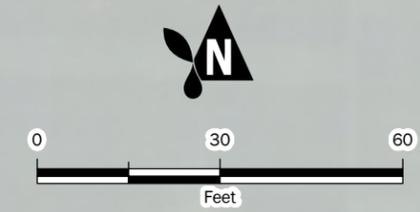
**Exploration Locations**

- Symbol (Exploration Type)
- Monitoring Well
  - Soil Boring/Probe

Color (Exploration Sampler)

- Art Brass Plating
- Philip Services Corporation

- ⬜ Art Brass Plating Tax Parcel
- ⬜ Building Outlines (as presented on other figures)



**Exploration Locations -  
Art Brass Plating Facility Detail**

In Situ Metals Immobilization - Metals Field Implementation Work Plan  
Art Brass Plating  
Seattle, Washington

	JUN-2018	BY: EAH	FIGURE NO. <b>3</b>
	PROJECT NO. 050067	REVISED BY: ACG / RAP	

GIS Path: T:\projects\_8\Artbrass Plant\2017\Delivered Metals Field Implementation Work Plan\03 Exploration Locations - ABP Facility Detail.mxd | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4901 Feet | Date Saved: 6/13/2018 | User: tmlen | Print Date: 6/13/2018

**INSET DETAIL**

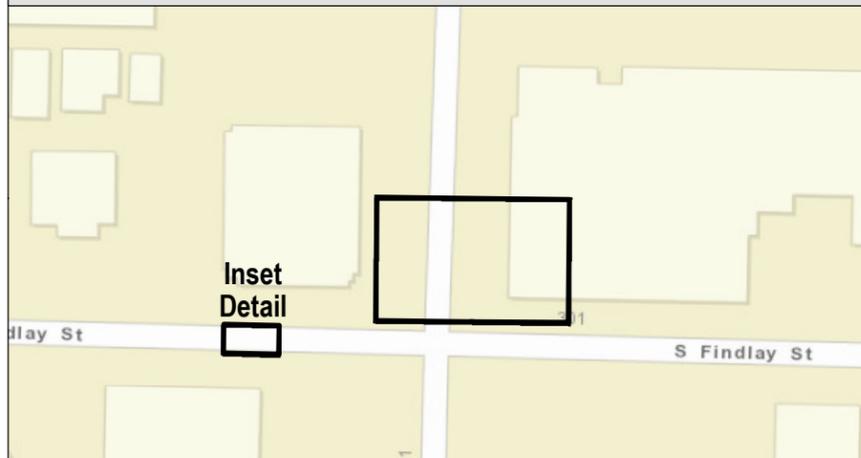
**S FINDLAY ST**

MW-8-70   MW-8   MW-8-30

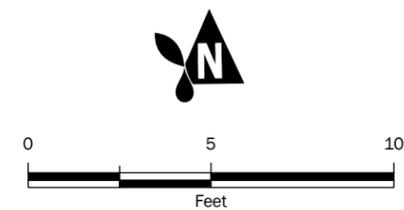
**3RD AVE S**

**ART BRASS PLATING FACILITY**

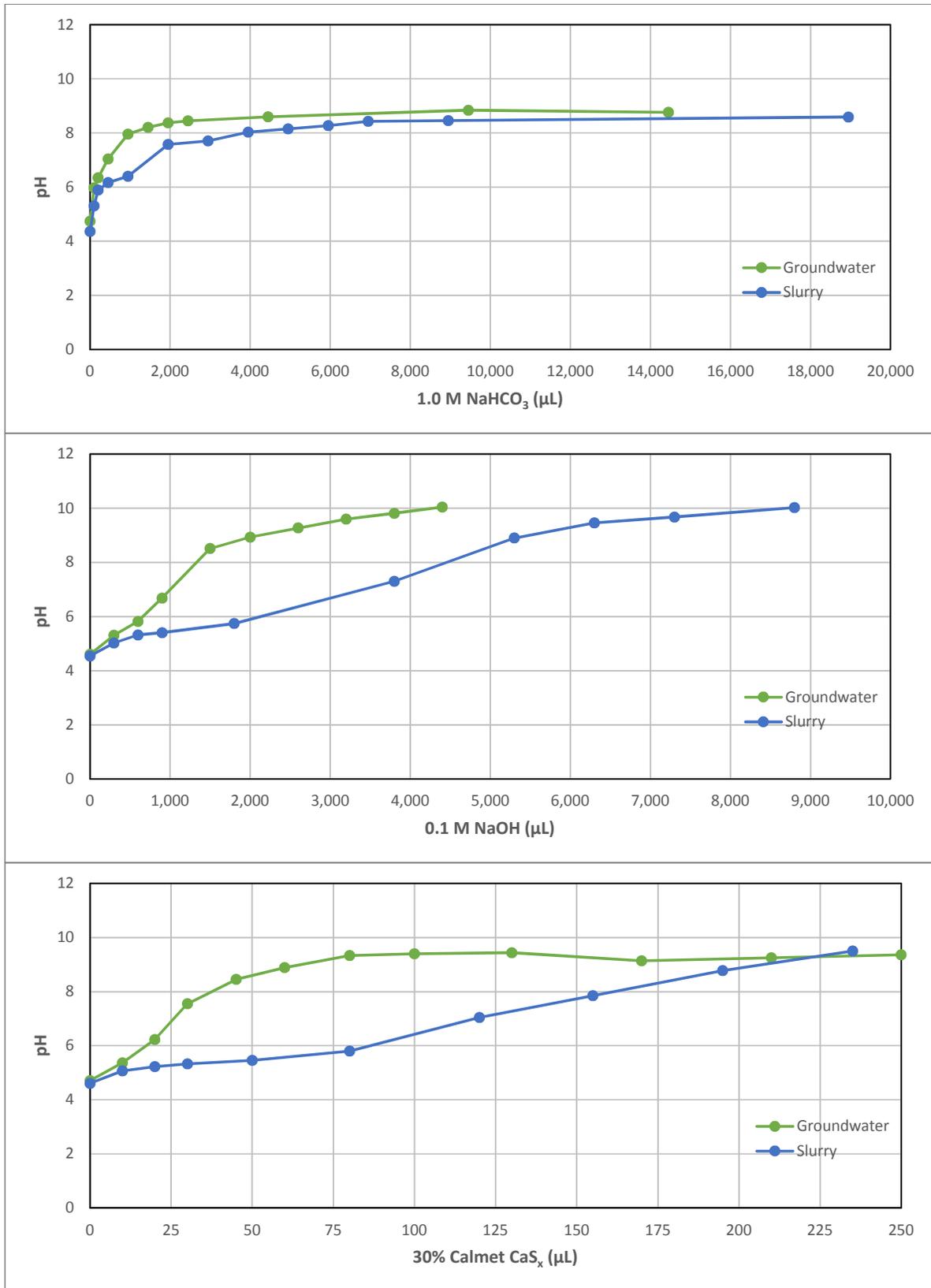
**MAP LOCATOR**



- Art Brass Plating Tax Parcel
- Building Outlines (as presented on other figures)
- Injection Well
- Performance Monitoring Well
- Upgradient Monitoring Well
- Monitoring Well (not part of Pilot Test)



<b>Pilot Testing Well Layout</b>		
In Situ Metals Immobilization - Metals Field Implementation Work Plan Art Brass Plating Seattle, Washington		
	JUN-2018	BY: EAH
	PROJECT NO. 050067	REVISED BY: ACG / RAP
		FIGURE NO. <b>4</b>



**Figure 5**

**Titration Batch Test Results**

Metals Field Implementation Work Plan

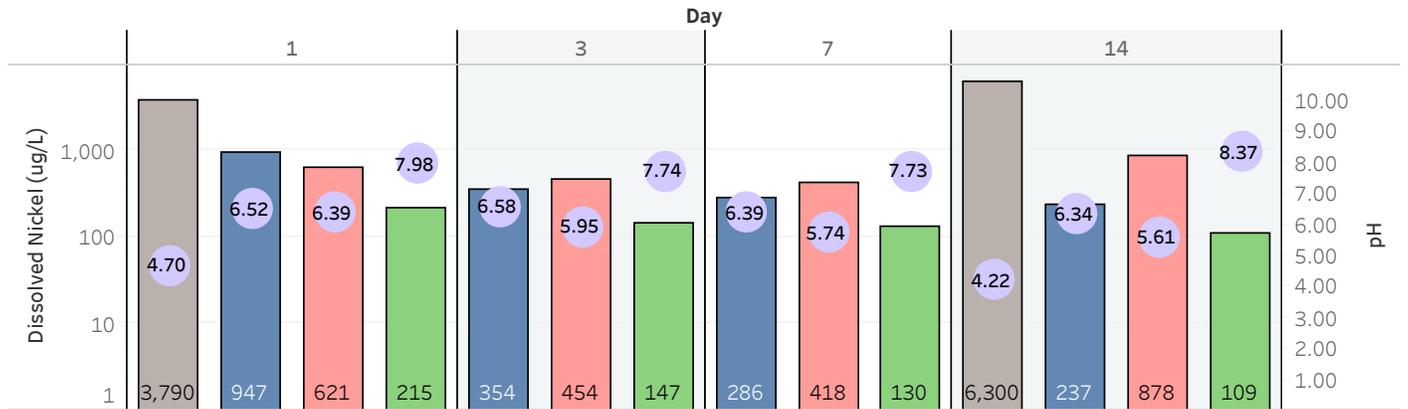
Art Brass Plating, Seattle, WA

Aspect Consulting

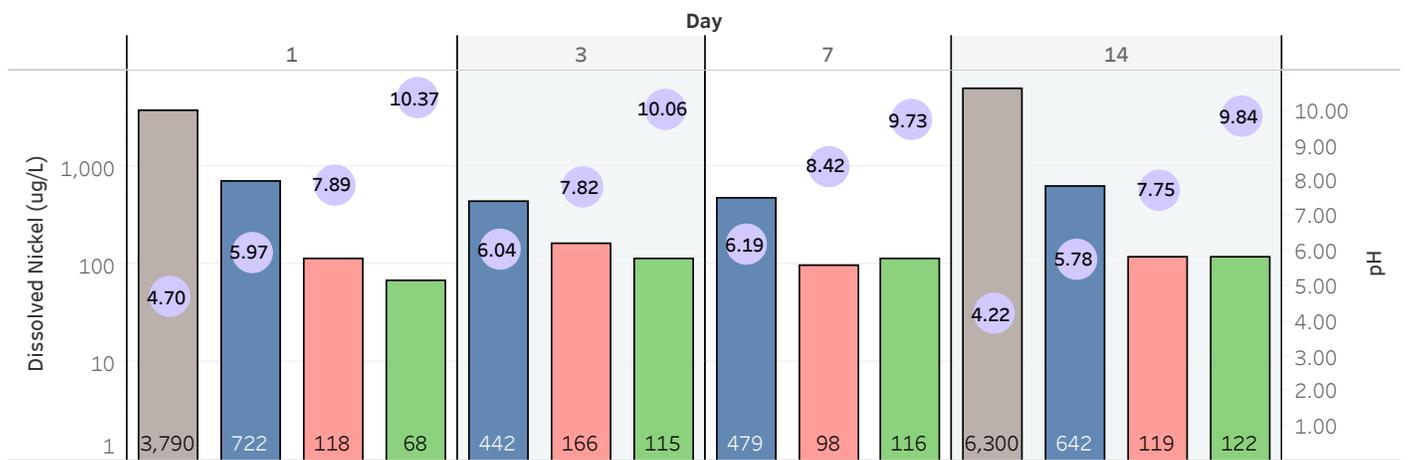
5/8/18

V:\050067 Art Brass Plating\Pilot Study\Metals\Field Implementation Work Plan\Ecology Review\Figures\05 Titration Results

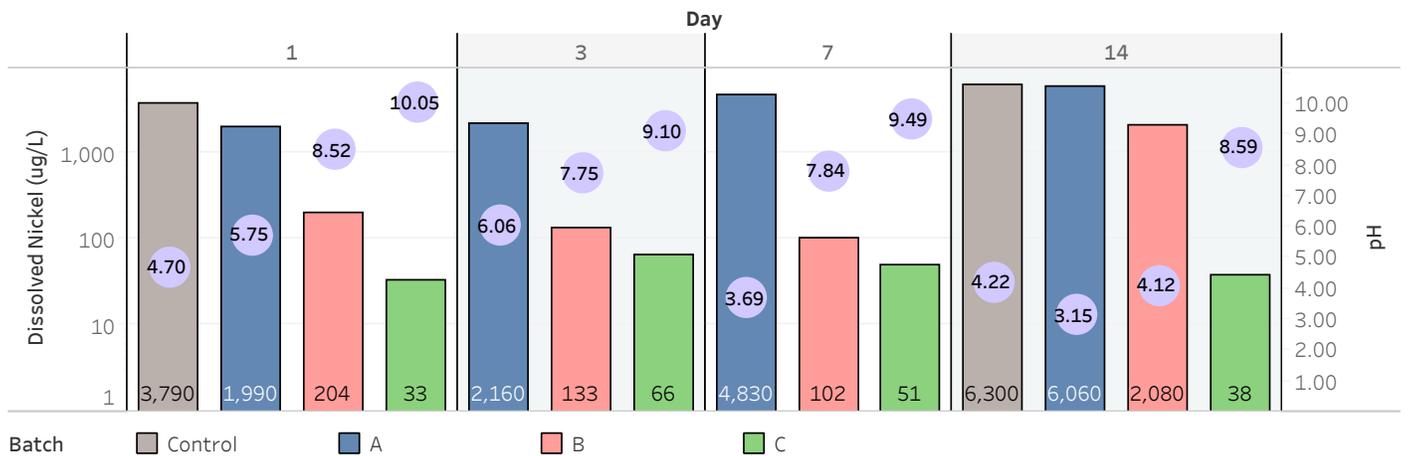
### Sodium Bicarbonate



### Sodium Hydroxide



### Calmet



Batch    Control    A    B    C

**INSET DETAIL**

**MW-8**  
 pH: 6.24 pH units  
 Acidity: < 10 U mg/L  
 Alk: 58.7 mg/L  
 SO4: 187 mg/L

**S FINDLAY ST**

MW-8-70    MW-8-30

**3RD AVES**

**ART BRASS PLATING FACILITY**

**MW-1**  
 pH: 4.18 pH units  
 Acidity: 40 mg/L  
 Alk: < 1 U mg/L  
 SO4: 219 mg/L

**PSW-6**  
 pH: 5.27 pH units  
 Acidity: 130 mg/L  
 Alk: 6.68 mg/L  
 SO4: 247 mg/L

**IW-1**  
 pH: 5.25 pH units  
 Acidity: 20 mg/L  
 Alk: 4.45 mg/L  
 SO4: 143 mg/L

MW-3-50

**MW-3**  
 pH: 4.87 pH units  
 Acidity: 26 mg/L  
 Alk: < 1 U mg/L  
 SO4: 163 mg/L

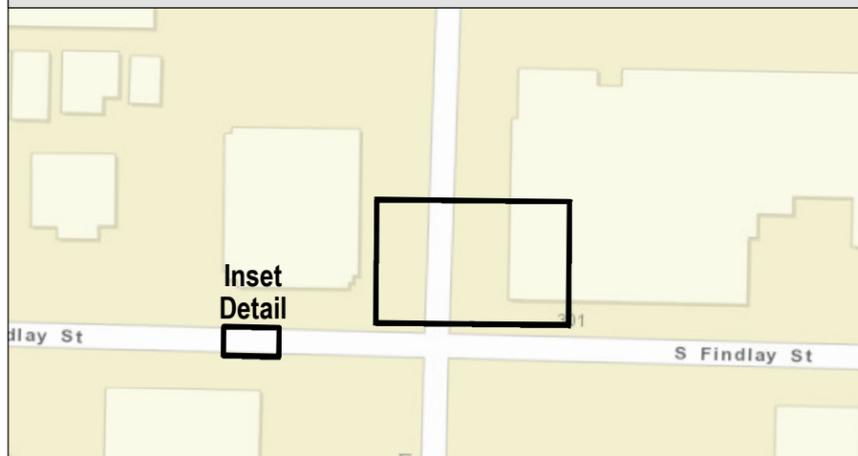
**MW-3-30**  
 pH: 6.33 pH units  
 Acidity: < 10 U mg/L  
 Alk: 158 mg/L  
 SO4: 18.6 mg/L

**PSW-8**  
 pH: 4.94 pH units  
 Acidity: 80 mg/L  
 Alk: < 1 U mg/L  
 SO4: 188 mg/L

**PSW-7**  
 pH: 4.97 pH units  
 Acidity: 20 mg/L  
 Alk: < 1 U mg/L  
 SO4: 215 mg/L

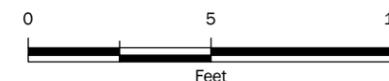
**IW-2**  
 pH: 5.19 pH units  
 Acidity: 24 mg/L  
 Alk: 3.64 mg/L  
 SO4: 145 mg/L

**MAP LOCATOR**



- Art Brass Plating Tax Parcel
- Building Outlines (as presented on other figures)
- Injection Well
- Performance Monitoring Well
- Upgradient Monitoring Well
- Monitoring Well (not part of Pilot Test)

**Notes:**  
 Alk = Alkalinity  
 SO4 = Sulfate  
 All results are in mg/L  
 Bold results indicate analyte was detected.



<b>General Chemistry Parameters in Groundwater</b>		
In Situ Metals Immobilization - Metals Field Implementation Work Plan Art Brass Plating Seattle, Washington		
	JUN-2018 <small>PROJECT NO. 050067</small>	BY: EAH <small>REVISED BY: ACG / RAP</small>
		FIGURE NO. <b>7</b>

**INSET DETAIL**

**MW-8**  
 Cd: < 0.1 U ug/L  
 Cu: 1.72 ug/L  
 Ni: 6740 ug/L  
 Zn: 7.56 ug/L

**S FINDLAY ST**

MW-8-70 MW-8-30

**3RD AVE S**

**ART BRASS PLATING FACILITY**

**MW-1**  
 Cd: 0.456 ug/L  
 Cu: 16.2 ug/L  
 Ni: 18600 ug/L  
 Zn: 44.4 ug/L

**PSW-6**  
 Cd: 0.171 ug/L  
 Cu: 1.06 ug/L  
 Ni: 4600 ug/L  
 Zn: 50.2 ug/L

**IW-1**  
 Cd: 0.176 ug/L  
 Cu: 23.1 ug/L  
 Ni: 2370 ug/L  
 Zn: 34.1 ug/L

MW-3-50

**MW-3**  
 Cd: 0.216 ug/L  
 Cu: 15.5 ug/L  
 Ni: 11400 ug/L  
 Zn: 46.6 ug/L

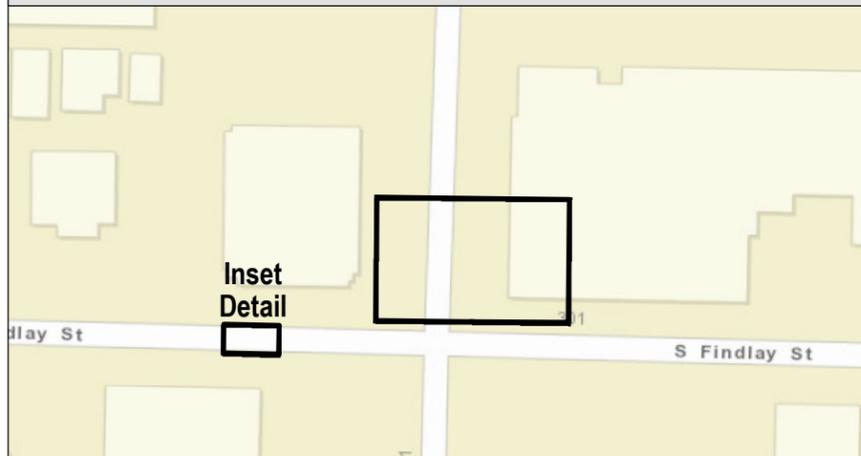
**MW-3-30**  
 Cd: < 0.1 U ug/L  
 Cu: < 0.5 U ug/L  
 Ni: 4.62 ug/L  
 Zn: < 4 U ug/L

**PSW-8**  
 Cd: 0.223 ug/L  
 Cu: 3.25 ug/L  
 Ni: 7510 ug/L  
 Zn: 54.8 ug/L

**PSW-7**  
 Cd: 0.251 ug/L  
 Cu: 2.55 ug/L  
 Ni: 8850 ug/L  
 Zn: 52.4 ug/L

**IW-2**  
 Cd: 0.139 ug/L  
 Cu: 10.2 ug/L  
 Ni: 4570 ug/L  
 Zn: 35.8 ug/L

**MAP LOCATOR**



- Art Brass Plating Tax Parcel
- Building Outlines (as presented on other figures)
- Injection Well
- Performance Monitoring Well
- Upgradient Monitoring Well
- Monitoring Well (not part of Pilot Test)

**Notes:**  
 Cd = Cadmium  
 Cu = Copper  
 Ni = Nickel  
 Zn = Zinc  
 All results are in ug/L  
 Bold results indicate analyte



**Dissolved Plating Metals in Groundwater**  
 In Situ Metals Immobilization - Metals Field Implementation Work Plan  
 Art Brass Plating  
 Seattle, Washington

	JUN-2018	BY: EAH	FIGURE NO. <b>8</b>
	PROJECT NO. 050067	REVISED BY: ACG / RAP	

Approximate Groundwater Flow Direction

3RD AVE S

MW-1

ART BRASS PLATING FACILITY

PSW-6

IW-1

MW-3-50

MW-3-30

MW-3

PSW-7

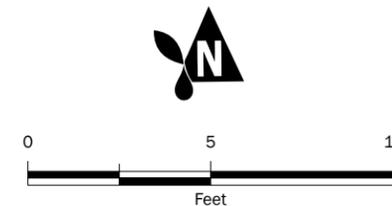
IW-2

PSW-8

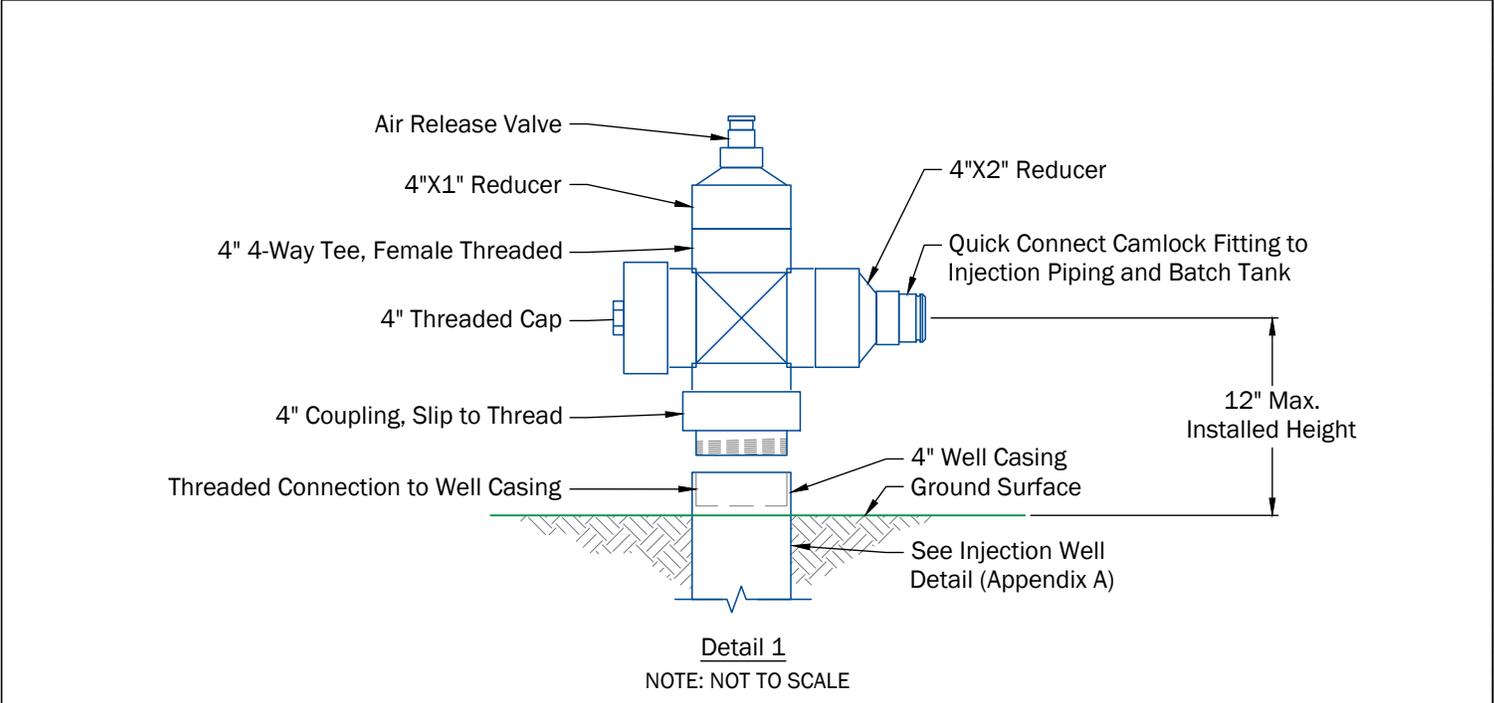
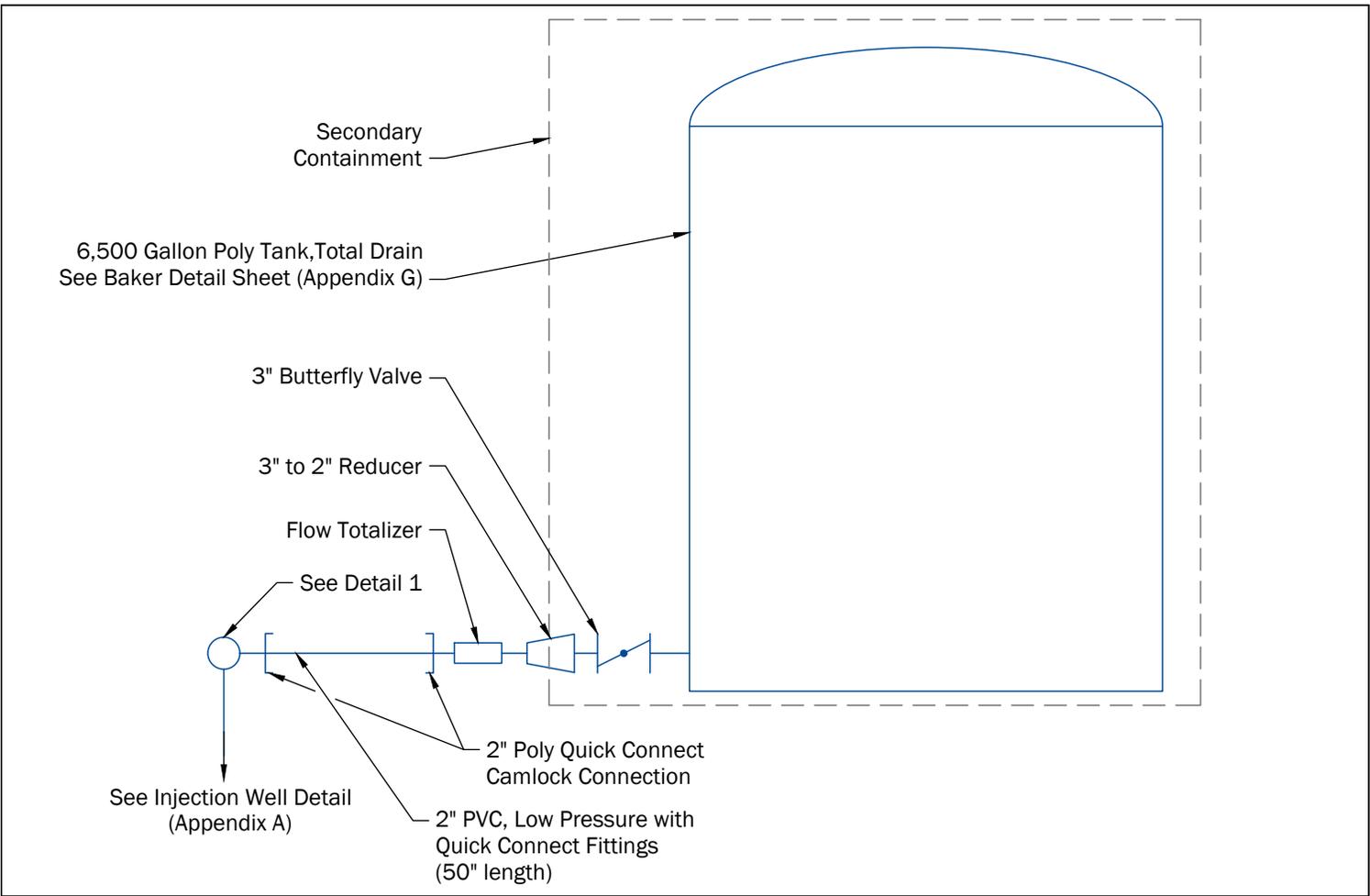
Secondary Containment Footprint

6,500 Gallon Baker Tank

- Target ROI (12 ft, See Table 10 for ROI assumptions)
- Art Brass Plating Tax Parcel
- Building Outlines (as presented on other figures)
- Injection Well
- Performance Monitoring Well
- Upgradient Monitoring Well
- Monitoring Well (not part of Pilot Test)



<b>Pilot Testing Design</b>		
In Situ Metals Immobilization - Metals Field Implementation Work Plan Art Brass Plating Seattle, Washington		
JUN-2018	BY: EAH	FIGURE NO. <b>9</b>
PROJECT NO. 050067	REVISED BY: ACG / RAP	



**Process and Instrumentation Diagram**  
 In-Situ Metals Immobilization-Pilot Testing Work Plan  
 Art Brass Plating  
 Seattle, Washington

	Jun-18	BY: ACG/CMV	Appendix
	PROJECT NO. 050067	REVISED BY:	<b>10</b>

CAD Path: Q:\ART Brass Plating\050067 - Art Brass\2017-04 In-Situ Metals Pilot Test Work Plan\050067.P&ID.dwg Fig 10 - P&ID || Date Saved: Jun 12, 2018 11:47am || User: cvenslyk



## **APPENDIX A**

### **Boring and Well Construction Logs**

Soil Classification		Terms Describing Relative Density and Consistency	
		Density	SPT <sup>(2)</sup> blows/foot
Coarse-Grained Soils - More than 50% <sup>(1)</sup> Retained on No. 200 Sieve	Gravels - More than 50% <sup>(1)</sup> of Coarse Fraction Retained on No. 4 Sieve	<b>GW</b>	Well-graded gravel and gravel with sand, little to no fines
		<b>GP</b>	Poorly-graded gravel and gravel with sand, little to no fines
		<b>GM</b>	Silty gravel and silty gravel with sand
		<b>GC</b>	Clayey gravel and clayey gravel with sand
		<b>SW</b>	Well-graded sand and sand with gravel, little to no fines
		<b>SP</b>	Poorly-graded sand and sand with gravel, little to no fines
Sands - 50% <sup>(1)</sup> or More of Coarse Fraction Passes No. 4 Sieve	≤ 5% Fines <sup>(5)</sup>	<b>SM</b>	Silty sand and silty sand with gravel
	5% to 15% Fines <sup>(5)</sup>	<b>SC</b>	Clayey sand and clayey sand with gravel
	15% to 50% Fines <sup>(5)</sup>	<b>ML</b>	Silt, sandy silt, gravelly silt, silt with sand or gravel
		<b>CL</b>	Clay of low to medium plasticity; silty, sandy, or gravelly clay, lean clay
		<b>OL</b>	Organic clay or silt of low plasticity
		<b>MH</b>	Elastic silt, clayey silt, silt with micaceous or diatomaceous fine sand or silt
Fine-Grained Soils - 50% <sup>(1)</sup> or More Passes No. 200 Sieve	Sils and Clays Liquid Limit Less than 50	<b>CH</b>	Clay of high plasticity, sandy or gravelly clay, fat clay with sand or gravel
		<b>OH</b>	Organic clay or silt of medium to high plasticity
		<b>PT</b>	Peat, muck and other highly organic soils
Sils and Clays Liquid Limit 50 or More		<b>2.0" OD Split-Spoon Sampler (SPT)</b>	Continuous Push Non-Standard Sampler
		<b>Bulk sample</b>	3.0" OD Thin-Wall Tube Sampler (including Shelby tube)
		<b>Grab Sample</b>	Portion not recovered
		<b>Estimated Percentage</b>	
		<b>Percentage by Weight</b>	<b>Modifier</b>
		<5	Trace
		5 to 15	Slightly (sandy, silty, clayey, gravelly)
		15 to 30	Sandy, silty, clayey, gravelly
		30 to 49	Very (sandy, silty, clayey, gravelly)
		<b>Moisture Content</b>	
		Dry - Absence of moisture, dusty, dry to the touch	
		Slightly Moist - Perceptible moisture	
		Moist - Damp but no visible water	
		Very Moist - Water visible but not free draining	
		Wet - Visible free water, usually from below water table	
		<b>Symbols</b>	
		<p>(1) Percentage by dry weight</p> <p>(2) (SPT) Standard Penetration Test (ASTM D-1586)</p> <p>(3) In General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)</p> <p>(4) Depth of groundwater</p> <p>(5) Combined USCS symbols used for fines between 5% and 15% as estimated in General Accordance with Standard Practice for Description and Identification of Soils (ASTM D-2488)</p>	
		ATD = At time of drilling BGS = below ground surface	

Classifications of soils in this report are based on visual field and/or laboratory observations, which include density/consistency, moisture condition, grain size, and plasticity estimates and should not be construed to imply field or laboratory testing unless presented herein. Visual-manual and/or laboratory classification methods of ASTM D-2487 and D-2488 were used as an identification guide for the Unified Soil Classification System.



**Art Brass Plating - 050067**

**Monitoring Well Log**

Project Address & Site Specific Location  
Seattle, WA, 3rd Ave South

Coordinates (SPN NAD83 ft)

Exploration Number

E:1270633 N:205245

**IW-1**

Contractor  
Holt Services, Inc.

Equipment  
Rotary drill rig

Sampling Method  
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)  
15.42'

Ecology Well Tag No.  
BKL-429

Operator  
Rayon

Exploration Method(s)  
10.5-in OD Hollow-stem Auger

Work Start/Completion Dates  
1/29/2018

Top of Casing Elev. (NAVD88)  
14.98'

Depth to Water (Below GS)  
4.9' (Static)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
15		8-inch steel flush monument Compression Plug Concrete surface seal					4-inch thick Asphalt with gravel base layer.	
		3/8-inch bentonite chips					Medium dense, moist, brown silty SAND (SM); fine to medium sand, with silt interbeds	
5		▼ 1/30/2018					Soft, moist, brown gray, sandy SILT (ML); fine sand, brown oxide staining, no odor, no sheen.	5
10		4-inch SCH40 threaded PVC	S1		Blows (non-SPT)= 1,2,2		Wet, brown gray, silty SAND (SM); fine to medium sand, no odor, no sheen.	
		#10/20 colorado silica sand					Scattered half-inch layers of brown staining.	10
10		▼ 1/29/2018	S2	IW-1-11-11.5 pH	Blows (non-SPT)= 1,1,2		Wet, black SAND (SP); fine to medium sand.	
		4-inch stainless steel 10-slot wire wrapped screen	S3	IW-1-11.5-12 pH	Blows (non-SPT)= 3,4,5 pH= 6.81		1-inch layer of silty sand.	
			S4	IW-1-13-13.5 pH	Blows (non-SPT)= 5,6,10 pH= 6.07		3/4-inch layer of silty sand.	15
15			S5	IW-1-14-14.5 pH	Blows (non-SPT)= 7,12,14 pH= 6.39			
			S6	IW-1-16-16.5 pH	Blows (non-SPT)= 8,14,25 pH= 6.97			
			S7	IW-1-17.5-18 pH	Blows (non-SPT)= 2,3,3 pH= 6.73			
20			S8	IW-1-20-20.5 pH	Blows (non-SPT)= 0,0,0 pH= 6.84			20
		2-foot sump						
		Threaded PVC endcap						
							Bottom of exploration at 23 ft. bgs.	

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ May 7, 2018

**Legend**

- No Soil Sample Recovery
- Split Barrel 3" X 2.375" (Mod Cal)

Water Level

- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: MML  
Approved by: DLC

**Exploration Log IW-1**



**Art Brass Plating - 050067**

**Monitoring Well Log**

Project Address & Site Specific Location  
Seattle, WA, 3rd Ave South

Coordinates (SPN NAD83 ft)

Exploration Number

E:1270639 N:205239

**IW-2**

Ecology Well Tag No.  
BKL-432

Contractor

Equipment

Sampling Method

Ground Surface (GS) Elev. (NAVD88)

Holt Services, Inc.

Rotary drill rig

Autohammer; 140 lb hammer; 30" drop

15.12'

Operator

Exploration Method(s)  
10.5-in OD Hollow-stem  
Auger

Work Start/Completion Dates

Top of Casing Elev. (NAVD88)

Depth to Water (Below GS)

Rayon

1/29/2018

1/29/2018

14.78'

4.88' (Static)

Depth (feet)	Elev. (feet)	Exploration Completion and Notes	Sample Type/ID	Analytical Sample Number & Lab Test(s)	Field Tests	Material Type	Description	Depth (ft)
15		8-inch steel flush monument Compression Plug Concrete surface seal					4-inch thick Asphalt with gravel base layer.	
		3/8-inch bentonite chips					Medium dense, moist, brown silty SAND (SM); fine to medium sand, with silt interbeds	
5	10	▼ 1/30/2018 4-inch SCH40 threaded PVC	S1		Blows (non-SPT)= 0,0,0		Soft, moist, brown gray, sandy SILT (ML); fine sand, brown oxide staining, no odor, no sheen.	5
		#10/20 colorado silica sand						
10	5	▽ 1/29/2018	S2	IW-2-10-10.5 pH	Blows (non-SPT)= 3,5,7 pH= 5.95		Wet, black SAND (SP); fine to medium sand.	10
		4-inch stainless steel 10-slot wire wrapped screen	S3	IW-2-11-11.5 pH	Blows (non-SPT)= 6,9,8 pH= 6.82		Scattered half-inch layers of brown staining.	
			S4	IW-2-12.5-13 pH	Blows (non-SPT)= 5,8,9 pH= 6.71		Scattered thinly laminated silty sand.	
15	0		S5	IW-2-13.5-14 pH	Blows (non-SPT)= 5,6,9 pH= 6.65			15
			S6	IW-2-14-14.5 pH	Blows (non-SPT)= 10,15,21 pH= 6.73			
			S7	IW-2-15-15.5 pH	Blows (non-SPT)= 8,16,20 pH= 6.77			
			S8	IW-2-16-16.5 pH	Blows (non-SPT)= 7,10,16 pH= 6.82			
20	-5	2-foot sump						20
		Threaded PVC endcap						
							Bottom of exploration at 23 ft. bgs.	

**Legend**

- No Soil Sample Recovery
- Split Barrel 3" X 2.375" (Mod Cal)

Water Level

- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: MML  
Approved by: DLC

**Exploration Log  
IW-2**

Sheet 1 of 1

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ May 7, 2018



**Art Brass Plating - 050067**

**Monitoring Well Log**

Project Address & Site Specific Location  
Seattle, WA, 3rd Ave South

Coordinates (SPN NAD83 ft)  
E:1270633 N:205252

Exploration Number

**PSW-6**

Ecology Well Tag No.  
BKL-431

Contractor  
Holt Services, Inc.

Equipment  
Rotary drill rig

Sampling Method  
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)  
15.02'

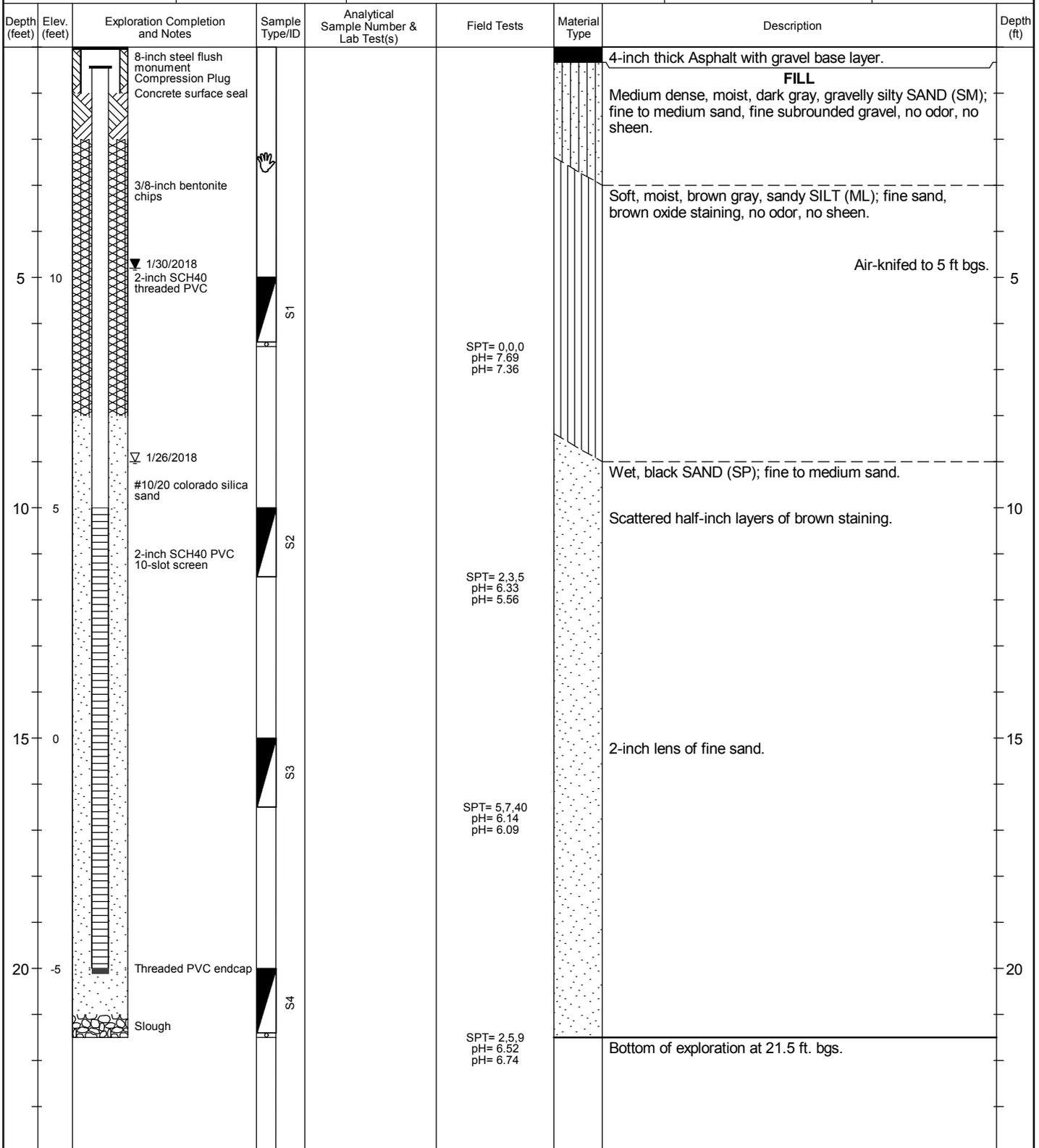
Operator  
Rayon

Exploration Method(s)  
8.5" OD X 4.25" ID  
Hollow-Stem Auger

Work Start/Completion Dates  
1/30/2018

Top of Casing Elev. (NAVD88)  
14.5'

Depth to Water (Below GS)  
4.8' (Static)



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BISERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECT\ART BRASS 050067.GPJ May 7, 2018

**Legend**

- ☐ No Soil Sample Recovery
- ▣ Grab sample
- ▣ Split Barrel 2" X 1.375" (SPT)

Water Level

- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: MML  
Approved by: DLC

**Exploration Log PSW-6**



**Art Brass Plating - 050067**

**Monitoring Well Log**

Project Address & Site Specific Location  
Seattle, WA, 3rd Ave South

Coordinates (SPN NAD83 ft)  
E:1270635 N:205240

Exploration Number

**PSW-7**

Ecology Well Tag No.  
BKL-428

Contractor  
Holt Services, Inc.

Equipment  
Rotary drill rig

Sampling Method  
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)  
14.91'

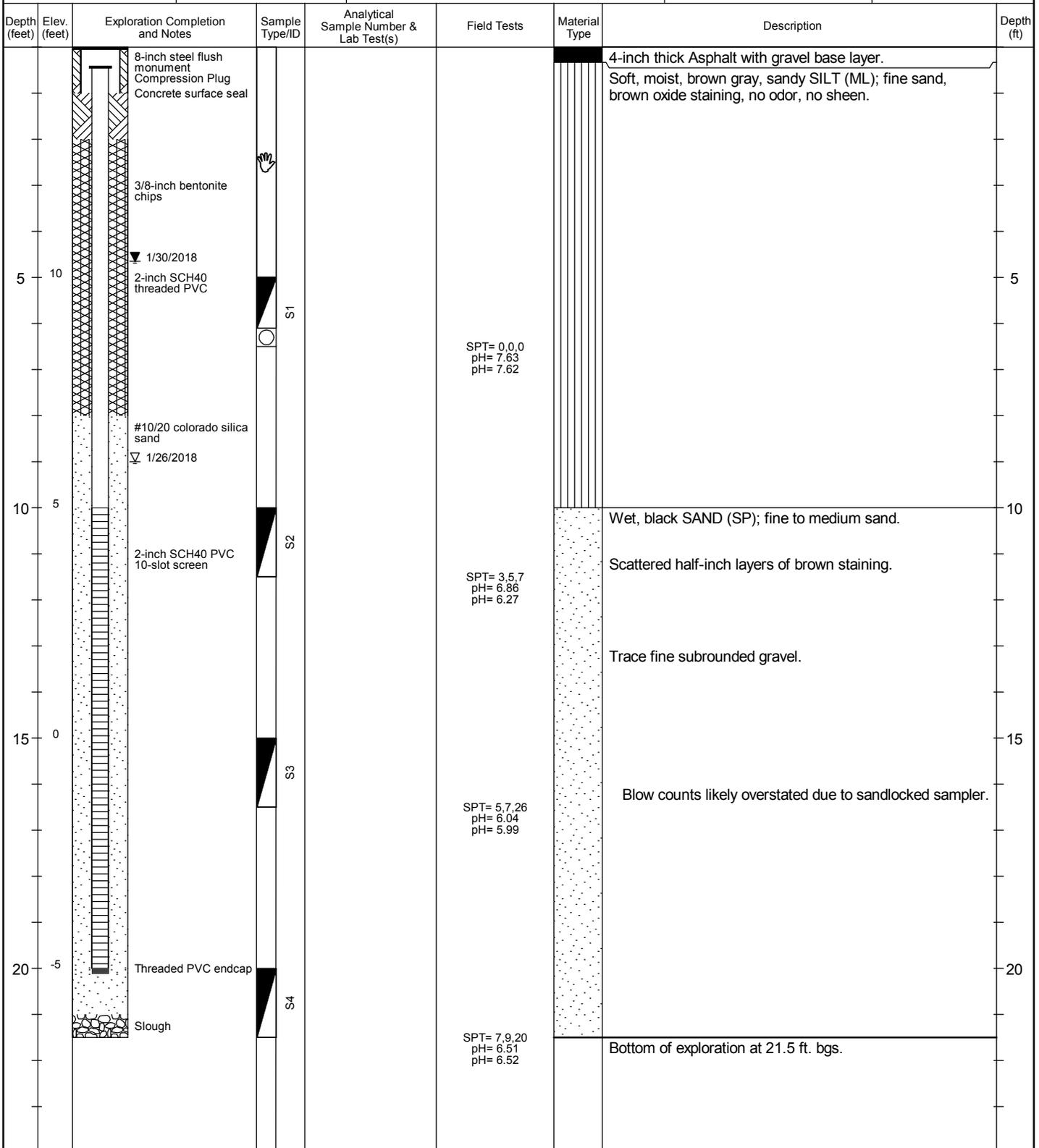
Operator  
Rayon

Exploration Method(s)  
8.5" OD X 4.25" ID  
Hollow-Stem Auger

Work Start/Completion Dates  
1/26/2018

Top of Casing Elev. (NAVD88)  
14.67'

Depth to Water (Below GS)  
4.65' (Static)



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BISERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECT\ART BRASS 050067.GPJ May 7, 2018

**Legend**

- ☐ No Soil Sample Recovery
- ▣ Grab sample
- ▣ Split Barrel 2" X 1.375" (SPT)

Water Level

- ▼ Static Water Level
- ▽ Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: MML  
Approved by: DLC

**Exploration Log PSW-7**



**Art Brass Plating - 050067**

**Monitoring Well Log**

Project Address & Site Specific Location  
Seattle, WA, 3rd Ave South

Coordinates (SPN NAD83 ft)

E:1270623 N:205243

Exploration Number

**PSW-8**

Ecology Well Tag No.  
BKL-427

Contractor

Holt Services, Inc.

Equipment

Rotary drill rig

Sampling Method

Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)

14.91'

Operator

Rayon

Exploration Method(s)  
8.5" OD X 4.25" ID  
Hollow-Stem Auger

Work Start/Completion Dates

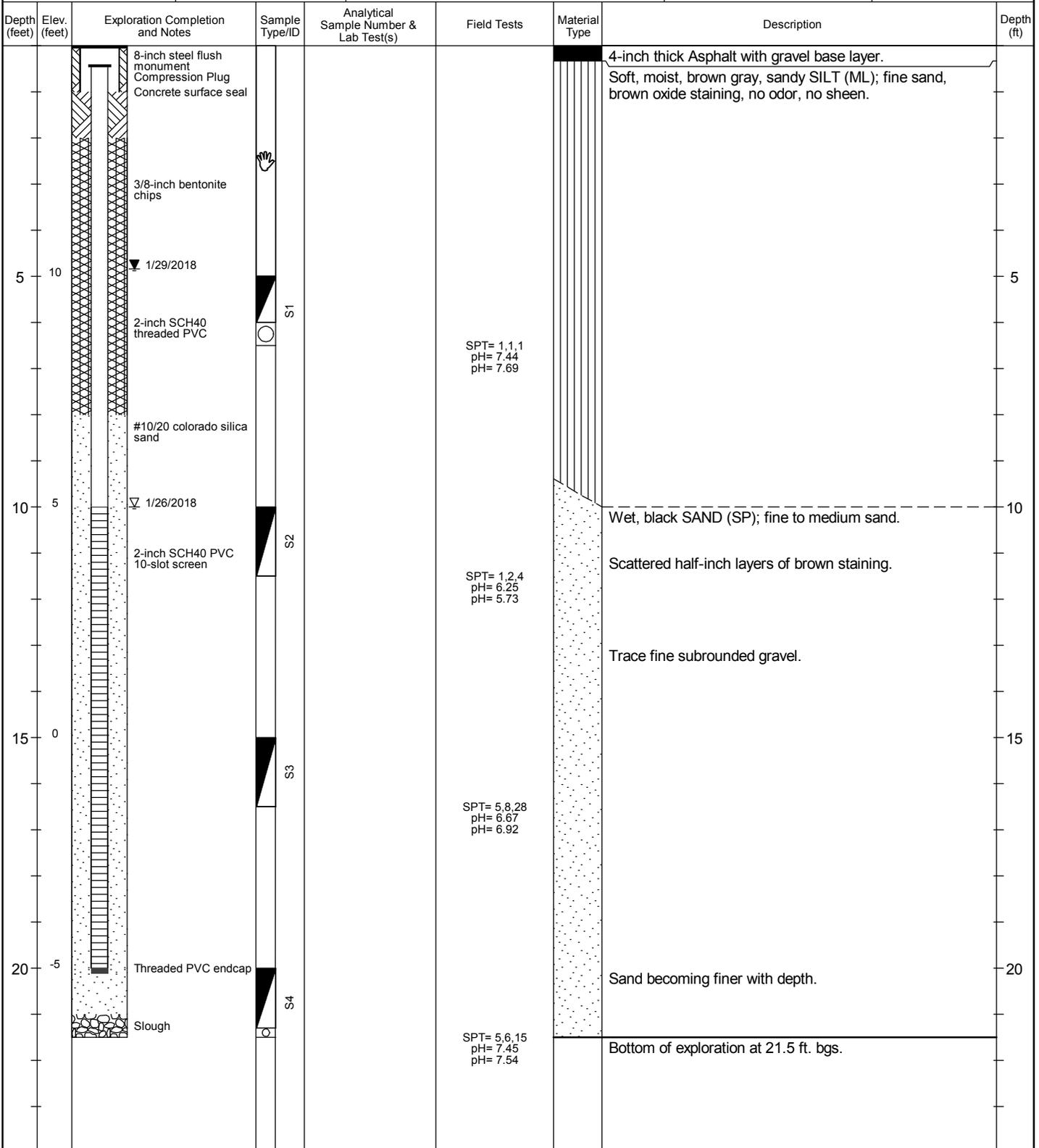
1/26/2018

Top of Casing Elev. (NAVD88)

14.7'

Depth to Water (Below GS)

4.84' (Static)



**Legend**

- No Soil Sample Recovery
- Grab sample
- Split Barrel 2" X 1.375" (SPT)

Water Level

- Static Water Level
- Water Level ATD

See Exploration Log Key for explanation of symbols

Logged by: MML  
Approved by: DLC

**Exploration Log PSW-8**

Sheet 1 of 1

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\PROJECTS\ART BRASS 050067.GPJ May 7, 2018

## **APPENDIX B**

### **Street Use Permit and Traffic Control Plan**



Seattle Department of Transportation  
 Street Use Division  
 700 Fifth Avenue, Suite 2300 | P.O. Box 34996  
 Seattle, Washington 98124-4996  
 (206) 684-5253 | [SDOTPermits@seattle.gov](mailto:SDOTPermits@seattle.gov)

SDOT Permit Number(s)

\_\_\_\_\_  
 \_\_\_\_\_

(Official Use Only)

# UTILITY PERMIT APPLICATION

Seattle Municipal Code (SMC) 15.32

## 1 APPLICATION DATE

(mo/day/year)

SDOT Project ID # \_\_\_\_\_

## 2 PRIMARY PROJECT ADDRESS

**Address Number**

**Street Name (include NE, SW, Ave, St, Blvd, etc.)**

## 3 PROJECT TYPE AND NAME (Check all that apply)

### UTILITY WORK IS:

**Associated with a Development:**

**New Construction**

- Single Family
- Multifamily
- Commercial/Mixed Use
- Industrial
- Other

**Tenant Improvements**

**Stand-Alone Infrastructure Build-out:**

**Small**

Within 4-block diameter for non-arterial streets and/or 4-block lineal run for arterial streets

**Large "Project-Based"**

- Involves multiple locations
- Less than one mile in length

**A Utility Major Project (UMP)**

**Part of a Street Improvements Project (SIP)**

**Associated with a Capital Improvements Project (CIP)**

**Name of Project** (for single family residences or similar, write "NA")

**If part of an UMP, SIP, or CIP provide project manager or project engineer (name)**

**4 PROJECT SCOPE** [see Section **6** for project **location description**]

**Describe Project, Work, and Expected Ground Disturbance in Right of Way**

Environmental monitoring well installation

Desired Start Date  (mo/day/year)

Duration (round to nearest 10)  (days)

Does Your Project Include Ground Disturbance?  Yes  No

Total Area Used in the Right of Way  (sq. ft.)

(include staging areas, work zones, and closures due to traffic control, such as street or sidewalk closure)

Job/Work Order Number

**5 BACKGROUND**

Applied Online/By Email

**EXISTING OR RELATED PERMITS**  
(Provide permit numbers if known)

**DPD Permits**

Note: DPD Permit #s are 7 digits and usually begin with a 3 or 6

	Permit #
Land Use	<input type="text"/>
Demolition/Building	<input type="text"/>
Side Sewer	<input type="text"/>
Other	<input type="text"/>

**SDOT Permits**

	Permit #
Construction Use	<input type="text"/>
Simple Utility	<input type="text" value="336822"/>
SIP/Utility Major	<input type="text"/>
Public Space Management: (Annual/Vending/Term)	<input type="text"/>
Other	<input type="text"/>

**INSPECTOR WARNING**

Verbal  Written

Note: Failure to notify Street Use of Inspector Warning could cause delays in permit processing and may lead to additional fees or fines.

## 6 PROJECT LOCATION DESCRIPTION

Describe Location (measured from street centerlines, monuments, or other fixed structures)

25 feet north of S Findlay St. and 10 feet east of 3rd Ave. S. in parking area.

### Affected Street(s)

EXAMPLE:

Street	From (intersecting street)	To (intersecting street)
22nd Ave	E John St	E Thomas St
3rd Ave N	25 feet north of S Findlay	East shoulder of 3rd Ave.

## 7 APPLICANT INFORMATION

PLEASE IDENTIFY YOURSELF (Check all that apply)

STAFF USE ONLY

- Public Agency** (SPU, SCL, King County, Sound Transit, WSDOT, etc.) ..... BIL
- Applying on behalf** of a Public Agency ..... BIL
- Letter of Authorization Required
- Regulated **Private Utility** Company (PSE, Comcast, Seattle Steam, etc.) ..... BIL
- Applying on behalf** of a Private Utility Company ..... BIL
- Letter of Authorization Required
- Private Contractor** ..... OTC
- Applying on behalf** of a Private Contractor ..... OTC
- Letter of Authorization Required
- Home/Property Owner** ..... OTC
- Engineering/Architecture Firm** ..... OTC

### STREET RESTORATION BY

- Permittee
- Private Contractor/Registered Side Sewer or Pavement Restoration Contractor
- SDOT Street Maintenance
- None

## 8

**WORK DESCRIPTION**

Note: All at-grade utility infrastructure installations may require additional review.

**TYPE OF WORK** (Check all that apply)

- Utility Poles or Street Lights** – Install, Replace, Remove or Maintain (51B)
- Utility Aerial Lines** – Maintain, Install or Remove (51C)
- Gas** – Maintain, Install or Remove (51D)
- Utility Maintenance** – No Ground-Disturbing Activity (51E)
- Side Sewer/Storm Services** completed by **private party** – Maintain, Install or Remove (51F)
- Utility Service Installations** completed by **private party** – Maintain, Install or Remove (51G)
- Electrical/Telecom** – Maintain, Install or Remove (51H)  
(see Section 9 for submittal requirements)
- Does this installation serve private property?  Yes  No
- Installing:
- Cabinets
- Vaults
- Maintenance Holes (MH)

 **Surveying, Soil Sampling, Potholing, Monitoring Wells or Test Bores** (51I)

Does work support ecological sampling or remediation?  Yes  No

Will monitor wells be installed?  Yes  No

Will monitor wells be:

- Temporary
- Permanent

How long will well(s) exist in right of way  (days or years)

Material

Depth  (feet or inches)

Size  (diameter in inches)

- Water infrastructure** and service lines by **SPU** – Maintain, Install or Remove (51J)
- Sanitary/Storm infrastructure** and service lines by **SPU** – Maintain, Install or Remove (51K)
- Pavement **Restoration Only** (51M)
- Franchise Utility Maintenance** (Railroad, Seattle Steam, Olympic Pipeline) (51N)
- Private Water Service Line** (from water meter to private property) (51O)

**IS YOUR PROJECT A UTILITY MAJOR PROJECT?**

- Major Projects – Utility System Construction (51)
- Major Projects – Transportation (51A)
- Major Projects – Maintain Existing Transportation Infrastructure (51L)

**INSTALLATION METHOD**

(If applicable. Check all that apply)

- Open Trench
- Hole-Hog®/Moling
- Directional Boring (do not use this permit application, requires Utility Major Permit)
- Microtunneling
- Pothole 12-inches or less (Auger drill/vac)
- Other

## APPLICATION REQUIREMENTS

### REQUIRED AT APPLICATION

- Site Plan - see Client Assistance Memo (CAM) 2116
- Traffic Control Plan (Arterials and High Impact Areas) - see CAM 2111

### ADDITIONAL DOCUMENTS AND APPROVALS THAT MAY BE REQUIRED

- Letter of Authorization (LOA)
- SCL Customer Service – Point of Connection (POC) Approval (see stamped approved service plan)
- King County Metro Transit Approval
- Holiday Moratorium Exception Request (Thanksgiving Day through Jan. 1) - see CAM 2107
- Pavement Moratorium Waiver Request
- Historic or International District Approval
- Other Department Review/Approval

### VAULT/MAINTENANCE HOLE (MH) INSTALLATION REQUIREMENTS

- Base Map and Topographic Map showing a 25-foot radius and the following:
  - Dimension specific location of vault/MH from existing fixed points
  - Call out size and type of vault and lid (external dimensions)
  - Provide standard plan #, if applicable
  - Indicate shape of vault (circular, rectangular), material, and surface treatment for lid (non-skid, fiber-glass, etc.)
- Vault and lid specifications and manufacturer's cutsheets

### AT-GRADE CABINET INSTALLATION REQUIREMENTS

- Base Map and Topographic Map showing a 25-foot radius and the following:
  - List reason that cabinet must be placed in right of way
  - Dimension specific location of cabinet from existing fixed point(s)
  - Indicate cabinet size and platform size
- Details of screen design

### ADA REVIEW REQUIREMENTS (Required for ADA-impacted infrastructure, such as wheelchair curb ramps)

- Photographs of existing conditions
- Base Map and Topographic Map
- Engineered Plan with existing and proposed spot elevations, slopes, and cross-slopes

### UTILITY MAJOR PROJECTS - SEE CAM 2600

## 10 APPLICANT

Name: <b>Bob Hanford</b>	SDOT Customer ID Number:
Company: <b>Aspect Consulting, LLC</b>	SDOT Company ID Number: <b>TRN100517</b>
Mailing Address (include city, state, zip): <b>350 Madison Ave. N. Bainbridge Island, WA 98110</b>	Office/Home Phone Number: <b>206-780-7729</b>
	Mobile Phone Number: <b>206-276-9256</b>
	Email Address: <b>bhanford@aspectconsulting</b>

## 11 FINANCIALLY RESPONSIBLE PARTY (Permittee)

Is **Applicant** the Financially Responsible Party?  Yes - skip this section, proceed to **12**

Is **Applicant applying on behalf** of the Financially Responsible Party?  Yes - **Letter of Authorization (LOA)** required

Name:	SDOT Customer ID Number:
Company:	SDOT Company ID Number:
Mailing Address (include city, state, zip):	Office/Home Phone Number:
	Mobile Phone Number:
	Email Address:

## 12 24-HOUR CONTACT (Job Site Contact)

Is **Applicant** the 24-Hour Contact?  Yes - skip this section, proceed to **13**

Is **Financially Responsible Party** the 24-Hour Contact?  Yes - skip this section, proceed to **13**

Name:	SDOT Customer ID Number:
Company:	SDOT Company ID Number:
Mailing Address (include city, state, zip):	Office/Home Phone Number:
	Mobile Phone Number:
	Email Address:

## 13 TERMS AND CONDITIONS

**Indemnification.** The Permittee agrees to defend, indemnify, and hold harmless the City of Seattle, its officials, officers, employees, and agents against: (1) any liability, claims, causes of action, judgments, or expenses, including reasonable attorney fees, resulting directly or indirectly from any act or omission of the Permittee, its subcontractors, anyone directly or indirectly employed by them, and anyone for whose acts or omissions they may be liable, arising out of the Permittee's use or occupancy of the public right of way; and (2) all loss by the failure of the Permittee to fully or adequately perform, in any respect, all authorizations or obligations under the Permit.

**Acceptance of terms, conditions, and requirements.** Permittee shall accept the terms, conditions, and requirements of the permit and agree to comply with them to the satisfaction of the Seattle Department of Transportation, Street Use

Division. Permittee further agrees to comply with all applicable city ordinances, including but not limited to Title 15 SMC, and all applicable requirements of state and federal law. Work shall begin within six months from the date of approval unless other arrangements are made, otherwise the application shall be void.

**Applicant/Permittee or Authorized Agent Statement:** I declare under penalty of perjury under the laws of the State of Washington that I am the Applicant/Permittee OR the authorized agent of the Applicant/Permittee, that the information provided is correct and complete, and that I have the authority to bind the Applicant/Permittee to this application.

**Deposits, Charges, and Future Billings:** The Permittee is responsible for all permit charges. If a deposit was made for estimated future Street Use services, any unused portion of the deposit will be refunded to the Applicant/Permittee. Any charges in excess of the deposit will be billed to the Applicant/Permittee.

APPLICANT SIGNATURE

DATE 06/01/2017

# PERMITTEE CHECKLIST PEDESTRIAN MOBILITY IN AND AROUND WORK ZONES

## 1 PROJECT INFORMATION

Company Name: <b>Aspect Consulting, LLC</b>	Applicant Name: <b>Bob Hanford</b>
Project Address: <b>5516 3rd Ave S.</b>	Submittal Date: <b>06/01/2017</b>
Permit #(s):	

## 2 EXISTING OR NEW PROJECT?

- Existing – permitted **prior** to January 1st, 2016 by SDOT Street Use
- New – permitted **after** January 1st, 2016 by SDOT Street Use

## 3 CURRENT PHASE

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Project has not started                           | <input type="checkbox"/> Utility work  |
| <input type="checkbox"/> Demolition   | <input type="checkbox"/> Street improvement work   |
| <input type="checkbox"/> Shoring and excavation                                       | <input type="checkbox"/> Emergency work as defined by SMC 25.08.110  |
| <input type="checkbox"/> Structure  | <input checked="" type="checkbox"/> Other:   |
| <input type="checkbox"/> Building envelope/façade work                                | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Environmental Pilot Study for groundwater</div> |
| <input type="checkbox"/> Sidewalk or street construction, restoration, or maintenance |  |

Duration of current phase  (specify days or months)

## 4 PEDESTRIAN MOBILITY

Applicant **must show** proposed mobility on Site Plans and Traffic Control Plans submitted with permit applications  
**How will pedestrians get around your work zone? Check all that apply.**

TYPE OF MOBILITY	LIST STREET FRONTAGE(S)
<input type="checkbox"/> <b>Open walkway</b> - Sidewalk is open	
<input type="checkbox"/> <b>Covered walkway</b> - Walk-through scaffolding, conex boxes, etc.	
<input type="checkbox"/> <b>Reroute</b> - There is pedestrian passage adjacent to the work area (may require Director Approval)	
<input type="checkbox"/> <b>Detour</b> - Sidewalk is closed; pedestrians are directed to alternative routes (may require Director Approval)	
<input type="checkbox"/> <b>Varies</b> - Depending on time of day (daytime mobility setup differs from nighttime mobility setup)	
<input checked="" type="checkbox"/> Other: <input type="text" value="No sidewalks present"/>	3rd Ave S. shoulder area

## 5 REASON

You may be required to submit a construction schedule, right of way impact plan, budget, and related items to justify your use of the right of way.

If using reroute or detour, provide the reasons. Check all that apply.

- My project needs to close the right of way for repair, installation, or restoration:**
- Sidewalk repair
  - Installation of Street Improvements
  - Installation of utilities
- Work poses a hazard to the public** - right of way areas must be closed adjacent to project site to protect public safety

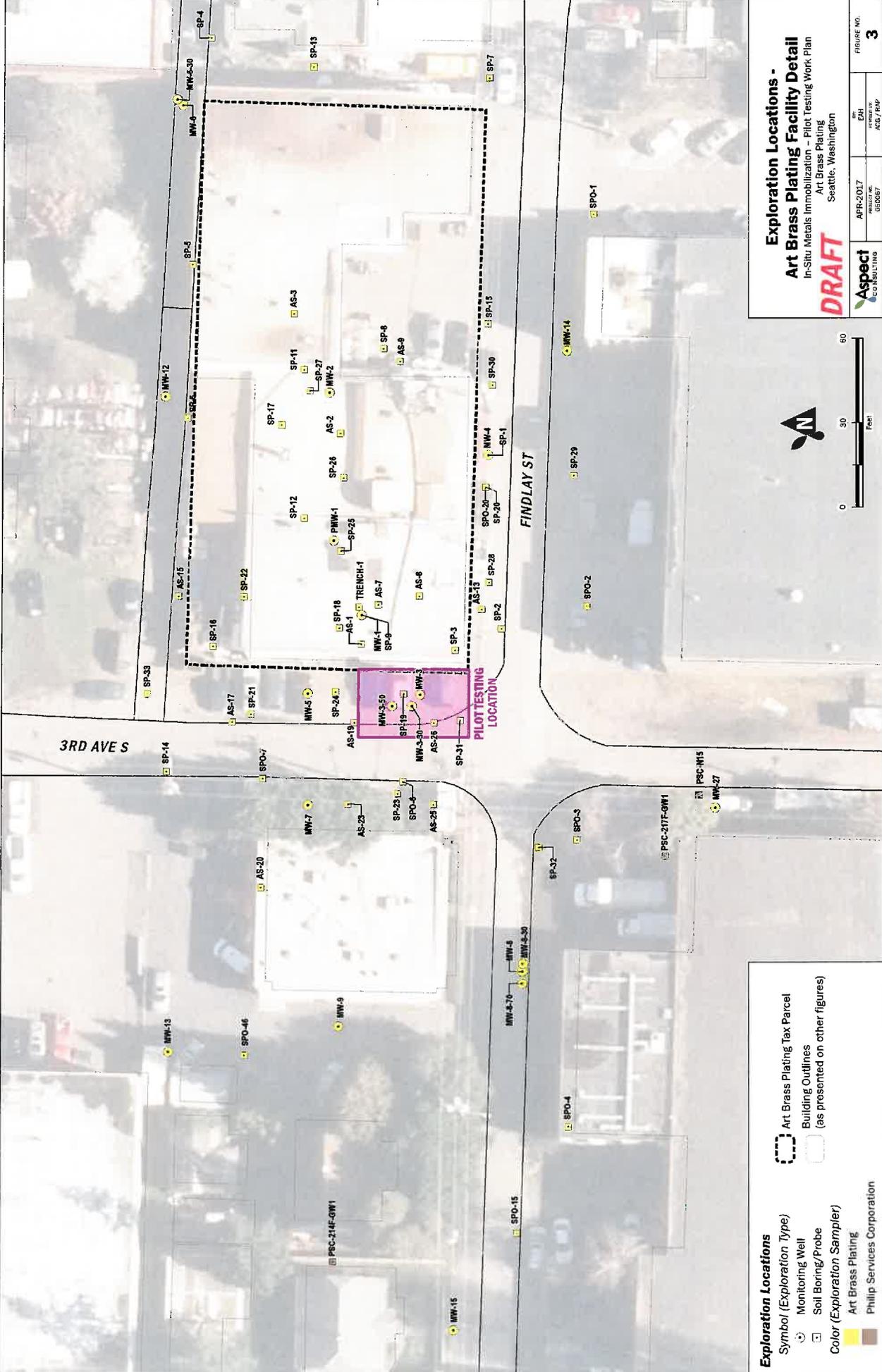
Describe potential hazard to public and why right of way needs to be closed:

- My project needs to control adjoining right of way for export, import, or deliveries:**
- Will perform more than 3 construction trips across sidewalk per hour (off-hauling, deliveries, construction entrance, vehicle egress/ingress, etc.)
- Terrain**
- There is not a sidewalk (unimproved right of way)
  - Steep slopes (impractical for use by public)
- Proposed reroute/detour will not impact adjacent properties, businesses or designated school zones**
- All options below must apply to qualify for Director's Rule Exemption
- No adjacent businesses on the block
  - No pedestrian demand on street where work is taking place and on adjacent blocks
  - Is not a primary City transit corridor or high-capacity transit route
  - No portion of the reroute or detour is in a designated school zone
- Cost of maintaining an open sidewalk exceeds 20% of total construction budget**
- Cost of keeping sidewalk open  (dollars)
  - Construction Budget  (dollars)
- Duration**
- Less than 20 business days
  - Less than 5 business days in Central Business District
  - Less than 5 business days in Urban Villages
  - Less than 5 business days on a Frequent Transit Network

## 6 CONTRACTOR RESPONSIBILITY

**Sidewalks on both sides of the street may not be closed at the same time.**

Pedestrians must have **continuous access** on **at least one side of the street**. If an ongoing or existing project has closed the sidewalk opposite of your project, you will need to coordinate with the opposing project to provide continuous pedestrian access on one side of the street at all times



**Exploration Locations**

Symbol (Exploration Type)

- Monitoring Well
- Soil Boring/Probe
- Art Brass Plating
- Philip Services Corporation

Color (Exploration Sampler)

- Art Brass Plating Tax Parcel
- Building Outlines (as presented on other figures)

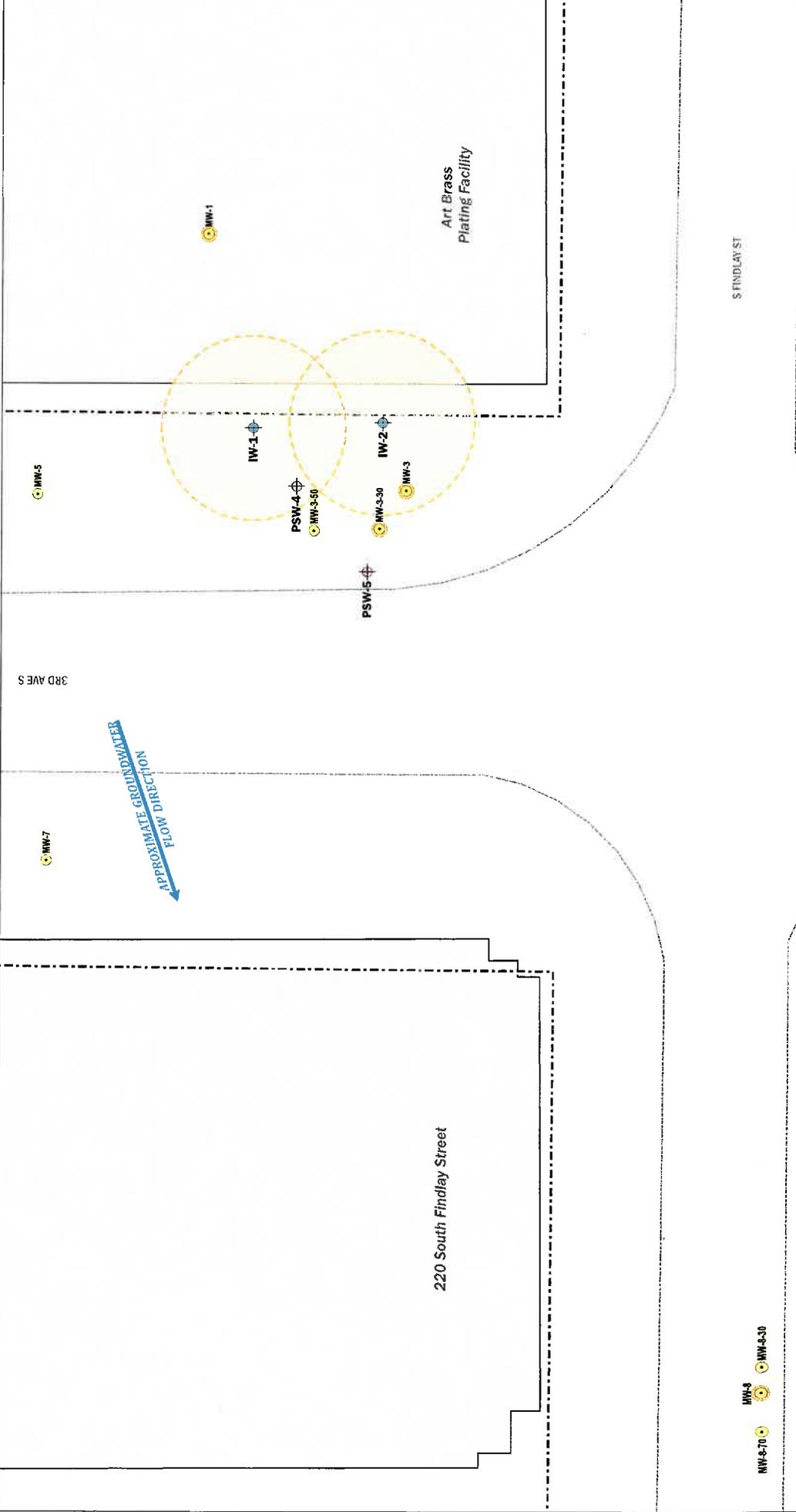


**Exploration Locations - Art Brass Plating Facility Detail**  
 In-Situ Metals Immobilization - Pilot Testing Work Plan  
 Art Brass Plating  
 Seattle, Washington

**DRAFT**

Aspect CONSULTING

APR-2017	APR-2017	APR-2017	FIGURE NO.
REVISED	ISSUED	DATE	3
		BY	
		ACQ/RSB	



**Pilot Testing Layout**  
 In-Situ Metals Immobilization - Pilot Testing Work Plan  
 Art Brass Plating  
 Seattle, Washington

**DRAFT**

Aspect  
 CONSULTING

APR-2017  
 PREPARED BY:  
 GIBSON

DATE  
 EM

FIGURE NO.  
**12**

0 10 20  
 Feet

**Proposed Pilot Testing Locations (2017)**

- Injection Monitoring Well
- Monitoring Well
- Existing Well to be used for Pilot Testing
- Radius of Influence Target: 10'

- Existing Art Brass Plating Well
- Building
- Road Edge
- King County Tax Parcel

MW-4 MW-7 MW-3-30 MW-3-50

220 South Findlay Street

3RD AVES

STANDLAY ST

Art Brass  
 Plating Facility



# STREET USE PERMIT

Permit No.: 350884

Inspector Copy

Permittee Copy

File Copy

Project ID: \_\_\_\_\_ IMPACT Project ID: **ex** Estimated Project Completion Date: **11/02/2017**

## LOCATION

Inspector: James Vanater

Inspection District: SOUTH SEATTLE

Address: <b>5516 3RD AVE S</b> High Impact Area: <b>N</b> Details: <b>ON 3RD AVE S, NORTH OF FINDLAY ST, EAST SIDE PARKING LANES</b>	Application Date: 6/27/17 11:35 am Issue Date: 1/2/18 11:36 am
--	---

## PARTIES (\* Primary Applicant)

Role	Name	Address	Phone	From	To
*24 Hour Contact	HANFORD, BOB	350 MADISON AVE N., BAINBRIDGE ISLAND, WA, 98110	(206)276-9256		
Permittee	ASPECT CONSULTING-BAINBRIDGE	350 MADISON AVE N., BAINBRIDGE ISLAND, WA, 98110-	(206)328-7443		

## PERMITTED USES

To Be Restored By: PERMITTEE

### 3RD AVE S BETWEEN S LUCILE ST AND S FINDLAY ST - NON-ARTERIAL

Use 511 Space A - Preparatory or exploratory work for upcoming projects, including surveying, installing monitoring wells, and soil sampling

Condition Description

Start Date 01/15/2018 - PARKING AREA

Start Date 10/01/2017 - PARKING AREA

Start Date	Duration	End Date	Sq. Ft	Issue Date	Ext.	Side of Street	Location Type	Closure Type	Peak Work OK	Day or Time Restrctns
01/15/2018	30	04/15/2018	1,000	01/02/2018	Y	EAST	PARKING LANE	CLOSED		
10/01/2017	30	12/30/2017	1,000	10/31/2017	N	EAST	PARKING LANE	CLOSED		

## CONDITIONS OF USE

**DESCRIPTION OF WORK :**  
**Additional Notes:** SCOPE: INSTALL (2) MONITORING WELLS  
 MONITORING WELL INFO: 2" PVC - 30' DEPTH, 5 YEAR DURATION  
 IMPACT: ON 3RDA VE S, NORTH OF FINDLAY ST, EAST SIDE PARKING LANES  
 Customer Description: Environmental monitoring well installation. 25 feet north of S Findlay St. and 10 feet east of 3rd Ave. S. in parking area.

**E1.15 :**  
 MULCHING AND MATTING - Apply mulch to protect exposed soils and promote plant establishment.

**E1.40 :**  
 PERMANENT SEEDING AND PLANTING - Install temporary surface runoff control measures prior to seeding or planting to protect the surface from erosion until the vegetation is established. Establish permanent vegetation (e.g., grasses, legumes, trees, and shrubs) as rapidly as possible to prevent soil erosion by wind or water.

**E1.45 :**  
 SODDING - Establish permanent turf for immediate erosion protection or to stabilize drainage pathways where concentrated overland flow will occur.

**E1.50 :**  
 TOPSOILING - Preserve and use topsoil to enhance final site stabilization with vegetation and to provide a suitable growth medium for final site stabilization with vegetation.



**Project ID:** \_\_\_\_\_ **IMPACT Project ID: ex** \_\_\_\_\_ **Estimated Project Completion Date: 11/02/2017**

**E3.25 :**  
 STORM DRAIN INLET PROTECTION - Install storm drain covers on stormwater structures less than 12 inches deep during construction. Install catch basin filter socks in stormwater structures greater than 12 inches deep. Place the storm drain or catch basin grate on top of the catch basin filter sock to hold it in place.

**C1.20 :**  
 USE OF CHEMICALS DURING CONSTRUCTION - Use only the recommended amounts of chemical materials and apply them in a proper manner. Neutralize the pH of concrete wash water from concrete mixers, if necessary.

**C1.35 :**  
 SAWCUTTING AND PAVING POLLUTION PREVENTION - Vacuum slurry and cuttings during the activity to prevent migration offsite and do not leave slurry and cuttings on permanent concrete or asphalt paving overnight. Dispose of collected slurry and cuttings, waste material, and demolition debris in a manner that does not violate groundwater or surface water quality standards. Implement preventative measures such as berms, barriers, secondary containment, and vector trucks if observations indicate that a violation of water quality standards could occur.

**C1.45 :**  
 SOLID WASTE HANDLING AND DISPOSAL - Remove and dispose of accumulated solid waste at authorized disposal areas. Label waste containers and place them in a covered area with closed lids. Salvage and recycle any useful materials.

**BMP5 :**  
 SPILL PREVENTION AND CLEANUP-Keep a spill cleanup kit in a nearby vehicle or next to the work site so that it is easily accessible. Make sure the contents of the spill kit are appropriate for the types and quantities of materials used for this work task. Refill spill kit materials before beginning work.

**BMP16 :**  
 CONCRETE POURING, CONCRETE/ASPHALT CUTTING, AND ASPHALT APPLICATION - Sweep or shovel loose aggregate chunks and dust for recycling or proper disposal. Place storm drain covers or similarly effective containment devices over all storm drains located downslope or adjacent to the work area. Shovel or vacuum all slurry and remove from the site. Perform cleaning of concrete application and mixing equipment or concrete-delivery vehicles in a designated area where the rinse water is controlled.

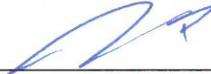
**BMP20 :**  
 LANDSCAPING AND LAWN VEGETATION MANAGEMENT - Use proper fertilizer and herbicide application techniques to minimize nutrient pollution of stormwater. Implement proper landscaping and mulching techniques to prevent plant material and excess mulch from entering the separate storm drainage system. Do not dispose of collected vegetation in separate storm drainage systems, waterways, water bodies or greenbelt areas.

**DAMAGED OR DESTROYED UTILITY :**  
 SDOT makes no representation regarding the safety or integrity of the subject structure. If the structure is damaged or destroyed, SDOT will have no obligation to provide an alternative location for the permit utility.

**TREE TRUNK OR ROOTS :**  
 Contact the City Arborist Office (684-8733) a minimum of five working-days prior to digging within any landscaped areas in the street rights-of-way. The edge of all trenching must be at least five feet (5') from any street trees. When trenching near trees with trunks greater than twelve inches (12") in diameter, hand dig all trenching for a distance of ten feet (10'), measured five feet (5') radius from the tree trunk. When encountering tree roots, cut off cleanly with sharp saw (do not leave torn or ripped tree roots unattended). Do not cut roots greater than two inches (2") in diameter (contractor will have to hand tunnel underneath the roots). Do not paint ends of roots. Notify Landscape Maintenance at 684-4121 at least forty eight (48) hours in advance when working in landscaped areas or on trees.

**FEES PAID AT THE COUNTER OR ONLINE**

Description	Date	Amount
ISSUANCE FEE - SIGNIFICANT	10/30/2017	\$305.00
MODIFICATION FEE	01/02/2018	\$155.00
<b>Totals:</b>		<b>\$460.00</b>

**STREET USE INSPECTOR** \_\_\_\_\_ **James Vanater**  
 Permittee  \_\_\_\_\_ Director Per  \_\_\_\_\_

**GENERAL REQUIREMENTS**

- Nature of permit.** This permit is issued according to Seattle Municipal Code ("SMC"), Chapter 15.04, for the use or occupancy of the public right of way in a manner consistent with the terms and conditions in this permit. This permit is wholly of a temporary nature, vests no permanent rights, and is revocable according to SMC Section 15.04.070.
- Acceptance of terms, conditions, and requirements.** The Permittee accepts the terms, conditions, and requirements of this permit and agrees to

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IMPACT Project ID: ex

Estimated Project Completion Date: 11/02/2017

comply with them to the satisfaction of the Seattle Department of Transportation, Street Use Division ("Street Use"), or such other agency as may be designated by the City. The Permittee further agrees to comply with all applicable City ordinances, including but not limited to SMC Title 15, and all applicable state and federal laws.

3. **Copy of permit.** A copy of the issued permit and current approved plans shall be on site and available at all times.
4. **Expiration of permit.** This permit shall remain valid until revoked according to SMC Section 15.04.070; provided that the permit shall expire automatically if the authorized work does not begin within six months from the date the permit is issued. The Permittee is responsible for keeping the permit up to date including submitting updated plans for approval. The Permittee shall submit requests to update a permit in writing or in person, and all requests shall be made to Street Use in a timely manner; otherwise, the Permittee may lose access to requested schedule for continued work in the right of way.
5. **Superiority of Street Improvement Permits.** When a Street Improvement Permit exists, rights acquired under the Street Improvement Permit supersede those acquired under any other Street Use or Utility Permits. Work not approved under the Street Improvement Permit shall require separate Street Use or Utility Permits and Permittee shall obtain these permits in advance of work.
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  - Permit number;
  - Job-site address;
  - Start date: please specify if Job Start date is the same as the excavation or ground breaking date. If the dates are different, please provide both dates;
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  - Utility Underground Locate Center (811 or 1-800-424-5555) before ground disturbance; and
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11. **King County Metro notification.** The contractor shall notify King County Metro Transit in advance of any construction that may disrupt transit service according to the following schedule.
  - Five working days notice for any work requiring a temporary bus stop.
  - Ten working days notice for relocation of a bus shelter or reroute of bus service.
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12. **Public notification.** The Permittee shall notify all potentially affected residents and businesses at least 10-business days before starting work in the public right of way, including alleys. If work requires removal of existing permitted structures, then at-least a 30-calendar day notice is required for any permit modification or revocation requests. Notification methods and timelines, including when ongoing notification is needed, must comply with Street Use standards and requirements.

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- If a tree has been approved for removal, the Permittee shall post a "tree removal" public-notice placard at least 10-business days before starting work.
  - If an SDOT public notice comment period is required prior to permitting, the Permittee shall conduct the public notice outreach prior to commencement of the SDOT public notice comment period.
- 13. Alley notification.** Where this permit authorizes work in an alley, the Permittee shall notify all potentially impacted property owners and businesses prior to any activity occurring in the alley, including and especially those property owners and businesses with tenants using the alley to access parking or for building ingress/egress or deliveries. The Permittee shall schedule work around waste-management-collection days. If this is not possible, the Permittee shall coordinate with waste management services to either provide intermittent alley access during waste pickup or to temporarily establish waste pickup at an alternate location. If an alley is to remain open during permitted work, a minimum 11-foot clear width is required for vehicular access. If an alley is closed to through traffic, the Permittee shall notify the nearest Seattle Fire Department fire station and the Seattle Police Department at the non-emergency numbers prior to commencing work.
- 14. Coordination of work.** In performing work authorized by this permit, the Permittee shall coordinate with other contractors, public agencies and other permittees working in the public right of way to minimize impact to the public. Documented coordination agreements may be required prior to permit issuance and additional notification to the public may be required.
- 15. Hours of work.** Work performed in the public right of way shall occur only during hours authorized under all applicable codes, regulations, rules, and permits.
- 16. Off-hours work.** Work outside of normal working hours, 8:00 AM - 5:00 PM Monday through Friday, is considered "off-hours work" and requires a minimum of 3-business days advanced notice to the Street Use Inspection Supervisor before the off-hours work commences. Off-hours work may also require a separately-approved traffic control plan. A minimum of two hours of inspection time shall be charged for off-hours inspections at the premium rate. A Stop Work order or Citation may be issued for failing to notify Street Use at least 3-business days before the off-hours work.
- 17. Inspection fees.** The Permittee shall pay for City inspections of work authorized under this permit according to the current fee schedule established by SMC Section 15.04.074 and all other associated costs.
- 18. Billing.** All fees and costs billed according to this permit shall be paid to the City of Seattle within 30-calendar days from the invoice date. Past due invoices may be subject to interest charges and may be sent to collections.
- 19. Deposits, charges, and future billings.** The Permittee, also identified as the "Financially Responsible Party" on Street Use permit applications, is responsible and liable for all permit-related charges. If a deposit was made for estimated future Street Use services, any unused portion of the deposit shall be refunded to the Permittee. Any charges in excess of the deposit shall be billed to the Permittee on a monthly basis.
- 20. Corrective work.** The Permittee is responsible for any additional costs incurred by the City resulting from temporary or corrective measures required to bring the work area into compliance with standards that apply, including but not limited to: temporary traffic control, requirements for temporary structures, temporary stabilization, and temporary restoration when the Permittee is not on site.
- 21. Indemnification.** The Permittee agrees to defend, indemnify, and hold harmless the City of Seattle, its officials, officers, employees, and agents; against any liability, claims, causes of action, judgments, or expenses, including reasonable attorney fees; resulting directly or indirectly from any act or omission of the Permittee, its contractors, subcontractors, anyone directly or indirectly employed by them, and anyone for whose acts or omissions they may be liable; arising out of the Permittee's use or occupancy of the public right of way; and all loss by the failure of the Permittee to fully or adequately perform, in any respect, all authorizations or obligations under this Permit.
- 22. Insurance.** The Permittee shall obtain and maintain in full force and effect, at its own expense, public liability insurance in an amount sufficient to protect the City from all potential claims and risks of loss from perils in connection with any activity that may arise from or be related to the Permittee's activity upon or the use or occupation of the public right of way allowed by the permit; and all claims and risks in connection with activities performed by the Permittee by virtue of the permission granted by the permit. The Permittee shall meet all other insurance requirements in SMC 15.04.045.

## EXISTING IMPROVEMENTS

- 1. Costs of damage to City property and improvements.** The Permittee shall be responsible for the costs of repairing any damage to City property or improvements, including street trees, resulting from work performed by or on behalf of the Permittee within the public right of way. Damage to street trees is assessed on the value of the tree according to SMC subsection 15.90.018.B.
- 2. Utility protection.** The Permittee shall be responsible for checking locations and providing adequate protection for all utilities in the work area.
- 3. Utility relocation.** The Permittee shall be responsible for notifying affected utilities and requesting any necessary relocation.
- 4. Survey monuments.** Before removing, destroying, disturbing, or covering a survey monument such that the survey point is no longer visible or readily accessible, the Permittee shall obtain a permit from the Department of Natural Resources according to Washington Administrative Code, Chapter 332-120.
- 5. Protecting, removing, and relocating existing improvements.** In addition to General Requirements item 12, the Permittee, at their own cost and expense, shall be responsible for coordinating the removal and relocation of existing improvements within the public right of way that their construction or permitted project may interfere with. These existing improvements include, but are not limited to trees, bike racks, newsstands, bike-share stations, signs, benches, artwork, and waste receptacles.
  - For bike-share stations, the Permittee shall contact the bike-share operator at least 30-calendar days before starting work in order to coordinate the removal and relocation of the bike-share station.
  - For all other existing improvements, the Permittee shall contact the improvement owner at least 10-business days before starting work to coordinate the temporary removal of the improvement.

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- For newsstands, the Permittee shall coordinate temporary relocation during the construction period by posting notice of upcoming construction projects at [SeattleNewsstands.org](http://SeattleNewsstands.org) at least 10-business days before starting work. The Permittee shall be responsible for reinstalling the improvements or coordinating the reinstallation in their original location or at a reasonable alternative location approved by the existing improvement owner and meeting all applicable City requirements. The Permittee is further responsible for protecting all trees within the construction project area and shall contact Urban Forestry to disclose and describe any construction impacts to trees.

Failure to contact the improvement owners or Urban Forestry is cause for Street Use to revoke this permit.

- 6. Monorail system proximity requirements.** The Permittee shall be responsible for coordinating with the Seattle Center when any work, deliveries, or loading/unloading will occur within 14 feet of a Monorail structure or 20 feet of a Monorail foundation or below-ground installation. The Permittee shall contact the Seattle Center at 206-905-2601 at least 10-business days before starting construction. Failure to do so is cause for permit revocation.
- 7. Monorail system proximity guidelines.** Below grade: The restricted digging area includes a 45-degree cone extending outward and downward from the ground level of all monorail piers. Nearby excavations shall be monitored to assure footing stability. At- or above-grade: The piers above ground level cannot be moved, nor can any item like lighting or signage be attached to the piers without prior written consent from the Seattle Center Director. Piers shall not be painted. Landscaping shall not occur adjacent to piers or within 10 feet of a Monorail structure without prior written consent of the Seattle Center Director. Any construction activity in the area of the power rails shall follow OSHA guidelines for working around high voltage. Construction equipment shall be located and operated in awareness of and taking account of beam height and the train's 14-foot-operational envelope from each side of the beam. Contractors shall string warning lines from pier to pier under the beams as a guide. Spotters shall be employed when any construction activity occurs within 25 feet of the beams.

#### ENVIRONMENTAL PROTECTION

- 1. Best management practices required.** The Permittee shall be responsible for protecting the public place, including but not limited to protecting existing street trees and green stormwater infrastructure, and controlling surface runoff, erosion and sediment at the construction site, as required by: the Stormwater Code, (SMC Title 22, Subtitle VIII); the Street and Sidewalk Use Code, (SMC Title 15); the Standard Specifications for Road, Bridge, and Municipal Construction; and Department of Planning and Development Director's Rule 21-2015/Seattle Public Utilities DWW 200, or successor rules or provisions. The site and the surrounding area shall generally be kept clean and free of construction debris or other material, including but not limited to mud, dust, rock, asphalt, and concrete. Waste materials shall be collected and disposed of at an appropriate disposal site. These materials shall be prevented from entering any part of the public sewer and storm drain system, and any surface waters.

#### TRAFFIC CONTROL REQUIREMENTS

- 1. Compliance with the Traffic Control Manual for In-Street Work.** In order to provide safe and effective work areas and to ward, control, protect, and expedite vehicular and pedestrian traffic; signage for all construction within the public right of way shall comply with the City of Seattle Traffic Control Manual for In-Street Work, as amended. When required, the conditions on the traffic control plan shall supersede any conflicting provisions or requirements in the City of Seattle Traffic Control Manual for In-Street Work. A copy of the current City of Seattle Traffic Control Manual for In-Street Work and the approved traffic control plan shall be on site at all times.
- 2. Lanes to remain open during peak hours.** Traffic lanes shall not be closed during the following peak hours: 6:00 AM-9:00 AM and 3:00 PM-7:00 PM in the Central Business District; and 7:00 AM-9:00 AM and 4:00 PM-6:00 PM for arterials elsewhere in the City, unless specifically noted on the approved traffic control plan.
- 3. Maintain access.** Access to adjoining properties and businesses shall be maintained or accommodated during construction. Pedestrian access around construction sites shall be implemented and maintained per SDOT Director's Rule 10-2015, or successor rule.
- 4. Width of temporary traffic lanes.** Temporary traffic lanes created during the permitted work shall be a minimum of 11 feet in width unless otherwise approved on the traffic control plan.
- 5. Working within restricted curb spaces.** When the project impacts a restricted curb space, such as meters, pay stations, specific use and load zones; the Permittee shall obtain permission from SDOT Traffic Operations and reserve the spaces with the Traffic Operations Permit Counter (206-684-5086) before starting work.
- 6. Temporary No Parking signs and easels.** In areas without parking pay stations or parking meters, or when Traffic Operations allows reserved parking spaces to be controlled with Temporary No Parking signs, establishing a Temporary No Parking Zone requires placing type R7-T38 (T-38) or R7-T39 (T-39) easels and completing an online verification form in conformance with the Traffic Control Manual for In-Street Work. In high impact areas, the Central Business District, and in areas where construction projects are densely clustered (such as in City-designated "Construction Hubs"), additional requirements for establishing a Temporary No Parking Zone may apply.
- 7. Nighttime illumination.** Four or more Type B warning lights of sufficient brilliance to be seen from 500 feet shall be maintained at all times during the hours of darkness at the points of obstruction or excavation of any right of way.
- 8. Work in alleys.** For work occurring in alleys that impedes vehicular access, including but not limited to egress, ingress, or through travel; "Street Closed" signs shall be placed at each end of the alley. Property owners adjacent to the alley shall be contacted, and their access concerns shall be addressed and mitigated if possible. This may require alternative work scheduling in the case of Solid Waste collection days

## Robert R. Hanford

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**From:** Schriener, Jake <Jake.Schriener@seattle.gov> on behalf of DOT\_UTILPERMITS <SDOTUtilPermits@seattle.gov>  
**Sent:** Friday, December 22, 2017 12:56 PM  
**To:** Robert R. Hanford  
**Subject:** Street Use Application # 350884

Mr. Bob Hanford,

Your SDOT **Utility Use** modification application has been approved. Total fees due are **\$155.00**. You may either pay this fee online or in-person at the Applicant Services Counter. Permits paid for online will be emailed to you as a .PDF within 1 – 2 business days.

Changes to the start date and/or duration may affect your fees. If you need to make any changes to start date or duration, please confirm the revisions with your permit reviewer **before** making your payment.

**Details about your permit:**

Your permit number is: **350884**

Your contact user ID is: **AC68616**

If you would like to pay online, you may login to our online permitting system at:

[http://olp.seattle.gov/DP1/Metroplex/seattle/login/wiz\\_login.asp](http://olp.seattle.gov/DP1/Metroplex/seattle/login/wiz_login.asp). If you don't have an account, click on the New User – Create Account button and input your contact user ID number.

Please email all correspondence to [SDOTPermits@seattle.gov](mailto:SDOTPermits@seattle.gov) and make sure your **permit number is in the subject line**.

Also, you may visit the Applicant Services Counter at:

700 5<sup>th</sup> Ave, Floor 23, Seattle, WA 98104

Hours of service: MTWF 8:00 – 5:00; T & TH 10:30 – 5:00

\*No payments accepted after 4:30 PM



**JAKE SCHRINER**

*Permit Services – Utility Permit Reviewer, Street Use Division*

Sent on behalf of [SDOTPermits@Seattle.Gov](mailto:SDOTPermits@Seattle.Gov)



Seattle Dept of Transportation  
 Street Use Permits, 23rd Floor  
 700 Fifth Ave, Suite 2300  
 P O Box 34996  
 Seattle, WA 98124-4996

# STREET USE PERMIT

Permit No.: 350884

Inspector Copy

Permittee Copy

File Copy

Project ID:

IMPACT Project ID: n/a

Estimated Project Completion Date: 11/02/2017

## LOCATION

Inspector: James Vanater  
 Inspection District: SOUTH SEATTLE

Address: 5516 3RD AVE S  
 High Impact Area: N  
 Details: ON 3RD AVE S, NORTH OF FINDLAY ST, EAST SIDE PARKING LANES

Application Date: 6/27/17 11:35 am  
 Issue Date: 10/31/17 9:37 am

## PARTIES (\* Primary Applicant)

Role	Name	Address	Phone	From	To
*24 Hour Contact	HANFORD, BOB	350 MADISON AVE N., BAINBRIDGE ISLAND, WA, 98110	(206)276-9256		
Permittee	ASPECT CONSULTING-BAINBRIDGE	350 MADISON AVE N., BAINBRIDGE ISLAND, WA, 98110-	(206)328-7443		

## PERMITTED USES

To Be Restored By: PERMITTEE

### 3RD AVE S BETWEEN S LUCILE ST AND S FINDLAY ST - NON-ARTERIAL

Use 511 Space A - Preparatory or exploratory work for upcoming projects, including surveying, installing monitoring wells, and soil sampling  
 Condition Description

Start Date 10/01/2017 - PARKING AREA

Start Date	Duration	End Date	Sq. Ft	Issue Date	Ext.	Side of Street	Location Type	Closure Type	Peak Work OK	Day or Time Rstrctns
10/01/2017	30	12/30/2017	1,000	10/31/2017	N	EAST	PARKING LANE	CLOSED		

## CONDITIONS OF USE

### DESCRIPTION OF WORK :

**Additional Notes:** SCOPE: INSTALL (2) MONITORING WELLS

MONITORING WELL INFO: 2" PVC - 30' DEPTH, 5 YEAR DURATION

IMPACT: ON 3RDA VE S, NORTH OF FINDLAY ST, EAST SIDE PARKING LANES

Customer Description: Environmental monitoring well installation. 25 feet north of S Findlay St. and 10 feet east of 3rd Ave. S. in parking area.

#### E1.15 :

MULCHING AND MATTING - Apply mulch to protect exposed soils and promote plant establishment.

#### E1.40 :

PERMANENT SEEDING AND PLANTING - Install temporary surface runoff control measures prior to seeding or planting to protect the surface from erosion until the vegetation is established. Establish permanent vegetation (e.g., grasses, legumes, trees, and shrubs) as rapidly as possible to prevent soil erosion by wind or water.

#### E1.45 :

SODDING - Establish permanent turf for immediate erosion protection or to stabilize drainage pathways where concentrated overland flow will occur.

#### E1.50 :

TOPSOILING - Preserve and use topsoil to enhance final site stabilization with vegetation and to provide a suitable growth medium for final site stabilization with vegetation.

#### E3.25 :

STORM DRAIN INLET PROTECTION - Install storm drain covers on stormwater structures less than 12 inches deep during construction. Install catch basin filter socks in stormwater structures greater than 12 inches deep. Place the storm drain or catch basin grate on top of the catch basin filter sock to hold it in place.

<b>Project ID:</b>	<b>IMPACT Project ID: n/a</b>	<b>Estimated Project Completion Date: 11/02/2017</b>
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**C1.20 :**  
 USE OF CHEMICALS DURING CONSTRUCTION - Use only the recommended amounts of chemical materials and apply them in a proper manner. Neutralize the pH of concrete wash water from concrete mixers, if necessary.

**C1.35 :**  
 SAWCUTTING AND PAVING POLLUTION PREVENTION - Vacuum slurry and cuttings during the activity to prevent migration offsite and do not leave slurry and cuttings on permanent concrete or asphalt paving overnight. Dispose of collected slurry and cuttings, waste material, and demolition debris in a manner that does not violate groundwater or surface water quality standards. Implement preventative measures such as berms, barriers, secondary containment, and vacor trucks if observations indicate that a violation of water quality standards could occur.

**C1.45 :**  
 SOLID WASTE HANDLING AND DISPOSAL - Remove and dispose of accumulated solid waste at authorized disposal areas. Label waste containers and place them in a covered area with closed lids. Salvage and recycle any useful materials.

**BMP5 :**  
 SPILL PREVENTION AND CLEANUP-Keep a spill cleanup kit in a nearby vehicle or next to the work site so that it is easily accessible. Make sure the contents of the spill kit are appropriate for the types and quantities of materials used for this work task. Refill spill kit materials before beginning work.

**BMP16 :**  
 CONCRETE POURING, CONCRETE/ASPHALT CUTTING, AND ASPHALT APPLICATION - Sweep or shovel loose aggregate chunks and dust for recycling or proper disposal. Place storm drain covers or similarly effective containment devices over all storm drains located downslope or adjacent to the work area. Shovel or vacuum all slurry and remove from the site. Perform cleaning of concrete application and mixing equipment or concrete-delivery vehicles in a designated area where the rinse water is controlled.

**BMP20 :**  
 LANDSCAPING AND LAWN VEGETATION MANAGEMENT - Use proper fertilizer and herbicide application techniques to minimize nutrient pollution of stormwater. Implement proper landscaping and mulching techniques to prevent plant material and excess mulch from entering the separate storm drainage system. Do not dispose of collected vegetation in separate storm drainage systems, waterways, water bodies or greenbelt areas.

**DAMAGED OR DESTROYED UTILITY :**  
 SDOT makes no representation regarding the safety or integrity of the subject structure. If the structure is damaged or destroyed, SDOT will have no obligation to provide an alternative location for the permit utility.

**TREE TRUNK OR ROOTS :**  
 Contact the City Arborist Office (684-8733) a minimum of five working-days prior to digging within any landscaped areas in the street rights-of-way. The edge of all trenching must be at least five feet (5') from any street trees. When trenching near trees with trunks greater than twelve inches (12") in diameter, hand dig all trenching for a distance of ten feet (10'), measured five feet (5') radius from the tree trunk. When encountering tree roots, cut off cleanly with sharp saw (do not leave torn or ripped tree roots unattended). Do not cut roots greater than two inches (2") in diameter (contractor will have to hand tunnel underneath the roots). Do not paint ends of roots. Notify Landscape Maintenance at 684-4121 at least forty eight (48) hours in advance when working in landscaped areas or on trees.

**FEES PAID AT THE COUNTER OR ONLINE**

Description	Date	Amount
ISSUANCE FEE - SIGNIFICANT	10/30/2017	\$305.00
<b>Totals:</b>		<b>\$305.00</b>

**STREET USE INSPECTOR**

James Vanater

Permittee \_\_\_\_\_

Director Per \_\_\_\_\_

**GENERAL REQUIREMENTS**

- 1. Nature of permit.** This permit is issued according to Seattle Municipal Code ("SMC"), Chapter 15.04, for the use or occupancy of the public right of way in a manner consistent with the terms and conditions in this permit. This permit is wholly of a temporary nature, vests no permanent rights, and is revocable according to SMC Section 15.04.070.
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12. **Public notification.** The Permittee shall notify all potentially affected residents and businesses at least 10-business days before starting work in the public right of way, including alleys. If work requires removal of existing permitted structures, then at-least a 30-calendarday notice is required for any permit modification or revocation requests. Notification methods and timelines, including when ongoing notification is needed, must comply with Street Use standards and requirements.
  - If a tree has been approved for removal, the Permittee shall post a "tree removal" public-notice placard at least 10-business days before starting work.
  - If an SDOT public notice comment period is required prior to permitting, the Permittee shall conduct the public notice outreach prior to commencement of the SDOT public notice comment period.
13. **Alley notification.** Where this permit authorizes work in an alley, the Permittee shall notify all potentially impacted property owners and businesses prior to any activity occurring in the alley, including and especially those property owners and businesses with tenants using the



<b>Project ID:</b>	<b>IMPACT Project ID: n/a</b>	<b>Estimated Project Completion Date: 11/02/2017</b>
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alley to access parking or for building ingress/egress or deliveries. The Permittee shall schedule work around waste-management-collection days. If this is not possible, the Permittee shall coordinate with waste management services to either provide intermittent alley access during waste pickup or to temporarily establish waste pickup at an alternate location. If an alley is to remain open during permitted work, a minimum 11-foot clear width is required for vehicular access. If an alley is closed to through traffic, the Permittee shall notify the nearest Seattle Fire Department fire station and the Seattle Police Department at the non-emergency numbers prior to commencing work.

14. **Coordination of work.** In performing work authorized by this permit, the Permittee shall coordinate with other contractors, public agencies and other permittees working in the public right of way to minimize impact to the public. Documented coordination agreements may be required prior to permit issuance and additional notification to the public may be required.
15. **Hours of work.** Work performed in the public right of way shall occur only during hours authorized under all applicable codes, regulations, rules, and permits.
16. **Off-hours work.** Work outside of normal working hours, 8:00 AM - 5:00 PM Monday through Friday, is considered "off-hours work" and requires a minimum of 3-business days advanced notice to the Street Use Inspection Supervisor before the off-hours work commences. Off-hours work may also require a separately-approved traffic control plan. A minimum of two hours of inspection time shall be charged for off-hours inspections at the premium rate. A Stop Work order or Citation may be issued for failing to notify Street Use at least 3-business days before the off-hours work.
17. **Inspection fees.** The Permittee shall pay for City inspections of work authorized under this permit according to the current fee schedule established by SMC Section 15.04.074 and all other associated costs.
18. **Billing.** All fees and costs billed according to this permit shall be paid to the City of Seattle within 30-calendar days from the invoice date. Past due invoices may be subject to interest charges and may be sent to collections.
19. **Deposits, charges, and future billings.** The Permittee, also identified as the "Financially Responsible Party" on Street Use permit applications, is responsible and liable for all permit-related charges. If a deposit was made for estimated future Street Use services, any unused portion of the deposit shall be refunded to the Permittee. Any charges in excess of the deposit shall be billed to the Permittee on a monthly basis.
20. **Corrective work.** The Permittee is responsible for any additional costs incurred by the City resulting from temporary or corrective measures required to bring the work area into compliance with standards that apply, including but not limited to: temporary traffic control, requirements for temporary structures, temporary stabilization, and temporary restoration when the Permittee is not on site.
21. **Indemnification.** The Permittee agrees to defend, indemnify, and hold harmless the City of Seattle, its officials, officers, employees, and agents; against any liability, claims, causes of action, judgments, or expenses, including reasonable attorney fees; resulting directly or indirectly from any act or omission of the Permittee, its contractors, subcontractors, anyone directly or indirectly employed by them, and anyone for whose acts or omissions they may be liable; arising out of the Permittee's use or occupancy of the public right of way; and all loss by the failure of the Permittee to fully or adequately perform, in any respect, all authorizations or obligations under this Permit.
22. **Insurance.** The Permittee shall obtain and maintain in full force and effect, at its own expense, public liability insurance in an amount sufficient to protect the City from all potential claims and risks of loss from perils in connection with any activity that may arise from or be related to the Permittee's activity upon or the use or occupation of the public right of way allowed by the permit; and all claims and risks in connection with activities performed by the Permittee by virtue of the permission granted by the permit. The Permittee shall meet all other insurance requirements in SMC 15.04.045.

**EXISTING IMPROVEMENTS**

1. **Costs of damage to City property and improvements.** The Permittee shall be responsible for the costs of repairing any damage to City property or improvements, including street trees, resulting from work performed by or on behalf of the Permittee within the public right of way. Damage to street trees is assessed on the value of the tree according to SMC subsection 15.90.018.B.
2. **Utility protection.** The Permittee shall be responsible for checking locations and providing adequate protection for all utilities in the work area.
3. **Utility relocation.** The Permittee shall be responsible for notifying affected utilities and requesting any necessary relocation.
4. **Survey monuments.** Before removing, destroying, disturbing, or covering a survey monument such that the survey point is no longer visible or readily accessible, the Permittee shall obtain a permit from the Department of Natural Resources according to Washington Administrative Code, Chapter 332-120.
5. **Protecting, removing, and relocating existing improvements.** In addition to General Requirements item 12, the Permittee, at their own cost and expense, shall be responsible for coordinating the removal and relocation of existing improvements within the public right of way that their construction or permitted project may interfere with. These existing improvements include, but are not limited to trees, bike racks, newsstands, bike-share stations, signs, benches, artwork, and waste receptacles.
  - For bike-share stations, the Permittee shall contact the bike-share operator at least 30-calendar days before starting work in order to coordinate the removal and relocation of the bike-share station.
  - For all other existing improvements, the Permittee shall contact the improvement owner at least 10-business days before starting work to coordinate the temporary removal of the improvement.
  - For newsstands, the Permittee shall coordinate temporary relocation during the construction period by posting notice of upcoming construction projects at [SeattleNewsstands.org](http://SeattleNewsstands.org) at least 10-business days before starting work.

The Permittee shall be responsible for reinstalling the improvements or coordinating the reinstallation in their original location or at a reasonable alternative location approved by the existing improvement owner and meeting all applicable City requirements. The Permittee is further responsible for protecting all trees within the construction project area and shall contact Urban Forestry to disclose and describe any construction impacts to trees.



Project ID:	IMPACT Project ID: n/a	Estimated Project Completion Date: 11/02/2017
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Failure to contact the improvement owners or Urban Forestry is cause for Street Use to revoke this permit.

**6. Monorail system proximity requirements.** The Permittee shall be responsible for coordinating with the Seattle Center when any work, deliveries, or loading/unloading will occur within 14 feet of a Monorail structure or 20 feet of a Monorail foundation or below-ground installation. The Permittee shall contact the Seattle Center at 206-905-2601 at least 10-business days before starting construction. Failure to do so is cause for permit revocation.

**7. Monorail system proximity guidelines.** Below grade: The restricted digging area includes a 45-degree cone extending outward and downward from the ground level of all monorail piers. Nearby excavations shall be monitored to assure footing stability. At- or above-grade: The piers above ground level cannot be moved, nor can any item like lighting or signage be attached to the piers without prior written consent from the Seattle Center Director. Piers shall not be painted. Landscaping shall not occur adjacent to piers or within 10 feet of a Monorail structure without prior written consent of the Seattle Center Director. Any construction activity in the area of the power rails shall follow OSHA guidelines for working around high voltage. Construction equipment shall be located and operated in awareness of and taking account of beam height and the train's 14-foot-operational envelope from each side of the beam. Contractors shall string warning lines from pier to pier under the beams as a guide. Spotters shall be employed when any construction activity occurs within 25 feet of the beams.

**ENVIRONMENTAL PROTECTION**

**1. Best management practices required.** The Permittee shall be responsible for protecting the public place, including but not limited to protecting existing street trees and green stormwater infrastructure, and controlling surface runoff, erosion and sediment at the construction site, as required by: the Stormwater Code, (SMC Title 22, Subtitle VIII); the Street and Sidewalk Use Code, (SMC Title 15); the Standard Specifications for Road, Bridge, and Municipal Construction; and Department of Planning and Development Director's Rule 21-2015/Seattle Public Utilities DWW 200, or successor rules or provisions. The site and the surrounding area shall generally be kept clean and free of construction debris or other material, including but not limited to mud, dust, rock, asphalt, and concrete. Waste materials shall be collected and disposed of at an appropriate disposal site. These materials shall be prevented from entering any part of the public sewer and storm drain system, and any surface waters.

**TRAFFIC CONTROL REQUIREMENTS**

- 1. Compliance with the Traffic Control Manual for In-Street Work.** In order to provide safe and effective work areas and to ward, control, protect, and expedite vehicular and pedestrian traffic; signage for all construction within the public right of way shall comply with the City of Seattle Traffic Control Manual for In-Street Work, as amended. When required, the conditions on the traffic control plan shall supersede any conflicting provisions or requirements in the City of Seattle Traffic Control Manual for In-Street Work. A copy of the current City of Seattle Traffic Control Manual for In-Street Work and the approved traffic control plan shall be on site at all times.
- 2. Lanes to remain open during peak hours.** Traffic lanes shall not be closed during the following peak hours: 6:00 AM-9:00 AM and 3:00 PM-7:00 PM in the Central Business District; and 7:00 AM-9:00 AM and 4:00 PM-6:00 PM for arterials elsewhere in the City, unless specifically noted on the approved traffic control plan.
- 3. Maintain access.** Access to adjoining properties and businesses shall be maintained or accommodated during construction. Pedestrian access around construction sites shall be implemented and maintained per SDOT Director's Rule 10-2015, or successor rule.
- 4. Width of temporary traffic lanes.** Temporary traffic lanes created during the permitted work shall be a minimum of 11 feet in width unless otherwise approved on the traffic control plan.
- 5. Working within restricted curb spaces.** When the project impacts a restricted curb space, such as meters, pay stations, specific use and load zones; the Permittee shall obtain permission from SDOT Traffic Operations and reserve the spaces with the Traffic Operations Permit Counter (206-684-5086) before starting work.
- 6. Temporary No Parking signs and easels.** In areas without parking pay stations or parking meters, or when Traffic Operations allows reserved parking spaces to be controlled with Temporary No Parking signs, establishing a Temporary No Parking Zone requires placing type R7-T38 (T-38) or R7-T39 (T-39) easels and completing an online verification form in conformance with the Traffic Control Manual for In-Street Work. In high impact areas, the Central Business District, and in areas where construction projects are densely clustered (such as in City-designated "Construction Hubs"), additional requirements for establishing a Temporary No Parking Zone may apply.
- 7. Nighttime illumination.** Four or more Type B warning lights of sufficient brilliance to be seen from 500 feet shall be maintained at all times during the hours of darkness at the points of obstruction or excavation of any right of way.
- 8. Work in alleys.** For work occurring in alleys that impedes vehicular access, including but not limited to egress, ingress, or through travel; "Street Closed" signs shall be placed at each end of the alley. Property owners adjacent to the alley shall be contacted, and their access concerns shall be addressed and mitigated if possible. This may require alternative work scheduling in the case of Solid Waste collection days

## **APPENDIX C**

### **Laboratory Analytical and Data Validation Reports**



15 February 2018

Adam Griffin  
Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle, WA 98104

RE: Art Brass

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
18B0022	N/A

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I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

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



# Chain of Custody Record & Laboratory Analysis Request



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

ARI Assigned Number: <b>18150072</b>		Turn-around Requested: <b>Standard</b>			Page: <b>1</b> of <b>1</b>							
ARI Client Company: <b>Aspect Consulting</b>			Phone: <b>206-780-7746</b>		Date: <b>2/1/18</b>	Ice Present?						
Client Contact: <b>Adam Griffin</b>			No. of Coolers:		Cooler Temps:							
Client Project Name: <b>Art Brass Plating Metals Pilot Study</b>				Analysis Requested				Notes/Comments				
Client Project #: <b>050067-014J-01</b>		Samplers: <b>AOO</b>		Diss. Metals Cd, Cu, Ni, Zn EPA 200.68	Diss. Metals As, Ba, Mn EPA 6010	Diss. Metals Al, Co, Fe, Mg K, Na 6010	Alkalinity EPA 310.1	TOC EPA 415.1 or 9100	Chloride EPA 300.1	Sulfate EPA 300.0	Acidity SM 2310B	
Sample ID	Date	Time	Matrix	No. Containers								
MW-3-012918	1/29/18	1800	H <sub>2</sub> O	7	X	X	X	X	X	X	X	X
MW-8-013118	1/31/18	1345	↓	6	X		X	X	X	X	X	X
MW-1-013118	1/31/18	1500		6	X		X	X	X	X	X	X
MW-3-30-013118	1/31/18	1620		6	X		X	X	X	X	X	X
IW-1-020118	2/1/18	0905		7	X	X	X	X	X	X	X	X
IW-2-020118	2/1/18	1440		7	X	X	X	X	X	X	X	X
PSW-6-020118	2/1/18	1015		7	X	X	X	X	X	X	X	X
PSW-7-020118	2/1/18	1320		9	X	X	X	X	X	X	X	X
PSW-7-020118-D	2/1/18	1320		1	X	X	X	X	X	X	X	X
PSW-8-020118	2/1/18	1130	7	X	X	X	X	X	X	X	X	
Comments/Special Instructions	Relinquished by: (Signature) <i>Amelia Oates</i>		Received by: (Signature) <i>Paul Walter</i>		Relinquished by: (Signature)			Received by: (Signature)				
	Printed Name: <b>Amelia Oates</b>		Printed Name: <b>Paul Walter</b>		Printed Name:			Printed Name:				
	Company: <b>Aspect</b>		Company: <b>ARI</b>		Company:			Company:				
	Date & Time: <b>2/1/18 1649</b>		Date & Time: <b>2/1/18 1649</b>		Date & Time:			Date & Time:				

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-3-012918	18B0022-01	Water	29-Jan-2018 18:00	01-Feb-2018 16:49
MW-8-013118	18B0022-02	Water	31-Jan-2018 13:45	01-Feb-2018 16:49
MW-1-013118	18B0022-03	Water	31-Jan-2018 15:00	01-Feb-2018 16:49
MW-3-30-013118	18B0022-04	Water	31-Jan-2018 16:20	01-Feb-2018 16:49
IW-1-020118	18B0022-05	Water	01-Feb-2018 09:05	01-Feb-2018 16:49
IW-2-020118	18B0022-06	Water	01-Feb-2018 14:40	01-Feb-2018 16:49
PSW-6-020118	18B0022-07	Water	01-Feb-2018 10:15	01-Feb-2018 16:49
PSW-7-020118	18B0022-08	Water	01-Feb-2018 13:20	01-Feb-2018 16:49
PSW-7-020118-D	18B0022-09	Water	01-Feb-2018 13:20	01-Feb-2018 16:49
PSW-8-020118	18B0022-10	Water	01-Feb-2018 11:30	01-Feb-2018 16:49



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

## Case Narrative

### Sample receipt

Samples as listed on the preceding page were received February 1, 2018 under ARI workorder 18B0022. For details regarding sample receipt, please refer to the Cooler Receipt Form. The Acidity analysis was subcontracted to ETS Labs.

### Dissolved Metals - EPA Method 6020A

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits.

The LCS percent recoveries were within control limits.

A matrix spike, matrix spike duplicate and duplicate were prepared in conjunction with sample PSW-7-020118. The duplicate RPD were within QC limits. The matrix spike and matrix spike duplicate have a natural concentration of Nickel that is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible. The Nickel has been flagged with an "HC" qualifier on the matrix spike and matrix spike duplicate. The results are advisory. All other matrix spike/matrix spike duplicate percent recoveries and RPD were within QC limits. No further corrective action was taken.

### Dissolved Metals - EPA Method 6010C

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank has Sodium detected below the reporting limit, but above the method detection limit. The Sodium has been flagged with a "J" qualifier on the method blank. No further corrective action was taken.

The LCS percent recoveries were within control limits.

A matrix spike, matrix spike duplicate and duplicate were prepared in conjunction with sample PSW-7-020118. The matrix spike, matrix spike duplicate and duplicate percent recoveries and RPD were within QC limits. The matrix spike and matrix spike duplicate have a Sodium concentration that exceeds the upper calibration range, and have been flagged with an "E" qualifier. No further corrective action was taken.

### Wet Chemistry (Alkalinity, Anions, TOC)

The samples were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blanks were clean at the reporting limits.



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-01

Project Manager: Adam Griffin

**Reported:**

15-Feb-2018 16:32

The LCS percent recoveries were within control limits.

The Alkalinity SRM percent recovery was within control limits.

A matrix spike and/or duplicate was prepared in conjunction with sample PSW-7-020118. The matrix spike percent recoveries and duplicate RPD were within QC limits.



WORK ORDER

18B0022

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: [none]

**Report To:**

Aspect Consulting, LLC.  
Adam Griffin  
401 Second Avenue South, Suite 201  
Seattle, WA 98104  
Phone: 206-780-7728  
Fax: -

**Invoice To:**

Aspect Consulting, LLC.  
Accounts Payable  
401 Second Avenue South, Suite 201  
Seattle, WA 98104  
Phone :206-780-7728  
Fax: -

Date Due: 16-Feb-2018 18:00 (10 day TAT)

Received By: Jacob Walter

Date Received: 01-Feb-2018 16:49

Logged In By: Jacob Walter

Date Logged In: 01-Feb-2018 17:36

Samples Received at: 4.4°C

Intact, properly signed and dated custody seals attached to outside of cooler(s).....	No	Custody papers included with the cooler.....	Yes
Custody papers properly filled out (in, signed, analyses requested, etc).....	Yes	Was a temperature blank included in the cooler.....	No
Was sufficient ice used (if appropriate).....	Yes	All bottles sealed in individual plastic bags.....	No
All bottles arrived in good condition (unbroken).....	Yes	All bottle labels complete and legible.....	Yes
Number of containers listed on COC match number received.....	Yes	Bottle labels and tags agree with COC.....	Yes
Correct bottles used for the requested analyses.....	Yes	All VOC vials free of air bubbles.....	Yes
Analyses/bottles require preservation (attach preservation sheet excluding VOC).....	No	Sufficient amount of sample sent in each bottle.....	Yes
Sample split at ARI.....	No		

Analysis	Due	TAT	Expires	Comments
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18B0022-01 MW-3-012918 [Water] Sampled 29-Jan-2018 18:00 (GMT-08:00)  
Pacific Time (US & Canada)

Met Diss 6020A - Ba	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	26-Feb-2018 18:00	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	28-Jul-2018 18:00	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	26-Feb-2018 18:00	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	12-Feb-2018 18:00	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	26-Feb-2018 18:00	



WORK ORDER

18B0022

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

Analysis	Due	TAT	Expires	Comments
<b>18B0022-02 MW-8-013118 [Water] Sampled 31-Jan-2018 13:45 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	28-Feb-2018 13:45	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	30-Jul-2018 13:45	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	30-Jul-2018 13:45	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	30-Jul-2018 13:45	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	30-Jul-2018 13:45	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	28-Feb-2018 13:45	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	28-Feb-2018 13:45	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	30-Jul-2018 13:45	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	14-Feb-2018 13:45	

<b>18B0022-03 MW-1-013118 [Water] Sampled 31-Jan-2018 15:00 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	30-Jul-2018 15:00	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	30-Jul-2018 15:00	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	28-Feb-2018 15:00	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	30-Jul-2018 15:00	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	30-Jul-2018 15:00	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	28-Feb-2018 15:00	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	28-Feb-2018 15:00	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	30-Jul-2018 15:00	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	14-Feb-2018 15:00	

<b>18B0022-04 MW-3-30-013118 [Water] Sampled 31-Jan-2018 16:20 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	30-Jul-2018 16:20	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	28-Feb-2018 16:20	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	28-Feb-2018 16:20	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	30-Jul-2018 16:20	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	30-Jul-2018 16:20	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	30-Jul-2018 16:20	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	28-Feb-2018 16:20	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	14-Feb-2018 16:20	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	30-Jul-2018 16:20	



WORK ORDER

18B0022

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

Analysis	Due	TAT	Expires	Comments
<b>18B0022-05 IW-1-020118 [Water] Sampled 01-Feb-2018 09:05 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	15-Feb-2018 09:05	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Met Diss 6020A - Ba	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 09:05	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	01-Mar-2018 09:05	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	31-Jul-2018 09:05	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 09:05	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	

<b>18B0022-06 IW-2-020118 [Water] Sampled 01-Feb-2018 14:40 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	15-Feb-2018 14:40	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 14:40	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Met Diss 6020A - Ba	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	31-Jul-2018 14:40	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	01-Mar-2018 14:40	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 14:40	



WORK ORDER

18B0022

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

Analysis	Due	TAT	Expires	Comments
<b>18B0022-07 PSW-6-020118 [Water] Sampled 01-Feb-2018 10:15 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 10:15	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	01-Mar-2018 10:15	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Met Diss 6020A - Ba	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	31-Jul-2018 10:15	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 10:15	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	15-Feb-2018 10:15	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	31-Jul-2018 10:15	

<b>18B0022-08 IW-7-020118 [Water] Sampled 01-Feb-2018 13:20 (GMT-08:00) MS/MSD Pacific Time (US &amp; Canada)</b>				
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 6020A - Ba	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	01-Mar-2018 13:20	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 13:20	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 13:20	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	15-Feb-2018 13:20	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	



WORK ORDER

18B0022

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

Analysis	Due	TAT	Expires	Comments
<b>18B0022-09 IW-7-020118-D [Water] Sampled 01-Feb-2018 13:20 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 13:20	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	01-Mar-2018 13:20	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	31-Jul-2018 13:20	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	15-Feb-2018 13:20	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 13:20	
Met Diss 6020A - Ba	16-Feb-2018 15:00	10	31-Jul-2018 13:20	

<b>18B0022-10 PSW-8-020118 [Water] Sampled 01-Feb-2018 11:30 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Alkalinity, Total SM 2320 B-97	16-Feb-2018 15:00	10	15-Feb-2018 11:30	
Organic Carbon, Total, 9060A	16-Feb-2018 15:00	10	01-Mar-2018 11:30	
Met Diss 6020A - Mn	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 6020A - Fe	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 6020A - Ba	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 6020A - As UCT	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 200.8 - Zn UCT	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 200.8 - Ni UCT	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 200.8 - Cu UCT	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Met Diss 200.8 - Cd UCT	16-Feb-2018 15:00	10	31-Jul-2018 11:30	
Filter 0.45 micron	16-Feb-2018 15:00	10	02-Feb-2018 16:49	
Chloride, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 11:30	
Sulfate, IC, EPA 300.0	16-Feb-2018 15:00	10	01-Mar-2018 11:30	

ESC Lab Sciences

<b>18B0022-01 MW-3-012918 [Water] Sampled 29-Jan-2018 18:00 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve	16-Feb-2018 15:00	10	12-Feb-2018 18:00	



WORK ORDER

18B0022

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

Analysis	Due	TAT	Expires	Comments
<b>ESC Lab Sciences</b>				
<b>18B0022-02 MW-8-013118 [Water] Sampled 31-Jan-2018 13:45 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		14-Feb-2018 13:45	
<b>18B0022-03 MW-1-013118 [Water] Sampled 31-Jan-2018 15:00 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		14-Feb-2018 15:00	
<b>18B0022-04 MW-3-30-013118 [Water] Sampled 31-Jan-2018 16:20 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		14-Feb-2018 16:20	
<b>18B0022-05 IW-1-020118 [Water] Sampled 01-Feb-2018 09:05 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		15-Feb-2018 09:05	
<b>18B0022-06 IW-2-020118 [Water] Sampled 01-Feb-2018 14:40 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		15-Feb-2018 14:40	
<b>18B0022-07 PSW-6-020118 [Water] Sampled 01-Feb-2018 10:15 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		15-Feb-2018 10:15	
<b>18B0022-08 IW-7-020118 [Water] Sampled 01-Feb-2018 13:20 (GMT-08:00) Pacific Time (US &amp; Canada)</b> MS/MSD				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		15-Feb-2018 13:20	
<b>18B0022-09 IW-7-020118-D [Water] Sampled 01-Feb-2018 13:20 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		15-Feb-2018 13:20	
<b>18B0022-10 PSW-8-020118 [Water] Sampled 01-Feb-2018 11:30 (GMT-08:00) Pacific Time (US &amp; Canada)</b>				
Acidity, SM2310 Full Titration Curve (S16-Feb-2018 15:00	10		15-Feb-2018 11:30	



WORK ORDER

18B0022

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: [none]

Preservation Confirmation

Container ID	Container Type	pH	
18B0022-01 A	Small OJ, 500 mL		
18B0022-01 B	Small OJ, 500 mL		
18B0022-01 C	Small OJ, 500 mL		
18B0022-01 D	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
18B0022-01 E	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-01 F	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-01 G	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-02 A	Small OJ, 500 mL		
18B0022-02 B	Small OJ, 500 mL		
18B0022-02 C	Small OJ, 500 mL		
18B0022-02 D	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
18B0022-02 E	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-02 F	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-03 A	Small OJ, 500 mL		
18B0022-03 B	Small OJ, 500 mL		
18B0022-03 C	Small OJ, 500 mL		
18B0022-03 D	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
18B0022-03 E	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-03 F	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-04 A	Small OJ, 500 mL		
18B0022-04 B	Small OJ, 500 mL		
18B0022-04 C	Small OJ, 500 mL		
18B0022-04 D	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
18B0022-04 E	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-04 F	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-05 A	Small OJ, 500 mL		
18B0022-05 B	Small OJ, 500 mL		
18B0022-05 C	Small OJ, 500 mL		
18B0022-05 D	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
18B0022-05 E	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
18B0022-05 F	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass



WORK ORDER

18B0022

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

18B0022-05 G	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-06 A	Small OJ, 500 mL		
18B0022-06 B	Small OJ, 500 mL		
18B0022-06 C	Small OJ, 500 mL		
18B0022-06 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2	Pass
18B0022-06 E	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-06 F	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-06 G	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-07 A	Small OJ, 500 mL		
18B0022-07 B	Small OJ, 500 mL		
18B0022-07 C	Small OJ, 500 mL		
18B0022-07 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2	Pass
18B0022-07 E	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-07 F	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-07 G	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-08 A	Small OJ, 500 mL		
18B0022-08 B	Small OJ, 500 mL		
18B0022-08 C	Small OJ, 500 mL		
18B0022-08 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2	Pass
18B0022-08 E	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-08 F	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-08 G	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-08 H	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-08 I	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-09 A	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-10 A	Small OJ, 500 mL		
18B0022-10 B	Small OJ, 500 mL		
18B0022-10 C	Small OJ, 500 mL		
18B0022-10 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2	Pass
18B0022-10 E	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-10 F	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass
18B0022-10 G	HDPE NM, 500 mL, 1:1 HNO3	L2	Pass



WORK ORDER

18B0022

Client: Aspect Consulting, LLC.	Project Manager: Amanda Volgardsen
Project: Art Brass	Project Number: [none]

*JBW*

Preservation Confirmed By

*2/1/2018*

Date



**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
**ARI Work Order:18B0022**

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone :(615) 773-9739  
Fax:

**PLEASE SEND DATA TO** subdata@arilabs.com

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18B0022-01</b>				
<b>Sampled: 01/29/18 18:00 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/12/18 18:00		
<i>Containers Supplied:</i>				
<div style="border: 1px solid black; padding: 2px;"> <b>18B0022-01 A</b> Small OJ, 500 mL         </div>				
<b>Sample ID: 18B0022-02</b>				
<b>Sampled: 01/31/18 13:45 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/14/18 13:45		
<i>Containers Supplied:</i>				
<div style="border: 1px solid black; padding: 2px;"> <b>18B0022-02 A</b> Small OJ, 500 mL         </div>				
<b>Sample ID: 18B0022-03</b>				
<b>Sampled: 01/31/18 15:00 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/14/18 15:00		
<i>Containers Supplied:</i>				
<div style="border: 1px solid black; padding: 2px;"> <b>18B0022-03 A</b> Small OJ, 500 mL         </div>				
<b>Sample ID: 18B0022-04</b>				
<b>Sampled: 01/31/18 16:20 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/14/18 16:20		
<i>Containers Supplied:</i>				
<div style="border: 1px solid black; padding: 2px;"> <b>18B0022-04 A</b> Small OJ, 500 mL         </div>				

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_



SUBCONTRACT ORDER  
To: ESC Lab Sciences  
ARI Work Order:18B0022

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18B0022-05</b>				
<b>Sampled: 02/01/18 09:05 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 09:05		
<i>Containers Supplied:</i>				
18B0022-05 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-06</b>				
<b>Sampled: 02/01/18 14:40 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 14:40		
<i>Containers Supplied:</i>				
18B0022-06 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-07</b>				
<b>Sampled: 02/01/18 10:15 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 10:15		
<i>Containers Supplied:</i>				
18B0022-07 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-08</b>				
<b>Sampled: 02/01/18 13:20 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 13:20		MS/MSD
<i>Containers Supplied:</i>				
18B0022-08 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-09</b>				
<b>Sampled: 02/01/18 13:20 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 13:20		
<i>Containers Supplied:</i>				
<b>Sample ID: 18B0022-10</b>				
<b>Sampled: 02/01/18 11:30 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 11:30		
<i>Containers Supplied:</i>				
18B0022-10 A Small OJ, 500 mL				

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_



# Cooler Receipt Form

*metals pilot study*

ARI Client: Aspect Consulting  
 COC No(s): \_\_\_\_\_ NA  
 Assigned ARI Job No: 18B0022

Project Name: Art Brass plating  
 Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_  
 Tracking No: \_\_\_\_\_ NA

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES NO  
 Were custody papers included with the cooler? ..... YES NO  
 Were custody papers properly filled out (ink, signed, etc.) ..... YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)  
 Time: 1649 1.8°C 4.4°C  
 If cooler temperature is out of compliance fill out form 00070F cooler #1 Temp Gun ID#: 2005206

Cooler Accepted by: JSW Date: 2/11/2018 Time: 1649

**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: \_\_\_\_\_

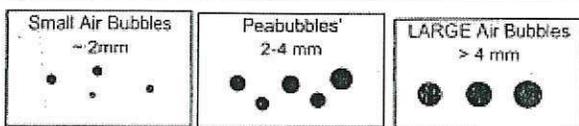
Samples Logged by: JSW Date: 2/11/2018 Time: 1717

**\*\* 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)

February 12, 2018

## Analytical Resources - Tukwila, WA

Sample Delivery Group: L968458

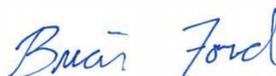
Samples Received: 02/06/2018

Project Number: 18B0022

Description: 18B0022

Report To: Amanda Volgardsen  
4611 S. 134th PI  
Tukwila, WA 98168

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	<b>2</b> Tc
<b>Ss: Sample Summary</b>	<b>3</b>	<b>3</b> Ss
<b>Cn: Case Narrative</b>	<b>5</b>	<b>4</b> Cn
<b>Sr: Sample Results</b>	<b>6</b>	<b>5</b> Sr
18B0022-01 L968458-01	<b>6</b>	<b>6</b> Qc
18B0022-02 L968458-02	<b>7</b>	<b>7</b> Gl
18B0022-03 L968458-03	<b>8</b>	<b>8</b> Al
18B0022-04 L968458-04	<b>9</b>	<b>9</b> Sc
18B0022-05 L968458-05	<b>10</b>	
18B0022-06 L968458-06	<b>11</b>	
18B0022-07 L968458-07	<b>12</b>	
18B0022-08 L968458-08	<b>13</b>	
18B0022-10 L968458-09	<b>14</b>	
<b>Qc: Quality Control Summary</b>	<b>15</b>	
Wet Chemistry by Method 2310 B-2011	<b>15</b>	
<b>Gl: Glossary of Terms</b>	<b>16</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>17</b>	
<b>Sc: Sample Chain of Custody</b>	<b>18</b>	

# SAMPLE SUMMARY



Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Collected by					
Collected date/time					
Received date/time					
18B0022-01 L968458-01 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-02 L968458-02 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-03 L968458-03 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-04 L968458-04 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-05 L968458-05 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-06 L968458-06 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-07 L968458-07 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH
Collected by					
Collected date/time					
Received date/time					
18B0022-08 L968458-08 GW					
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

# SAMPLE SUMMARY



18B0022-10 L968458-09 GW

Collected by

Collected date/time

Received date/time

02/01/18 11:30

02/06/18 10:00

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1072418	1	02/11/18 11:45	02/11/18 11:45	TH

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
Technical Service Representative

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	26000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-01 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-02 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	40000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-03 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-04 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	20000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-05 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	24000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-06 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	130000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-07 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	20000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-08 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	80000		3630	10000	1	02/11/2018 11:45	<a href="#">WG1072418</a>

Sample Narrative:

L968458-09 WG1072418: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3285514-1 02/11/18 11:45

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Acidity	U		3630	10000

Sample Narrative:

BLANK: Endpoint pH 8.3

L968458-05 Original Sample (OS) • Duplicate (DUP)

(OS) L968458-05 02/11/18 11:45 • (DUP) R3285514-4 02/11/18 11:45

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	20000	20000	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

L969132-02 Original Sample (OS) • Duplicate (DUP)

(OS) L969132-02 02/11/18 11:45 • (DUP) R3285514-5 02/11/18 11:45

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3285514-2 02/11/18 11:45 • (LCSD) R3285514-3 02/11/18 11:45

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Acidity	20000	22000	22000	110	110	85.0-115			0.000	20

Sample Narrative:

LCS: Endpoint pH 8.3  
LCSD: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.  
 \* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

## State Accreditations

Alabama	40660	Nevada	TN-03-2002-34
Alaska	UST-080	New Hampshire	2975
Arizona	AZ0612	New Jersey-NELAP	TN002
Arkansas	88-0469	New Mexico	TN00003
California	01157CA	New York	11742
Colorado	TN00003	North Carolina	Env375
Connecticut	PH-0197	North Carolina <sup>1</sup>	DW21704
Florida	E87487	North Carolina <sup>2</sup>	41
Georgia	NELAP	North Dakota	R-140
Georgia <sup>1</sup>	923	Ohio-VAP	CL0069
Idaho	TN00003	Oklahoma	9915
Illinois	200008	Oregon	TN200002
Indiana	C-TN-01	Pennsylvania	68-02979
Iowa	364	Rhode Island	221
Kansas	E-10277	South Carolina	84004
Kentucky <sup>1</sup>	90010	South Dakota	n/a
Kentucky <sup>2</sup>	16	Tennessee <sup>1,4</sup>	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	6157585858
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	109
Minnesota	047-999-395	Washington	C1915
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA
Nebraska	NE-OS-15-05		

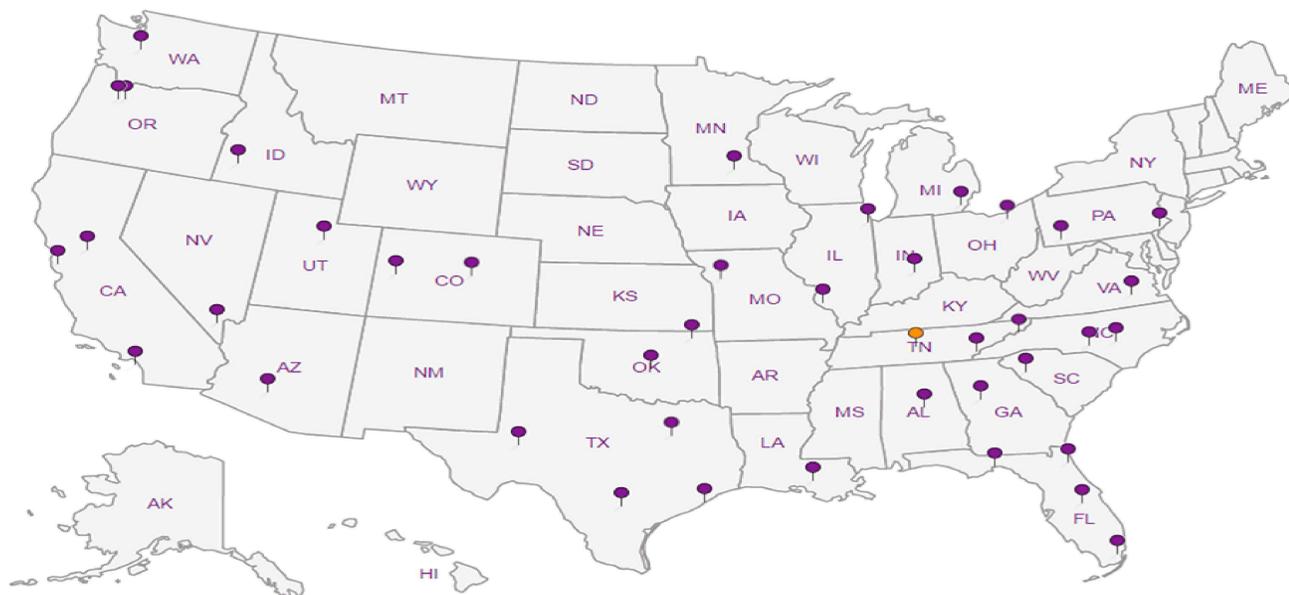
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP, LLC	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	S-67674
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water   <sup>2</sup> Underground Storage Tanks   <sup>3</sup> Aquatic Toxicity   <sup>4</sup> Chemical/Microbiological   <sup>5</sup> Mold   n/a Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.





Analytical Resources, Incorporated  
Analytical Chemists and Consultants

**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
ARI Work Order: 18B0022

*MW*  
*L967880*  
*L968458*

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone: (615) 773-9739  
Fax:

PLEASE SEND DATA TO [subdata@arilabs.com](mailto:subdata@arilabs.com)

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18B0022-01</b>				
<b>Sampled: 01/29/18 18:00 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/12/18 18:00		
<i>Containers Supplied:</i>				
18B0022-01 A Small OJ, 500 mL				-01
<b>Sample ID: 18B0022-02</b>				
<b>Sampled: 01/31/18 13:45 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/14/18 13:45		
<i>Containers Supplied:</i>				
18B0022-02 A Small OJ, 500 mL				-02
<b>Sample ID: 18B0022-03</b>				
<b>Sampled: 01/31/18 15:00 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/14/18 15:00		
<i>Containers Supplied:</i>				
18B0022-03 A Small OJ, 500 mL				-03
<b>Sample ID: 18B0022-04</b>				
<b>Sampled: 01/31/18 16:20 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/14/18 16:20		
<i>Containers Supplied:</i>				
18B0022-04 A Small OJ, 500 mL				

*Standard Report -04*  
*EDD Needed*

A177

*Jack Watt sbw 2/5/18 @ 1527*  
Released By \_\_\_\_\_ Date \_\_\_\_\_

*QJ Bz 834*  
Received By \_\_\_\_\_ Date \_\_\_\_\_

*013 mg*  
*2-6-18* *8845 1000*  
Date \_\_\_\_\_

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_



Analytical Resources, Incorporated  
Analytical Chemists and Consultants

**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
ARI Work Order: 18B0022

L968453

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18B0022-05</b>				
<b>Sampled: 02/01/18 09:05 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 09:05		
<i>Containers Supplied:</i>				
18B0022-05 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-06</b>				
<b>Sampled: 02/01/18 14:40 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 14:40		
<i>Containers Supplied:</i>				
18B0022-06 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-07</b>				
<b>Sampled: 02/01/18 10:15 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 10:15		
<i>Containers Supplied:</i>				
18B0022-07 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-08</b>				
<b>Sampled: 02/01/18 13:20 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 13:20		MS/MSD
<i>Containers Supplied:</i>				
18B0022-08 A Small OJ, 500 mL				
<b>Sample ID: 18B0022-10</b>				
<b>Sampled: 02/01/18 11:30 Matrix: Water</b>				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 11:30		
<i>Containers Supplied:</i>				
18B0022-10 A Small OJ, 500 mL				

05

06

07

-08

-09

013 msc  
sc

Released By: *[Signature]* Date: 2/15/18 @ 15:27  
 Received By: *[Signature]* 834 Date: 2-6-18  
 0845 1000

Released By

Date

Received By

Date



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

## Sample ID Cross Reference Report

**Client:** Aspect Consulting, LLC.

**Work Order:** 18B0022

**Project:** Art Brass

**Project Number:** 050067-014J-01

<u>LabNumber</u>	<u>SampleName</u>	<u>ClientMatrix</u>	<u>Sampled</u>	<u>SampleReceived</u>
18B0022-01	MW-3-012918	Water	29-Jan-2018 18:00	01-Feb-2018 16:49
18B0022-02	MW-8-013118	Water	31-Jan-2018 13:45	01-Feb-2018 16:49
18B0022-03	MW-1-013118	Water	31-Jan-2018 15:00	01-Feb-2018 16:49
18B0022-04	MW-3-30-013118	Water	31-Jan-2018 16:20	01-Feb-2018 16:49
18B0022-05	IW-1-020118	Water	01-Feb-2018 09:05	01-Feb-2018 16:49
18B0022-06	IW-2-020118	Water	01-Feb-2018 14:40	01-Feb-2018 16:49
18B0022-07	PSW-6-020118	Water	01-Feb-2018 10:15	01-Feb-2018 16:49
18B0022-08	PSW-7-020118	Water	01-Feb-2018 13:20	01-Feb-2018 16:49
18B0022-09	PSW-7-020118-D	Water	01-Feb-2018 13:20	01-Feb-2018 16:49
18B0022-10	PSW-8-020118	Water	01-Feb-2018 11:30	01-Feb-2018 16:49

013 MW  
50

## ESC LAB SCIENCES Cooler Receipt Form

Client: <u>ANARCBSTWA</u>	SDG#	<u>L968458</u>	
Cooler Received/Opened On: <u>02/6</u> /2018	Temperature:	<u>0.3° C</u>	
Received By: <u>David Riffin</u>			
Signature: 			
Receipt Check List	NP	Yes	No
COC Seal Present / Intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
COC Signed / Accurate?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bottles arrive intact?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Correct bottles used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sufficient volume sent?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
If Applicable	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
VOA Zero headspace?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Preservation Correct / Checked?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**MW-3-012918**  
**18B0022-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 01/29/2018 18:00

Instrument: ICPMS2

Analyzed: 02-Feb-2018 18:41

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.216</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>15.5</b>	ug/L	
Nickel, Dissolved	7440-02-0	100	50.0	<b>11400</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>46.6</b>	ug/L	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**MW-3-012918**  
**18B0022-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 01/29/2018 18:00

Instrument: ICP2

Analyzed: 14-Feb-2018 13:30

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	1.25	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	0.0060	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	0.0084	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	26.0	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	0.0791	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	7.14	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	0.356	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	6.79	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	37.0	mg/L	



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Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**MW-3-012918**  
**18B0022-01 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 01/29/2018 18:00

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 22:14

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146  
Prepared: 07-Feb-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.88</b>	mg/L	



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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**MW-3-012918**  
**18B0022-01 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 01/29/2018 18:00

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079  
Prepared: 05-Feb-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	ND	mg/L CaCO <sub>3</sub>	U



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**Reported:**  
15-Feb-2018 16:32

**MW-3-012918**  
**18B0022-01RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/29/2018 18:00

Instrument: DX500

Analyzed: 07-Feb-2018 19:46

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	23.7	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**MW-3-012918**  
**18B0022-01RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/29/2018 18:00

Instrument: DX500

Analyzed: 08-Feb-2018 17:12

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>163</b>	mg/L	D



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Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**MW-8-013118**  
**18B0022-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 01/31/2018 13:45

Instrument: ICPMS2

Analyzed: 02-Feb-2018 18:46

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	1.72	ug/L	
Nickel, Dissolved	7440-02-0	100	50.0	6740	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	7.56	ug/L	



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Project Manager: Adam Griffin

Reported:  
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**MW-8-013118**  
**18B0022-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 01/31/2018 13:45

Instrument: ICP2

Analyzed: 14-Feb-2018 14:33

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0418</b>	mg/L	J
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>51.1</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>3.54</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>13.1</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>11.1</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>41.5</b>	mg/L	



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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**MW-8-013118**  
**18B0022-02 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 01/31/2018 13:45

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 22:45

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146  
Prepared: 07-Feb-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.99</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**MW-8-013118**  
**18B0022-02 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 01/31/2018 13:45

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079  
Prepared: 05-Feb-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	<b>58.7</b>	mg/L CaCO <sub>3</sub>	



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**Reported:**  
15-Feb-2018 16:32

**MW-8-013118**  
**18B0022-02RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/31/2018 13:45

Instrument: DX500

Analyzed: 07-Feb-2018 20:03

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	33.5	mg/L	D



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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**MW-8-013118**  
**18B0022-02RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/31/2018 13:45

Instrument: DX500

Analyzed: 08-Feb-2018 17:28

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>187</b>	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**MW-1-013118**  
**18B0022-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 01/31/2018 15:00

Instrument: ICPMS2

Analyzed: 02-Feb-2018 18:51

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.456</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>16.2</b>	ug/L	
Nickel, Dissolved	7440-02-0	100	50.0	<b>18600</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>44.4</b>	ug/L	



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Reported:  
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**MW-1-013118**  
**18B0022-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 01/31/2018 15:00

Instrument: ICP2

Analyzed: 14-Feb-2018 14:37

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.823</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>20.2</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.413</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>6.76</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>9.20</b>	mg/L	



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Reported:  
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**MW-1-013118**  
**18B0022-03 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 01/31/2018 15:00

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 23:03

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146  
Prepared: 07-Feb-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.91</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**MW-1-013118**  
**18B0022-03 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 01/31/2018 15:00

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079 Sample Size: 100 mL  
Prepared: 05-Feb-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	ND	mg/L CaCO <sub>3</sub>	U



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Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**MW-1-013118**  
**18B0022-03RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/31/2018 15:00

Instrument: DX500

Analyzed: 07-Feb-2018 20:20

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	<b>49.2</b>	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**MW-1-013118**  
**18B0022-03RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/31/2018 15:00

Instrument: DX500

Analyzed: 08-Feb-2018 17:45

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>219</b>	mg/L	D



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Project: Art Brass

Project Number: 050067-014J-01

Project Manager: Adam Griffin

**Reported:**

15-Feb-2018 16:32

**MW-3-30-013118**

**18B0022-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 01/31/2018 16:20

Instrument: ICPMS2

Analyzed: 02-Feb-2018 18:56

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Preparation Batch: BGB0032

Sample Size: 25 mL

Prepared: 02-Feb-2018

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	ND	ug/L	U
Nickel, Dissolved	7440-02-0	1	0.500	<b>4.62</b>	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



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Reported:  
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**MW-3-30-013118**

**18B0022-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 01/31/2018 16:20

Instrument: ICP2

Analyzed: 14-Feb-2018 14:41

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	ND	mg/L	U
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	14.4	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	8.68	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	20.9	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	7.22	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	30.1	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**MW-3-30-013118**

**18B0022-04 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 01/31/2018 16:20

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 23:26

Sample Preparation:

Preparation Method: No Prep Wet Chem

Preparation Batch: BGB0146

Prepared: 07-Feb-2018

Sample Size: 20 mL

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>3.96</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**MW-3-30-013118**

**18B0022-04 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 01/31/2018 16:20

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem

Preparation Batch: BGB0079

Prepared: 05-Feb-2018

Sample Size: 100 mL

Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	<b>158</b>	mg/L CaCO3	



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**Reported:**  
15-Feb-2018 16:32

**MW-3-30-013118**  
**18B0022-04RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 01/31/2018 16:20

Instrument: DX500

Analyzed: 07-Feb-2018 20:36

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	<b>22.2</b>	mg/L	D

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	20	2.00	<b>18.6</b>	mg/L	D



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Project Number: 050067-014J-01  
Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**IW-1-020118**  
**18B0022-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 02/01/2018 09:05

Instrument: ICPMS2

Analyzed: 02-Feb-2018 19:00

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.176</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>23.1</b>	ug/L	
Nickel, Dissolved	7440-02-0	20	10.0	<b>2370</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>34.1</b>	ug/L	



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Reported:  
15-Feb-2018 16:32

**IW-1-020118**  
**18B0022-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 02/01/2018 09:05

Instrument: ICP2

Analyzed: 14-Feb-2018 13:34

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.433</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0287</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>28.2</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>3.05</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>9.53</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.561</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>8.65</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>33.8</b>	mg/L	



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Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**IW-1-020118**  
**18B0022-05 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 02/01/2018 09:05

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 23:49

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146 Sample Size: 20 mL  
Prepared: 07-Feb-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.88</b>	mg/L	



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Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**IW-1-020118**  
**18B0022-05 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 02/01/2018 09:05

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079 Sample Size: 100 mL  
Prepared: 05-Feb-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	<b>4.45</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**IW-1-020118**  
**18B0022-05RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 09:05

Instrument: DX500

Analyzed: 08-Feb-2018 18:02

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>143</b>	mg/L	D



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Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**IW-1-020118**  
**18B0022-05RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 09:05

Instrument: DX500

Analyzed: 08-Feb-2018 18:19

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	33.7	mg/L	D



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Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**IW-2-020118**  
**18B0022-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 02/01/2018 14:40

Instrument: ICPMS2

Analyzed: 02-Feb-2018 19:05

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.139</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>10.2</b>	ug/L	
Nickel, Dissolved	7440-02-0	20	10.0	<b>4570</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>35.8</b>	ug/L	



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Reported:  
15-Feb-2018 16:32

**IW-2-020118**  
**18B0022-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 02/01/2018 14:40

Instrument: ICP2

Analyzed: 14-Feb-2018 13:38

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.313</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0054</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0265</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>20.5</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>5.79</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>6.28</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.469</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>6.12</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>38.8</b>	mg/L	



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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**IW-2-020118**  
**18B0022-06 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 02/01/2018 14:40

Instrument: TOC-LCSH

Analyzed: 08-Feb-2018 00:52

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146  
Prepared: 07-Feb-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.97</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**IW-2-020118**  
**18B0022-06 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 02/01/2018 14:40

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079  
Prepared: 05-Feb-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	<b>3.64</b>	mg/L CaCO3	



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**Reported:**  
15-Feb-2018 16:32

**IW-2-020118**  
**18B0022-06RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 14:40

Instrument: DX500

Analyzed: 07-Feb-2018 21:27

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	<b>19.3</b>	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**IW-2-020118**  
**18B0022-06RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 14:40

Instrument: DX500

Analyzed: 08-Feb-2018 18:36

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>145</b>	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**PSW-6-020118**  
**18B0022-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 02/01/2018 10:15

Instrument: ICPMS2

Analyzed: 02-Feb-2018 19:10

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.171</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>1.06</b>	ug/L	
Nickel, Dissolved	7440-02-0	20	10.0	<b>4600</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>50.2</b>	ug/L	



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Reported:  
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**PSW-6-020118**  
**18B0022-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 02/01/2018 10:15

Instrument: ICP2

Analyzed: 14-Feb-2018 13:43

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.794</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0059</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0487</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>44.5</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>6.37</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>14.8</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.906</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>12.5</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**PSW-6-020118**  
**18B0022-07 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 02/01/2018 10:15

Instrument: TOC-LCSH

Analyzed: 08-Feb-2018 01:14

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146 Sample Size: 20 mL  
Prepared: 07-Feb-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.70</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**PSW-6-020118**  
**18B0022-07 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 02/01/2018 10:15

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079  
Prepared: 05-Feb-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	<b>6.68</b>	mg/L CaCO <sub>3</sub>	



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**Reported:**  
15-Feb-2018 16:32

**PSW-6-020118**  
**18B0022-07RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 10:15

Instrument: DX500

Analyzed: 07-Feb-2018 21:43

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	<b>49.6</b>	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**PSW-6-020118**  
**18B0022-07RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 10:15

Instrument: DX500

Analyzed: 13-Feb-2018 13:35

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	125	12.5	<b>247</b>	mg/L	D



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Project: Art Brass  
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Reported:  
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**PSW-7-020118**  
**18B0022-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 02/01/2018 13:20

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:15

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.251</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>2.55</b>	ug/L	
Nickel, Dissolved	7440-02-0	50	25.0	<b>8850</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>52.4</b>	ug/L	



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Reported:  
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**PSW-7-020118**  
**18B0022-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 02/01/2018 13:20

Instrument: ICP2

Analyzed: 14-Feb-2018 14:11

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.838</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0058</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0319</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>30.0</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>6.30</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>8.93</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.596</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>7.98</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>46.8</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**PSW-7-020118**  
**18B0022-08 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 02/01/2018 13:20

Instrument: TOC-LCSH

Analyzed: 08-Feb-2018 01:40

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146 Sample Size: 20 mL  
Prepared: 07-Feb-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.60</b>	mg/L	



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**Reported:**  
15-Feb-2018 16:32

**PSW-7-020118**  
**18B0022-08 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 02/01/2018 13:20

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079  
Prepared: 05-Feb-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	ND	mg/L CaCO3	U



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**Reported:**  
15-Feb-2018 16:32

**PSW-7-020118**  
**18B0022-08RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 13:20

Instrument: DX500

Analyzed: 07-Feb-2018 22:00

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	27.6	mg/L	D



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**Reported:**  
15-Feb-2018 16:32

**PSW-7-020118**  
**18B0022-08RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 13:20

Instrument: DX500

Analyzed: 08-Feb-2018 19:09

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>215</b>	mg/L	D



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Project Manager: Adam Griffin

Reported:  
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**PSW-7-020118-D**  
**18B0022-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 02/01/2018 13:20

Instrument: ICPMS2

Analyzed: 02-Feb-2018 15:40

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGB0032 Sample Size: 25 mL  
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.227</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>2.75</b>	ug/L	
Nickel, Dissolved	7440-02-0	50	25.0	<b>8800</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>52.3</b>	ug/L	



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**Reported:**

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**PSW-8-020118**

**18B0022-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 02/01/2018 11:30

Instrument: ICPMS2

Analyzed: 02-Feb-2018 15:45

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Preparation Batch: BGB0032

Sample Size: 25 mL

Prepared: 02-Feb-2018

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	<b>0.223</b>	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	<b>3.25</b>	ug/L	
Nickel, Dissolved	7440-02-0	50	25.0	<b>7510</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	<b>54.8</b>	ug/L	



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Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**PSW-8-020118**  
**18B0022-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 02/01/2018 11:30

Instrument: ICP2

Analyzed: 14-Feb-2018 13:47

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGB0265  
Prepared: 12-Feb-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.869</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0359</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>30.5</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>4.73</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>9.13</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.601</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>8.33</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>38.4</b>	mg/L	



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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**PSW-8-020118**  
**18B0022-10 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 02/01/2018 11:30

Instrument: TOC-LCSH

Analyzed: 08-Feb-2018 02:40

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0146 Sample Size: 20 mL  
Prepared: 07-Feb-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	<b>1.43</b>	mg/L	



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Project: Art Brass  
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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**PSW-8-020118**  
**18B0022-10 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 02/01/2018 11:30

Instrument: LCHAT2

Analyzed: 05-Feb-2018 13:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0079  
Prepared: 05-Feb-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	ND	mg/L CaCO <sub>3</sub>	U



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Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**PSW-8-020118**  
**18B0022-10RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 11:30

Instrument: DX500

Analyzed: 07-Feb-2018 22:51

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	<b>32.9</b>	mg/L	D



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: 050067-014J-01  
Project Manager: Adam Griffin

**Reported:**  
15-Feb-2018 16:32

**PSW-8-020118**  
**18B0022-10RE2 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 02/01/2018 11:30

Instrument: DX500

Analyzed: 08-Feb-2018 20:33

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0134  
Prepared: 07-Feb-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	<b>188</b>	mg/L	D



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Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGB0032 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: CC

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0032-BLK1)</b>											
						Prepared: 02-Feb-2018	Analyzed: 02-Feb-2018 16:06				
Cadmium, Dissolved	111	ND	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.100	ug/L							U
Copper, Dissolved	63	ND	0.500	ug/L							U
Copper, Dissolved	65	ND	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.500	ug/L							U
Zinc, Dissolved	66	ND	4.00	ug/L							U
Zinc, Dissolved	67	ND	4.00	ug/L							U

<b>LCS (BGB0032-BS1)</b>											
						Prepared: 02-Feb-2018	Analyzed: 02-Feb-2018 16:31				
Cadmium, Dissolved	111	27.1	0.100	ug/L	25.0		109	80-120			
Cadmium, Dissolved	114	26.9	0.100	ug/L	25.0		108	80-120			
Copper, Dissolved	63	25.5	0.500	ug/L	25.0		102	80-120			
Copper, Dissolved	65	25.9	0.500	ug/L	25.0		104	80-120			
Nickel, Dissolved	60	28.2	0.500	ug/L	25.0		113	80-120			
Nickel, Dissolved	62	27.5	0.500	ug/L	25.0		110	80-120			
Zinc, Dissolved	66	84.1	4.00	ug/L	80.0		105	80-120			
Zinc, Dissolved	67	77.2	4.00	ug/L	80.0		96.5	80-120			

<b>Duplicate (BGB0032-DUP1)</b>											
			<b>Source: 18B0022-08</b>			Prepared: 02-Feb-2018		Analyzed: 02-Feb-2018 16:11			
Cadmium, Dissolved	111	0.271	0.100	ug/L		0.251			7.66	20	
Copper, Dissolved	63	2.49	0.500	ug/L		2.55			2.46	20	
Zinc, Dissolved	66	51.1	4.00	ug/L		52.4			2.51	20	

<b>Duplicate (BGB0032-DUP2)</b>											
			<b>Source: 18B0022-08</b>			Prepared: 02-Feb-2018		Analyzed: 05-Feb-2018 17:51			
Nickel, Dissolved	62	9520	25.0	ug/L		8850			7.27	20	D

<b>Matrix Spike (BGB0032-MS1)</b>											
			<b>Source: 18B0022-08</b>			Prepared: 02-Feb-2018		Analyzed: 02-Feb-2018 16:20			
Cadmium, Dissolved	111	27.3	0.100	ug/L	25.0	0.251	108	75-125			
Copper, Dissolved	63	28.4	0.500	ug/L	25.0	2.55	103	75-125			
Zinc, Dissolved	66	133	4.00	ug/L	80.0	52.4	101	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

<b>Matrix Spike (BGB0032-MS2)</b>											
			<b>Source: 18B0022-08</b>			Prepared: 02-Feb-2018		Analyzed: 05-Feb-2018 18:00			
Nickel, Dissolved	62	9500	25.0	ug/L	25.0	8850	NR	75-125			HC, D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project: Art Brass

Project Number: 050067-014J-01

Project Manager: Adam Griffin

Reported:

15-Feb-2018 16:32

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGB0032 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: CC

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Matrix Spike Dup (BGB0032-MSD1)</b>		<b>Source: 18B0022-08</b>		Prepared: 02-Feb-2018		Analyzed: 02-Feb-2018 16:25					
Cadmium, Dissolved	111	25.2	0.100	ug/L	25.0	0.251	99.6	75-125	8.29	20	
Copper, Dissolved	63	27.6	0.500	ug/L	25.0	2.55	100	75-125	2.72	20	
Zinc, Dissolved	66	125	4.00	ug/L	80.0	52.4	90.8	75-125	6.16	20	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

<b>Matrix Spike Dup (BGB0032-MSD2)</b>		<b>Source: 18B0022-08</b>		Prepared: 02-Feb-2018		Analyzed: 05-Feb-2018 18:05					
Nickel, Dissolved	62	9260	25.0	ug/L	25.0	8850	NR	75-125	2.61	20	HC, D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Reported:  
15-Feb-2018 16:32

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGB0265 - WMN (No Prep)**

Instrument: ICP2 Analyst: CC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0265-BLK1)</b>											
						Prepared: 12-Feb-2018 Analyzed: 14-Feb-2018 14:03					
Aluminum, Dissolved	ND	0.0085	0.0500	mg/L							U
Arsenic, Dissolved	ND	0.0047	0.0500	mg/L							U
Barium, Dissolved	ND	0.0007	0.0030	mg/L							U
Calcium, Dissolved	ND	0.0051	0.0500	mg/L							U
Iron, Dissolved	ND	0.0013	0.0500	mg/L							U
Magnesium, Dissolved	ND	0.0160	0.0500	mg/L							U
Manganese, Dissolved	ND	0.0003	0.0010	mg/L							U
Potassium, Dissolved	ND	0.0520	0.500	mg/L							U
Sodium, Dissolved	0.0123	0.0114	0.500	mg/L							J
<b>LCS (BGB0265-BS1)</b>											
						Prepared: 12-Feb-2018 Analyzed: 14-Feb-2018 14:24					
Aluminum, Dissolved	2.05	0.0085	0.0500	mg/L	2.00		103	80-120			
Arsenic, Dissolved	2.08	0.0047	0.0500	mg/L	2.00		104	80-120			
Barium, Dissolved	2.13	0.0007	0.0030	mg/L	2.00		106	80-120			
Calcium, Dissolved	9.68	0.0051	0.0500	mg/L	10.0		96.8	80-120			
Iron, Dissolved	1.96	0.0013	0.0500	mg/L	2.00		97.8	80-120			
Magnesium, Dissolved	10.3	0.0160	0.0500	mg/L	10.0		103	80-120			
Manganese, Dissolved	0.493	0.0003	0.0010	mg/L	0.500		98.6	80-120			
Potassium, Dissolved	9.84	0.0520	0.500	mg/L	10.0		98.4	80-120			
Sodium, Dissolved	9.89	0.0114	0.500	mg/L	10.0		98.9	80-120			
Sodium, Dissolved	9.46	1.90	50.0	mg/L	10.0		94.6	80-120			J
<b>Duplicate (BGB0265-DUP1)</b>											
			Source: 18B0022-08			Prepared: 12-Feb-2018 Analyzed: 14-Feb-2018 14:07					
Aluminum, Dissolved	0.838	0.0085	0.0500	mg/L		0.838			0.04	20	
Arsenic, Dissolved	0.0049	0.0047	0.0500	mg/L		0.0058			17.30	20	J
Barium, Dissolved	0.0312	0.0007	0.0030	mg/L		0.0319			2.34	20	
Calcium, Dissolved	30.0	0.0051	0.0500	mg/L		30.0			0.06	20	
Iron, Dissolved	6.28	0.0013	0.0500	mg/L		6.30			0.27	20	
Magnesium, Dissolved	8.96	0.0160	0.0500	mg/L		8.93			0.33	20	
Manganese, Dissolved	0.598	0.0003	0.0010	mg/L		0.596			0.33	20	
Potassium, Dissolved	8.04	0.0520	0.500	mg/L		7.98			0.76	20	
Sodium, Dissolved	47.2	0.0114	0.500	mg/L		46.8			0.67	20	
<b>Matrix Spike (BGB0265-MS1)</b>											
			Source: 18B0022-08			Prepared: 12-Feb-2018 Analyzed: 14-Feb-2018 14:15					
Aluminum, Dissolved	2.90	0.0085	0.0500	mg/L	2.00	0.838	103	75-125			
Arsenic, Dissolved	2.11	0.0047	0.0500	mg/L	2.00	0.0058	105	75-125			



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Project: Art Brass  
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Project Manager: Adam Griffin

Reported:  
15-Feb-2018 16:32

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGB0265 - WMN (No Prep)**

Instrument: ICP2 Analyst: CC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Matrix Spike (BGB0265-MS1)</b>		<b>Source: 18B0022-08</b>			Prepared: 12-Feb-2018		Analyzed: 14-Feb-2018 14:15				
Barium, Dissolved	2.17	0.0007	0.0030	mg/L	2.00	0.0319	107	75-125			
Calcium, Dissolved	39.8	0.0051	0.0500	mg/L	10.0	30.0	98.1	75-125			
Iron, Dissolved	8.31	0.0013	0.0500	mg/L	2.00	6.30	101	75-125			
Magnesium, Dissolved	19.6	0.0160	0.0500	mg/L	10.0	8.93	106	75-125			
Manganese, Dissolved	1.07	0.0003	0.0010	mg/L	0.500	0.596	94.3	75-125			
Potassium, Dissolved	17.8	0.0520	0.500	mg/L	10.0	7.98	98.5	75-125			
Sodium, Dissolved	56.9	0.0114	0.500	mg/L	10.0	46.8	101	75-125			E

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

<b>Matrix Spike Dup (BGB0265-MSD1)</b>		<b>Source: 18B0022-08</b>			Prepared: 12-Feb-2018		Analyzed: 14-Feb-2018 14:19				
Aluminum, Dissolved	2.86	0.0085	0.0500	mg/L	2.00	0.838	101	75-125	1.48	20	
Arsenic, Dissolved	2.12	0.0047	0.0500	mg/L	2.00	0.0058	106	75-125	0.60	20	
Barium, Dissolved	2.16	0.0007	0.0030	mg/L	2.00	0.0319	106	75-125	0.62	20	
Calcium, Dissolved	40.0	0.0051	0.0500	mg/L	10.0	30.0	100	75-125	0.55	20	
Iron, Dissolved	8.29	0.0013	0.0500	mg/L	2.00	6.30	99.9	75-125	0.25	20	
Magnesium, Dissolved	19.5	0.0160	0.0500	mg/L	10.0	8.93	106	75-125	0.39	20	
Manganese, Dissolved	1.06	0.0003	0.0010	mg/L	0.500	0.596	92.4	75-125	0.92	20	
Potassium, Dissolved	17.8	0.0520	0.500	mg/L	10.0	7.98	98.6	75-125	0.03	20	
Sodium, Dissolved	56.8	0.0114	0.500	mg/L	10.0	46.8	99.9	75-125	0.12	20	E

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project: Art Brass  
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Reported:  
15-Feb-2018 16:32

Wet Chemistry - Quality Control

Batch BGB0079 - No Prep Wet Chem

Instrument: LCHAT2 Analyst: UW

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0079-BLK1)</b>		Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 13:44								
Alkalinity, Total	ND	1.00	mg/L CaCO3							U
<b>Blank (BGB0079-BLK2)</b>		Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 15:50								
Alkalinity, Total	ND	1.00	mg/L CaCO3							U
<b>Duplicate (BGB0079-DUP1)</b>		<b>Source: 18B0022-08</b>		Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 13:44						
Alkalinity, Total	ND	1.00	mg/L CaCO3		ND					U
<b>Reference (BGB0079-SRM1)</b>		Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 13:44								
Alkalinity, Total	108	1.00	mg/L CaCO3	108		99.9	90.37-108.33			



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Reported:  
15-Feb-2018 16:32

Wet Chemistry - Quality Control

Batch BGB0134 - No Prep Wet Chem

Instrument: DX500 Analyst: KK

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0134-BLK1)</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 13:37								
Chloride	ND	0.100	mg/L							U
Sulfate	ND	0.100	mg/L							U
<b>LCS (BGB0134-BS1)</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 13:54								
Chloride	1.49	0.100	mg/L	1.50		99.1	90-110			
<b>LCS (BGB0134-BS2)</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 19:12								
Sulfate	1.57	0.100	mg/L	1.50		105	90-110			
<b>Duplicate (BGB0134-DUP2)</b>		<b>Source: 18B0022-08RE1</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 22:17						
Chloride	27.9	2.00	mg/L		27.6			1.08	20	D
<b>Duplicate (BGB0134-DUP3)</b>		<b>Source: 18B0022-08RE2</b>		Prepared: 07-Feb-2018 Analyzed: 08-Feb-2018 19:26						
Sulfate	217	10.0	mg/L		215			0.97	20	D
<b>Matrix Spike (BGB0134-MS2)</b>		<b>Source: 18B0022-08RE1</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 22:34						
Chloride	83.0	5.00	mg/L	50.0	27.6	111	75-125			D
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
<b>Matrix Spike (BGB0134-MS4)</b>		<b>Source: 18B0022-08RE2</b>		Prepared: 07-Feb-2018 Analyzed: 13-Feb-2018 13:51						
Sulfate	712	50.0	mg/L	500	215	99.5	75-125			D
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										



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Reported:  
15-Feb-2018 16:32

**Wet Chemistry - Quality Control**

**Batch BGB0146 - No Prep Wet Chem**

Instrument: TOC-LCSH Analyst: KK

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0146-BLK1)</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 17:01								
Total Organic Carbon	ND	0.50	mg/L							U
<b>LCS (BGB0146-BS1)</b>		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 17:23								
Total Organic Carbon	20.9	0.50	mg/L	20.0		105	90-110			
<b>Duplicate (BGB0146-DUP1)</b>		<b>Source: 18B0022-08</b>		Prepared: 07-Feb-2018 Analyzed: 08-Feb-2018 02:02						
Total Organic Carbon	1.60	0.50	mg/L		1.60			0.00		
<b>Matrix Spike (BGB0146-MS1)</b>		<b>Source: 18B0022-08</b>		Prepared: 07-Feb-2018 Analyzed: 08-Feb-2018 02:21						
Total Organic Carbon	22.6	0.50	mg/L	20.0	1.60	105	75-125			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project: Art Brass  
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Reported:  
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### Certified Analyses included in this Report

Analyte	Certifications
<b>EPA 200.8 UCT-KED in Water</b>	
Cadmium-111	NELAP,WADOE,WA-DW,DoD-ELAP
Cadmium-114	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-63	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-65	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-60	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-62	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-66	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-67	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 300.0 in Water</b>	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
<b>EPA 6010C in Water</b>	
Aluminum	WADOE,NELAP
Arsenic	WADOE,NELAP
Barium	WADOE,NELAP
Calcium	WADOE,NELAP
Iron	WADOE,NELAP
Potassium	WADOE,NELAP
Magnesium	WADOE,NELAP
Manganese	WADOE,NELAP
Sodium	WADOE,NELAP
<b>EPA 9060A in Water</b>	
Total Organic Carbon	DoD-ELAP,WADOE,NELAP
<b>SM 2320 B-97 in Water</b>	
Alkalinity, Total	DoD-ELAP,WADOE,WA-DW,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	02/28/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2018
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



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Reported:

15-Feb-2018 16:32

### Notes and Definitions

- U This analyte is not detected above the applicable reporting or detection limit.
- J Estimated concentration value detected below the reporting limit.
- HC The natural concentration of the spiked analyte is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
- E The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
- D The reported value is from a dilution
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.



28 February 2018

Dana Cannon  
Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle, WA 98104

RE: Art Brass

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)  
18B0133

Associated SDG ID(s)  
N/A

-----

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

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



# Chain of Custody Record & Laboratory Analysis Request



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

ARI Assigned Number: <b>18B0133</b>	Turn-around Requested:	Page: <b>1</b> of <b>1</b>
ARI Client Company: <b>Aspect Consulting</b>	Phone:	Date: <b>2/18</b> Ice Present?
Client Contact: <b>Aspect - Dana / Delia</b>		No. of Coolers: Cooler Temps:

Client Project Name: <b>Art Brass</b>	Analysis Requested						Notes/Comments
Client Project #:	Samplers: <b>SN</b>	Total Metals (Cd, Co, Fe, Mn, Ni, Zn)	Total Sulfide	Total Carbon	Total Organic Carbon	Total Inorganic Carbon	Total Sulfur

Sample ID	Date	Time	Matrix	No. Containers	Total Metals (Cd, Co, Fe, Mn, Ni, Zn)	Total Sulfide	Total Carbon	Total Organic Carbon	Total Inorganic Carbon	Total Sulfur			
8F18-AB-1001	02/08/17	1000	Soil	4	X	X	X	X	X	X			
8F18-AB-1002	02/08/17	1130	Soil	4	X	X	X	X	X	X			

Comments/Special Instructions <b>Sulfide Samples Preserved with Zinc Acetate</b>	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Sasha Norwood</b>	Printed Name: <b>Brandon Fisk</b>	Printed Name:	Printed Name:
	Company: <b>Anchor QEA</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>08 Feb 18 / 1400</b>	Date & Time: <b>2/9/18 1010</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
8F18_AB_1001	18B0133-01	Solid	08-Feb-2018 10:00	09-Feb-2018 10:10
8F18_AB_1002	18B0133-02	Solid	08-Feb-2018 11:30	09-Feb-2018 10:10



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

## Case Narrative

### Sample receipt

Samples as listed on the preceding page were received February 9, 2018 under ARI workorder 18B0133. For details regarding sample receipt, please refer to the Cooler Receipt Form. The Sulfur analysis was subcontracted to Hazen Research Labs.

### Total Metals - EPA Method 6010C

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits.

The LCS percent recoveries were within control limits.

### Wet Chemistry (Sulfide, Total Carbon, Total Organic Carbon)

The samples were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blanks were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The SRM percent recoveries were within QC limits.

A Sulfide matrix spike and duplicate were prepared in conjunction with sample 8F18\_AB\_1001. The duplicate RPD was within QC limits. The matrix spike has low spike recovery. The matrix spike was re-read to verify, and results reported as is. The results are advisory. No further corrective action was taken.

A TOC/Carbon matrix spike and duplicates were prepared in conjunction with the reanalysis of sample 8F18\_AB\_1001. The Carbon matrix spike percent recovery and duplicate RPD were within QC limits. The TOC duplicate DUP1 has high RPD. The TOC matrix spike MS1 has low spike recovery. The QC was run in triplicate to confirm. The data has been flagged as having a possible matrix interference. The results are advisory. No further corrective action was taken.



# Cooler Receipt Form

ARI Client: Anchor QEA

Project Name: Art Brass

COC No(s): \_\_\_\_\_ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 18B0133

Tracking No: 7714 4/21 2837 NA

**Preliminary Examination Phase:**

Were intact, properly signed and dated custody seals attached to the outside of 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: 1.9

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DC02566

Cooler Accepted by: BF Date: 2/9/18 BF Time: 1010

**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: packing paper  
 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: SEF Date: 2/9/18 Time: 1033

**\*\* 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)



**Hazen Research, Inc.**  
4601 Indiana Street  
Golden, CO 80403 USA  
Tel: (303) 279-4501  
Fax: (303) 278-1528

Lab Control ID: 18M01314  
Received: Feb 16, 2018  
Reported: Feb 28, 2018  
Purchase Order No.  
18B0133

Customer ID: 03769Z  
Account ID: Z05352

Amanda Volgardsen  
Analytical Resources, Incorporated  
4611 South 134th Place Suite 100  
Tukwila, WA 98168

# ANALYTICAL REPORT

*Report may only be copied in its entirety.  
Results reported herein relate only to discrete samples  
submitted by the client. Hazen Research, Inc. does not warrant  
that the results are representative of anything other than the  
samples that were received in the laboratory*

By:   
\_\_\_\_\_  
Jessica Axen  
Analytical Laboratories Manager



**Hazen Research, Inc.**  
4601 Indiana Street  
Golden, CO 80403 USA  
Tel: (303) 279-4501  
Fax: (303) 278-1528

Lab Control ID: 18M01314  
Received: Feb 16, 2018  
Reported: Feb 28, 2018  
Purchase Order No.  
18B0133

Customer ID: 03769Z

Account ID: Z05352

### **ANALYTICAL REPORT**

Amanda Volgardsen  
Analytical Resources, Incorporated

<b>Lab Sample ID</b>	<b>Customer Sample ID</b>	<b>Sulfur %</b>
18M01314-001	18B0133-01	0.03
18M01314-002	18B0133-02	0.05



18m01314

**SUBCONTRACT ORDER**  
**To: Hazen Research Inc.**  
**ARI Work Order: 18B0133**

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

Hazen Research Inc.  
4601 Indiana Street  
Golden, CO 80403  
Phone : (303) 278-1528  
Fax: (303) 278-1528

**PLEASE SEND DATA TO** [subdata@arilabs.com](mailto:subdata@arilabs.com)

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18B0133-01</b>				
<b>Sampled: 02/08/18 10:00 Matrix: Solid</b>				
Sulfur, Total ASTM D4239-85C (Subc)	02/23/18	02/28/18 10:00		
Containers Supplied: <b>EP15</b>				
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				

<b>Sample ID: 18B0133-02</b>				
<b>Sampled: 02/08/18 11:30 Matrix: Solid</b>				
Sulfur, Total ASTM D4239-85C (Subc)	02/23/18	02/28/18 11:30		
Containers Supplied: <b>EP15</b>				
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				

Standard Report  
EDD Needed (EIM)

Stevaniz Fisher ARI 2/15/18 *[Signature]* 2/16/18 1100  
 Released By                      Date                      Received By                      Date

Released By                      Date                      Received By                      Date  
 Printed: 2/15/2018 2:19:34PM Page 1 of 1



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01 (Solid)**

**Metals and Metallic Compounds**

Method: EPA 6010C

Sampled: 02/08/2018 10:00

Instrument: ICP2

Analyzed: 19-Feb-2018 13:59

Sample Preparation: Preparation Method: SWC EPA 3050B  
Preparation Batch: BGB0346 Sample Size: 1.026 g (wet) Dry Weight: 0.81 g  
Prepared: 16-Feb-2018 Final Volume: 50 mL % Solids: 79.18

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cadmium	7440-43-9	2	0.0152	0.246	<b>0.104</b>	mg/kg	J
Copper	7440-50-8	2	0.0304	0.246	<b>8.86</b>	mg/kg	
Iron	7439-89-6	2	0.444	6.15	<b>9700</b>	mg/kg	
Manganese	7439-96-5	2	0.0136	0.123	<b>79.9</b>	mg/kg	
Nickel	7440-02-0	2	0.244	1.23	<b>17.1</b>	mg/kg	
Zinc	7440-66-6	2	0.196	1.23	<b>20.0</b>	mg/kg	



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01 (Solid)**

**Wet Chemistry**

Method: Plumb 1981

Sampled: 02/08/2018 10:00

Instrument: APOLLO1

Analyzed: 23-Feb-2018 08:29

Sample Preparation:

Preparation Method: Plumb 1981  
Preparation Batch: BGB0267  
Prepared: 12-Feb-2018

Sample Size: 1 g (wet)  
Final Volume: 1 g

Dry Weight: 0.79 g  
% Solids: 79.18

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Carbon		1	0.02	<b>0.21</b>	%	



Aspect Consulting, LLC.  
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Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01 (Solid)**

**Wet Chemistry**

Method: Plumb 1981, Combustion IR

Sampled: 02/08/2018 10:00

Instrument: [CALC]

Analyzed: 23-Feb-2018 08:29

Sample Preparation:

Preparation Method: [CALC]  
Preparation Batch: [CALC]  
Prepared: 12-Feb-2018

Final Volume: 1

% Solids: 79.18

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Inorganic Carbon		1	0.0200	<b>0.211</b>	%	



Aspect Consulting, LLC.  
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Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01 (Solid)**

**Wet Chemistry**

Method: PSEP 1986

Sampled: 02/08/2018 10:00

Instrument: BAL2

Analyzed: 12-Feb-2018 12:36

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0264  
Prepared: 12-Feb-2018

Sample Size: 5 g (wet)  
Final Volume: 5 g

Dry Weight: 3.96 g  
% Solids: 79.18

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	<b>74.76</b>	%	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01 (Solid)**

**Wet Chemistry**

Method: SM 2540 G-97

Sampled: 02/08/2018 10:00

Instrument: BAL2

Analyzed: 12-Feb-2018 13:48

Sample Preparation:

Preparation Method: Plumb 1981  
Preparation Batch: BGB0267  
Prepared: 12-Feb-2018

Sample Size: 1 g (wet)  
Final Volume: 1 g

Dry Weight: 0.79 g  
% Solids: 79.18

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	<b>79.18</b>	%	



Aspect Consulting, LLC.  
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Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01 (Solid)**

**Wet Chemistry**

Method: SM 4500-S2 D-00

Sampled: 02/08/2018 10:00

Instrument: UV1800-2

Analyzed: 12-Feb-2018 17:40

Sample Preparation: Preparation Method: PSEP 1986  
Preparation Batch: BGB0261 Sample Size: 5.247 g (wet) Dry Weight: 3.92 g  
Prepared: 12-Feb-2018 Final Volume: 100 mL % Solids: 74.80

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	1.27	ND	mg/kg	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1001**  
**18B0133-01RE2 (Solid)**

**Wet Chemistry**

Method: Plumb 1981, Combustion IR

Sampled: 02/08/2018 10:00

Instrument: [CALC]

Analyzed: 21-Feb-2018 12:46

Sample Preparation: Preparation Method: [CALC]  
Preparation Batch: [CALC]  
Prepared: 12-Feb-2018 Final Volume: 1 % Solids: 79.18

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Inorganic Carbon		1	0.0200	ND	%	U

Instrument: APOLLO1

Analyzed: 21-Feb-2018 12:46

Sample Preparation: Preparation Method: Plumb 1981  
Preparation Batch: BGB0267  
Prepared: 12-Feb-2018 Sample Size: 1 g (wet) Dry Weight: 0.79 g  
Final Volume: 1 g % Solids: 79.18

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	<b>0.14</b>	%	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1002**  
**18B0133-02 (Solid)**

**Metals and Metallic Compounds**

Method: EPA 6010C

Sampled: 02/08/2018 11:30

Instrument: ICP2

Analyzed: 19-Feb-2018 14:03

Sample Preparation: Preparation Method: SWC EPA 3050B  
Preparation Batch: BGB0346 Sample Size: 1.079 g (wet) Dry Weight: 0.88 g  
Prepared: 16-Feb-2018 Final Volume: 50 mL % Solids: 81.84

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cadmium	7440-43-9	2	0.0140	0.227	<b>0.0880</b>	mg/kg	J
Copper	7440-50-8	2	0.0279	0.227	<b>7.62</b>	mg/kg	
Iron	7439-89-6	2	0.408	5.66	<b>9500</b>	mg/kg	
Manganese	7439-96-5	2	0.0125	0.113	<b>69.9</b>	mg/kg	
Nickel	7440-02-0	2	0.225	1.13	<b>35.5</b>	mg/kg	
Zinc	7440-66-6	2	0.181	1.13	<b>18.9</b>	mg/kg	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**8F18\_AB\_1002**  
**18B0133-02 (Solid)**

**Wet Chemistry**

Method: Plumb 1981

Sampled: 02/08/2018 11:30

Instrument: APOLLO1

Analyzed: 23-Feb-2018 10:16

Sample Preparation:

Preparation Method: Plumb 1981  
Preparation Batch: BGB0267  
Prepared: 12-Feb-2018

Sample Size: 1 g (wet)  
Final Volume: 1 g

Dry Weight: 0.82 g  
% Solids: 81.84

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Carbon		1	0.02	<b>0.46</b>	%	



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Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1002**  
**18B0133-02 (Solid)**

**Wet Chemistry**

Method: Plumb 1981, Combustion IR

Sampled: 02/08/2018 11:30

Instrument: [CALC]

Analyzed: 23-Feb-2018 10:16

Sample Preparation: Preparation Method: [CALC]  
Preparation Batch: [CALC]  
Prepared: 12-Feb-2018 Final Volume: 1 % Solids: 81.84

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Inorganic Carbon		1	0.0400	<b>0.242</b>	%	

Instrument: APOLLO1

Analyzed: 21-Feb-2018 14:12

Sample Preparation: Preparation Method: Plumb 1981  
Preparation Batch: BGB0267  
Prepared: 12-Feb-2018 Sample Size: 1 g (wet) Dry Weight: 0.82 g  
Final Volume: 1 g % Solids: 81.84

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	<b>0.22</b>	%	



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Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**8F18\_AB\_1002**  
**18B0133-02 (Solid)**

**Wet Chemistry**

Method: PSEP 1986

Sampled: 02/08/2018 11:30

Instrument: BAL2

Analyzed: 12-Feb-2018 12:36

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGB0264  
Prepared: 12-Feb-2018

Sample Size: 5 g (wet)  
Final Volume: 5 g

Dry Weight: 4.09 g  
% Solids: 81.84

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids, Sulfide		1	0.04	<b>76.91</b>	%	



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**8F18\_AB\_1002**  
**18B0133-02 (Solid)**

**Wet Chemistry**

Method: SM 2540 G-97

Sampled: 02/08/2018 11:30

Instrument: BAL2

Analyzed: 12-Feb-2018 13:48

Sample Preparation:

Preparation Method: Plumb 1981  
Preparation Batch: BGB0267  
Prepared: 12-Feb-2018

Sample Size: 1 g (wet)  
Final Volume: 1 g

Dry Weight: 0.82 g  
% Solids: 81.84

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	<b>81.84</b>	%	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**8F18\_AB\_1002**  
**18B0133-02 (Solid)**

**Wet Chemistry**

Method: SM 4500-S2 D-00

Sampled: 02/08/2018 11:30

Instrument: UV1800-2

Analyzed: 12-Feb-2018 17:41

Sample Preparation:	Preparation Method: PSEP 1986	Sample Size: 5.435 g (wet)	Dry Weight: 4.18 g
	Preparation Batch: BGB0261	Final Volume: 100 mL	% Solids: 76.90
	Prepared: 12-Feb-2018		

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfide	18496-25-8	1	1.20	ND	mg/kg	U



Aspect Consulting, LLC.  
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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**Metals and Metallic Compounds - Quality Control**

**Batch BGB0346 - SWC EPA 3050B**

Instrument: ICP2 Analyst: CC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0346-BLK1)</b>											
						Prepared: 16-Feb-2018 Analyzed: 19-Feb-2018 13:24					
Cadmium	ND	0.0124	0.200	mg/kg							U
Copper	ND	0.0247	0.200	mg/kg							U
Iron	ND	0.361	5.00	mg/kg							U
Manganese	ND	0.0111	0.100	mg/kg							U
Nickel	ND	0.199	1.00	mg/kg							U
Zinc	ND	0.160	1.00	mg/kg							U
<b>LCS (BGB0346-BS1)</b>											
						Prepared: 16-Feb-2018 Analyzed: 19-Feb-2018 13:41					
Cadmium	46.0	0.0124	0.200	mg/kg	50.0		91.9	80-120			
Copper	46.2	0.0247	0.200	mg/kg	50.0		92.4	80-120			
Iron	188	0.361	5.00	mg/kg	200		94.0	80-120			
Manganese	43.3	0.0111	0.100	mg/kg	50.0		86.6	80-120			
Nickel	47.4	0.199	1.00	mg/kg	50.0		94.8	80-120			
Zinc	46.3	0.160	1.00	mg/kg	50.0		92.5	80-120			



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**Wet Chemistry - Quality Control**

**Batch BGB0261 - PSEP 1986**

Instrument: UV1800-2 Analyst: GM

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0261-BLK1)</b>		Prepared: 12-Feb-2018 Analyzed: 12-Feb-2018 17:38								
Sulfide	ND	1.00	mg/kg							U
<b>LCS (BGB0261-BS1)</b>		Prepared: 12-Feb-2018 Analyzed: 12-Feb-2018 17:38								
Sulfide	179	10.0	mg/kg	198		90.5	75-125			D
<b>Duplicate (BGB0261-DUP1)</b>		<b>Source: 18B0133-01</b>		Prepared: 12-Feb-2018 Analyzed: 12-Feb-2018 17:40						
Sulfide	ND	1.30	mg/kg		ND					U
<b>Matrix Spike (BGB0261-MS1)</b>		<b>Source: 18B0133-01</b>		Prepared: 12-Feb-2018 Analyzed: 12-Feb-2018 17:41						
Sulfide	133	12.1	mg/kg	240	ND	55.4	75-125			*, D

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

**Reported:**  
28-Feb-2018 13:12

**Wet Chemistry - Quality Control**

**Batch BGB0264 - No Prep Wet Chem**

Instrument: BAL2 Analyst: KLE

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0264-BLK1)</b>					Prepared: 12-Feb-2018 Analyzed: 12-Feb-2018 12:36					
Total Solids, Sulfide	ND	0.04	%							U
<b>Duplicate (BGB0264-DUP1)</b>					Source: 18B0133-01 Prepared: 12-Feb-2018 Analyzed: 12-Feb-2018 12:36					
Total Solids, Sulfide	74.57	0.04	%		74.76			0.26	20	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

### Wet Chemistry - Quality Control

#### Batch BGB0267 - Plumb 1981

Instrument: APOLLO1 Analyst: KLE

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGB0267-BLK1)</b>		Prepared: 12-Feb-2018 Analyzed: 19-Feb-2018 13:01								
Total Organic Carbon	ND	0.02	%							U
Total Solids	ND	0.04	%							U
<b>Blank (BGB0267-BLK2)</b>		Prepared: 12-Feb-2018 Analyzed: 23-Feb-2018 08:06								
Total Carbon	ND	0.02	%							U
<b>Duplicate (BGB0267-DUP1)</b>		<b>Source: 18B0133-01RE2</b>		Prepared: 12-Feb-2018 Analyzed: 21-Feb-2018 12:55						
Total Organic Carbon	0.12	0.02	%		0.14			21.00	20	*
Total Solids	79.21	0.04	%		79.18			0.04	20	
<b>Duplicate (BGB0267-DUP2)</b>		<b>Source: 18B0133-01RE2</b>		Prepared: 12-Feb-2018 Analyzed: 21-Feb-2018 13:04						
Total Organic Carbon	0.12	0.02	%		0.14			15.30	20	
Total Solids	79.20	0.04	%		79.18			0.02	20	
<b>Duplicate (BGB0267-DUP4)</b>		<b>Source: 18B0133-01</b>		Prepared: 12-Feb-2018 Analyzed: 23-Feb-2018 08:47						
Total Carbon	0.21	0.02	%		0.21			1.45	20	
<b>Duplicate (BGB0267-DUP5)</b>		<b>Source: 18B0133-01RE2</b>		Prepared: 12-Feb-2018 Analyzed: 23-Feb-2018 09:05						
Total Carbon	0.22	0.02	%		0.21			3.72	20	
<b>Matrix Spike (BGB0267-MS1)</b>		<b>Source: 18B0133-01RE2</b>		Prepared: 12-Feb-2018 Analyzed: 21-Feb-2018 13:16						
Total Organic Carbon	1.22	0.02	%	1.71	0.14	63.1	75-125			*
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
<b>Matrix Spike (BGB0267-MS5)</b>		<b>Source: 18B0133-01RE2</b>		Prepared: 12-Feb-2018 Analyzed: 23-Feb-2018 09:57						
Total Carbon	2.01	0.02	%	1.71	0.21	105	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
<b>Reference (BGB0267-SRM1)</b>		Prepared: 12-Feb-2018 Analyzed: 21-Feb-2018 12:14								
Total Organic Carbon	2.66	0.02	%	2.83		94.1	75-125			
<b>Reference (BGB0267-SRM3)</b>		Prepared: 12-Feb-2018 Analyzed: 23-Feb-2018 08:18								
Total Carbon	3.13	0.02	%	3.35		93.3	80-120			



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Dana Cannon

Reported:  
28-Feb-2018 13:12

**Certified Analyses included in this Report**

Analyte	Certifications
<b>EPA 6010C in Solid</b>	
Cadmium	NELAP,WADOE,DoD-ELAP,ADEC
Copper	NELAP,WADOE,DoD-ELAP
Iron	NELAP,WADOE,DoD-ELAP
Manganese	NELAP,WADOE,DoD-ELAP
Nickel	NELAP,WADOE,DoD-ELAP,ADEC
Zinc	NELAP,WADOE,DoD-ELAP
<b>Plumb 1981, Combustion IR in Solid</b>	
Total Organic Carbon	DoD-ELAP
<b>SM 4500-S2 D-00 in Solid</b>	
Sulfide	DoD-ELAP,NELAP,WADOE

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	02/28/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2018
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: [none]

Project Manager: Dana Cannon

Reported:

28-Feb-2018 13:12

### Notes and Definitions

- U This analyte is not detected above the applicable reporting or detection limit.
- J Estimated concentration value detected below the reporting limit.
- H Hold time violation - Hold time was exceeded.
- D The reported value is from a dilution
- \* Flagged value is not within established control limits.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.



23 April 2018

Delia Massey  
Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle, WA 98104

RE: Art Brass

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
18D0126	N/A

----

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

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



# Chain of Custody Record & Laboratory Analysis Request

2 coolers



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

ARI Assigned Number: 18D0126	Turn-around Requested: Std.	Page: 1 of 2
ARI Client Company: Anchor for Aspect	Phone: 503.972.5019	Date: 4/6/18
Client Contact: Delia M. (Aspect) + Jessica G. (Anchor)	No. of Coolers: 2	Ice Present? Yes
Client Project Name: Art Brass	Client Project #:	Cooler Temps: 2.4°C 5.5°C

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested					Notes/Comments
					200.8 (Cd, Cu, Ni, Zn)	600 (As, Ba, Mn, Al, Co, Fe, Mg, K, Na)	310.1/310.2 AIK+acid	300.1/300.0 (Cr, Se)	9060 TOL	

4A18-000-MB.d1	4/4/18	1720	w	4	X	X	X	X	X		
4A18-100-1A.d1				4	X	X	X	X	X		AIK 12.5x diluted
4A18-150-1A.d1				1	X						
4A18-100-1B.d1				4	X	X	X	X	X		AIK 20.8x diluted
4A18-100-1C.d1				4	X	X	X	X	X		AIK 13.9x diluted
4A18-200-2A.d1				4	X	X	X	X	X		AIK 15.6x diluted
4A18-250-2A.d1				1	X						
4A18-200-2B.d1	4/6/18	1145		4	X	X	X	X	X		AIK 15.6x diluted
4A18-200-2C.d1	4/4/18	1720		4	X	X	X	X	X		AIK 12.5x diluted
4A18-300-3A.d1	4/4/18	1720		4	X	X	X	X	X		AIK 13.9x diluted

Comments/Special Instructions Metals Samples 0.45 um <del>filter</del> filtered	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Minna Carey	Printed Name: Jacob Walter	Printed Name:	Printed Name:
	Company: Anchor Q&A	Company: ART	Company:	Company:
	Date & Time: 4/6/18 1250	Date & Time: 04/07/18 0940	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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

# Chain of Custody Record & Laboratory Analysis Request

2 COOLERS



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

ARI Assigned Number: <b>18D0126</b>	Turn-around Requested: <b>Standard</b>	Page: <b>2</b> of <b>2</b>
ARI Client Company: <b>Anchor for Aspect</b>	Phone: <b>503.972.5019</b>	Date: <b>4/6/18</b> Ice Present? <b>Yes</b>
Client Contact: <b>Delia M. (Aspect) + Jessica G. (Anchor)</b>	No. of Coolers: <b>2</b>	Cooler Temps: <b>2.4°C 5.5°C</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested						Notes/Comments	
					200.8 (Cd, Cu, Ni, Zn)	6010 (As, Ba, Mn, Al, Co, Fe, Mg, K, Na)	310.1/310.2 Alk & acid	300.1/300.0 (Cl, SO <sub>4</sub> )	9060 TOC			
4A18-300-3B.d1	4/4/18	1720	W	4	X	X	X	X	X			AIK 12.5x diluted
4A18-300-3C.d1	4/4/18	1720	↓	4	X	X	X	X	X			AIK 12.5x diluted
4A18-000-GW.d1	4/6/18	1145	↓	1	X							

Comments/Special Instructions <b>Metals Samples 0.45um filtered</b>	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Minna Carey</b>	Printed Name: <b>Jacob Walter</b>	Printed Name:	Printed Name:
	Company: <b>Anchor QEA</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>4/6/18 1250</b>	Date & Time: <b>04/07/18 0940</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
4A18-000_MB.d1	18D0126-01	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-100_1A.d1	18D0126-02	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-150_1A.d1	18D0126-03	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-100_1B.d1	18D0126-04	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-100_1C.d1	18D0126-05	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-200_2A.d1	18D0126-06	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-250_2A.d1	18D0126-07	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-200_2B.d1	18D0126-08	Water	06-Apr-2018 11:45	07-Apr-2018 09:40
4A18-200_2C.d1	18D0126-09	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-300_3A.d1	18D0126-10	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-300_3B.d1	18D0126-11	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-300_3C.d1	18D0126-12	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
4A18-000_GW.d1	18D0126-13	Water	06-Apr-2018 11:45	07-Apr-2018 09:40



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

## Case Narrative

### Sample receipt

Samples as listed on the preceding page were received April 07, 2018 under ARI workorder 18D0126. For details regarding sample receipt, please refer to the Cooler Receipt Form. The Acidity analysis was subcontracted to ETS Labs.

### Dissolved Metals - EPA Method 200.8

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits.

The LCS percent recoveries were within control limits.

### Dissolved Metals - EPA Method 6010C

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank has Sodium detected below the reporting limit, but above the method detection limit. The Sodium has been flagged with a "J" qualifier on the method blank. There were no metals detected above the reporting limits. No further corrective action was taken.

The LCS percent recoveries were within control limits.

### Wet Chemistry (Alkalinity, Anions, TOC)

The samples were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blanks were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The Alkalinity SRM percent recovery was within control limits.



WORK ORDER

18D0126

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: Anchor for Aspect

Preservation Confirmation

Container ID	Container Type	pH
18D0126-01 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-01 B	Small OJ, 500 mL	
18D0126-01 C	Glass NM, Amber, 250 mL	
18D0126-01 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-02 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-02 B	Small OJ, 500 mL	
18D0126-02 C	Glass NM, Amber, 250 mL	
18D0126-02 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-03 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-04 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-04 B	Small OJ, 500 mL	
18D0126-04 C	Glass NM, Amber, 250 mL	
18D0126-04 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-05 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-05 B	Small OJ, 500 mL	
18D0126-05 C	Glass NM, Amber, 250 mL	
18D0126-05 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-06 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-06 B	Small OJ, 500 mL	
18D0126-06 C	Glass NM, Amber, 250 mL	
18D0126-06 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-07 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-08 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-08 B	Small OJ, 500 mL	
18D0126-08 C	Glass NM, Amber, 250 mL	
18D0126-08 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-09 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-09 B	Small OJ, 500 mL	
18D0126-09 C	Glass NM, Amber, 250 mL	
18D0126-09 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-10 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-10 B	Small OJ, 500 mL	
18D0126-10 C	Glass NM, Amber, 250 mL	
18D0126-10 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-11 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass



WORK ORDER

18D0126

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> Anchor for Aspect

18D0126-11 B	Small OJ, 500 mL	
18D0126-11 C	Glass NM, Amber, 250 mL	
18D0126-11 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-12 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18D0126-12 B	Small OJ, 500 mL	
18D0126-12 C	Glass NM, Amber, 250 mL	
18D0126-12 D	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18D0126-13 A	HDPE NM, 500 mL, 1:1 HNO3	L2 pass

SEF

4/11/18

Preservation Confirmed By

Date



# Cooler Receipt Form

ARI Client: Anchar

Project Name: \_\_\_\_\_

COC No(s): \_\_\_\_\_ NA

Delivered by: Fed-Ex/UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 18D0126

Tracking No: 0263 77193811114 NA

**Preliminary Examination Phase:**

0201 7719 3811 0861

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: 0940

cooler # 2.4°C 5.5°C

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DD05706

Cooler Accepted by: JSW Date: 09/07/18 Time: 0940

**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: SEP Date: 4/19/18 Time: 1723

**\*\* 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:**

NO sample time or date on labels  
limited volume for all samples except AIC

By: SEP Date: 4/19/18

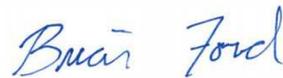
<p>Small Air Bubbles ~ 2mm</p>	<p>Peabubbles 2-4 mm</p>	<p>LARGE Air Bubbles &gt; 4 mm</p>	<p>Small → "sm" (&lt; 2 mm)</p> <p>Peabubbles → "pb" (2 to &lt; 4 mm)</p> <p>Large → "lg" (4 to &lt; 6 mm)</p> <p>Headspace → "hs" (&gt; 6 mm)</p>
------------------------------------	------------------------------	--	--

## Analytical Resources - Tukwila, WA

Sample Delivery Group: L985175  
Samples Received: 04/12/2018  
Project Number: 18D0126  
Description: Art Brass

Report To: Amanda Volgardsen  
4611 S. 134th PI  
Tukwila, WA 98168

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	<b>2</b> Tc
<b>Ss: Sample Summary</b>	<b>3</b>	<b>3</b> Ss
<b>Cn: Case Narrative</b>	<b>5</b>	<b>4</b> Cn
<b>Sr: Sample Results</b>	<b>6</b>	<b>5</b> Sr
18D0126-01 L985175-01	6	<b>6</b> Qc
18D0126-02 L985175-02	7	<b>7</b> Gl
18D0126-04 L985175-03	8	<b>8</b> Al
18D0126-05 L985175-04	9	<b>9</b> Sc
18D0126-06 L985175-05	10	
18D0126-08 L985175-06	11	
18D0126-09 L985175-07	12	
18D0126-10 L985175-08	13	
18D0126-11 L985175-09	14	
18D0126-12 L985175-10	15	
<b>Qc: Quality Control Summary</b>	<b>16</b>	
Wet Chemistry by Method 2310 B-2011	16	
<b>Gl: Glossary of Terms</b>	<b>17</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>18</b>	
<b>Sc: Sample Chain of Custody</b>	<b>19</b>	

# SAMPLE SUMMARY



Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Collected by					
Collected date/time					
Received date/time					
18D0126-01 L985175-01 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-02 L985175-02 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-04 L985175-03 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-05 L985175-04 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-06 L985175-05 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-08 L985175-06 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-09 L985175-07 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH
Collected by					
Collected date/time					
Received date/time					
18D0126-10 L985175-08 GW					
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

# SAMPLE SUMMARY



18D0126-11 L985175-09 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH

1  
Cp

2  
Tc

3  
Ss

18D0126-12 L985175-10 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
 Technical Service Representative

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	14000		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-01 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-02 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	32000		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-03 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-04 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-05 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-06 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-07 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-08 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-09 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	8000	J	3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985175-10 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3302008-1 04/15/18 16:00

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Acidity	U		3630	10000

Sample Narrative:

BLANK: Endpoint pH 8.3

L985162-03 Original Sample (OS) • Duplicate (DUP)

(OS) L985162-03 04/15/18 16:00 • (DUP) R3302008-4 04/15/18 16:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

L985239-02 Original Sample (OS) • Duplicate (DUP)

(OS) L985239-02 04/15/18 16:00 • (DUP) R3302008-5 04/15/18 16:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3302008-2 04/15/18 16:00 • (LCSD) R3302008-3 04/15/18 16:00

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Acidity	20000	22000	22000	110	110	85.0-115			0.000	20

Sample Narrative:

LCS: Endpoint pH 8.3  
LCSD: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

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## Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

## Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 GI

8 AI

9 Sc

## Qualifier Description

J The identification of the analyte is acceptable; the reported value is an estimate.



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

\* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

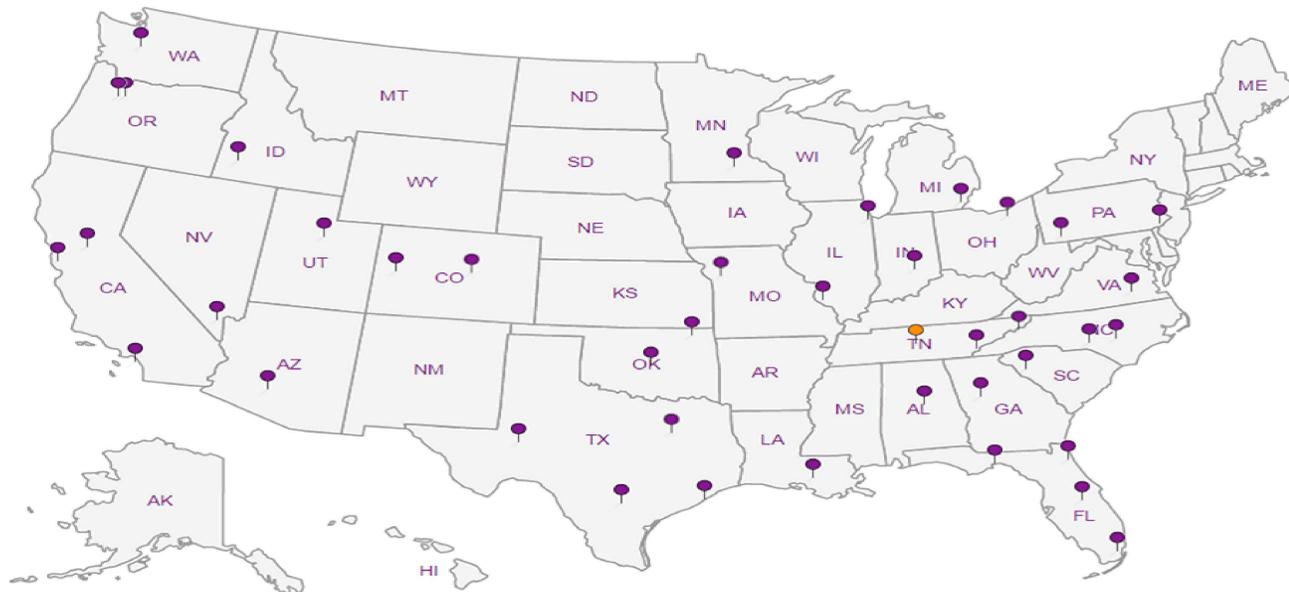
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup>Drinking Water <sup>2</sup>Underground Storage Tanks <sup>3</sup>Aquatic Toxicity <sup>4</sup>Chemical/Microbiological <sup>5</sup>Mold <sup>6</sup>Wastewater n/a Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.





L985175

**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
**ARI Work Order:18D0126**

C156

SENDING LABORATORY:

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

RECEIVING LABORATORY:

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone : (615) 773-9739  
Fax:

PLEASE SEND DATA TO subdata@arilabs.com

Analysis	Due	Expires	Sub Laboratory ID	Comments
----------	-----	---------	-------------------	----------

<b>Sample ID: 18D0126-01</b> Sampled: 04/04/18 17:20 Matrix: Water				
Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		
Containers Supplied:				-01

<b>Sample ID: 18D0126-02</b> Sampled: 04/04/18 17:20 Matrix: Water				limited volume. Alk 12.5x diluted
Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		
Containers Supplied:				-02

<b>Sample ID: 18D0126-04</b> Sampled: 04/04/18 17:20 Matrix: Water				limited volume. Alk 20.8x diluted
Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		
Containers Supplied:				-03

<b>Sample ID: 18D0126-05</b> Sampled: 04/04/18 17:20 Matrix: Water				limited volume. Alk 13.9x diluted
Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		
Containers Supplied:				-04

7-10  
day TAT

EDD Needed  
Some samples diluted  
in field due to limited  
volume

Released By: [Signature] Date: 4/11/18 Received By: [Signature] Date: 4/12/18

Released By: \_\_\_\_\_ Date: \_\_\_\_\_ Received By: \_\_\_\_\_ Date: \_\_\_\_\_

4.5 mg



SUBCONTRACT ORDER  
To: ESC Lab Sciences  
ARI Work Order: 18D0126

L985175

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18D0126-06</b> <b>Sampled: 04/04/18 17:20 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		limited volume. Alk 15.6x diluted
Containers Supplied:				-05
<input type="text"/>				
<b>Sample ID: 18D0126-08</b> <b>Sampled: 04/06/18 11:45 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/20/18 11:45		limited volume. Alk 15.6x diluted
Containers Supplied:				-06
<input type="text"/>				
<b>Sample ID: 18D0126-09</b> <b>Sampled: 04/04/18 17:20 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		limited volume. Alk 12.5x diluted
Containers Supplied:				-07
<input type="text"/>				
<b>Sample ID: 18D0126-10</b> <b>Sampled: 04/04/18 17:20 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		limited volume. Alk 13.9x diluted
Containers Supplied:				-08
<input type="text"/>				
<b>Sample ID: 18D0126-11</b> <b>Sampled: 04/04/18 17:20 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		limited volume. Alk 12.5x diluted
Containers Supplied:				-09
<input type="text"/>				
<b>Sample ID: 18D0126-12</b> <b>Sampled: 04/04/18 17:20 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc)	04/23/18	04/18/18 17:20		limited volume. Alk 12.5x diluted
Containers Supplied:				-10
<input type="text"/>				

Released By Date 4/11/18 Received By Kelly New 844 Date 1059 4/12/18

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_

4.5.18



L985175

### Sample ID Cross Reference Report

**Client:** Aspect Consulting, LLC.

**Work Order:** 18D0126

**Project:** Art Brass

**Project Number:** [none]

<u>LabNumber</u>	<u>SampleName</u>	<u>ClientMatrix</u>	<u>Sampled</u>	<u>SampleReceived</u>
18D0126-01	4A18-000_MB.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-02	4A18-100_1A.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-03	4A18-150_1A.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-04	4A18-100_1B.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-05	4A18-100_1C.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-06	4A18-200_2A.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-07	4A18-250_2A.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-08	4A18-200_2B.d1	Water	06-Apr-2018 11:45	07-Apr-2018 09:40
18D0126-09	4A18-200_2C.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-10	4A18-300_3A.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-11	4A18-300_3B.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-12	4A18-300_3C.d1	Water	04-Apr-2018 17:20	07-Apr-2018 09:40
18D0126-13	4A18-000_GW.d1	Water	06-Apr-2018 11:45	07-Apr-2018 09:40

## ESC LAB SCIENCES Cooler Receipt Form

Client: <b>ANARESTWA</b>	SDG#	<b>L98575</b>	
Cooler Received/Opened On: <b>4/12/18</b>	Temperature:	<b>4.5</b>	
Received By: <b>Kelly Mercer</b>			
Signature: 			

Receipt Check List	NP	Yes	No
COC Seal Present / Intact?			
COC Signed / Accurate?		<input checked="" type="checkbox"/>	
Bottles arrive intact?		<input checked="" type="checkbox"/>	
Correct bottles used?		<input checked="" type="checkbox"/>	
Sufficient volume sent?		<input checked="" type="checkbox"/>	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

4A18-000\_MB.d1  
18D0126-01 (Water)

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 15:26

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	ND	ug/L	U
Nickel, Dissolved	7440-02-0	1	0.500	ND	ug/L	U
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-000\_MB.d1**  
**18D0126-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 13-Apr-2018 15:12

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	ND	mg/L	U
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	ND	mg/L	U
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>0.0180</b>	mg/L	J
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	ND	mg/L	U
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	ND	mg/L	U
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	ND	mg/L	U
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	ND	mg/L	U
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>0.0509</b>	mg/L	J



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-000\_MB.d1**  
**18D0126-01 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 11-Apr-2018 14:44

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	1	0.100	0.100	ND	mg/L	U

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	0.100	0.100	ND	mg/L	U



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**4A18-000\_MB.d1**  
**18D0126-01 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH Analyzed: 11-Apr-2018 11:39

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0209 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	ND	mg/L	U



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**4A18-000\_MB.d1**  
**18D0126-01 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/04/2018 17:20

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201  
Prepared: 10-Apr-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	ND	mg/L CaCO3	U



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**4A18-100\_1A.d1**  
**18D0126-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 15:17

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	<b>1.48</b>	ug/L	
Nickel, Dissolved	7440-02-0	5	2.50	<b>947</b>	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



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**4A18-100\_1A.d1**  
**18D0126-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 13-Apr-2018 15:16

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.141</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0078</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>14.0</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.109</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>4.46</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.180</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>6.06</b>	mg/L	



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**4A18-100\_1A.d1**  
**18D0126-02 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 12:05

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0209  
Prepared: 10-Apr-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.70</b>	mg/L	



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**4A18-100\_1A.d1**  
**18D0126-02 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/04/2018 17:20

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>6.00</b>	mg/L CaCO3	



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**4A18-100\_1A.d1**  
**18D0126-02RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 13:06

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	1.00	<b>12.3</b>	mg/L	D



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**Reported:**  
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**4A18-100\_1A.d1**  
**18D0126-02RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 00:30

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>96.1</b>	mg/L	D



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**4A18-150\_1A.d1**  
**18D0126-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 15:54

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.58</b>	ug/L	D
Nickel, Dissolved	7440-02-0	5	2.50	<b>1040</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>9.34</b>	ug/L	D



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**4A18-100\_1B.d1**  
**18D0126-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 15:59

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.09</b>	ug/L	D
Nickel, Dissolved	7440-02-0	5	2.50	<b>621</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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**4A18-100\_1B.d1**  
**18D0126-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 13-Apr-2018 15:20

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.108</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0053</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0079</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>11.3</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0925</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.64</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.187</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.39</b>	mg/L	



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**4A18-100\_1B.d1**  
**18D0126-04 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 12:28

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0209 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.38</b>	mg/L	



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**4A18-100\_1B.d1**  
**18D0126-04 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/04/2018 17:20

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.13</b>	mg/L CaCO <sub>3</sub>	



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**4A18-100\_1B.d1**  
**18D0126-04RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 13:26

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>10.6</b>	mg/L	D



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**4A18-100\_1B.d1**  
**18D0126-04RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 01:31

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>87.0</b>	mg/L	D



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**4A18-100\_1C.d1**  
**18D0126-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:04

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.54</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>215</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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**4A18-100\_1C.d1**  
**18D0126-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 13-Apr-2018 15:24

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.276</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0085</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0086</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>14.7</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.131</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>4.44</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0576</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>6.23</b>	mg/L	



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**4A18-100\_1C.d1**  
**18D0126-05 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 14:41

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>6.98</b>	mg/L	



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**4A18-100\_1C.d1**  
**18D0126-05 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/04/2018 17:20

Instrument: Accumet AR60 Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>52.1</b>	mg/L CaCO3	



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**4A18-100\_1C.d1**  
**18D0126-05RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 13:45

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>11.1</b>	mg/L	D



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**4A18-100\_1C.d1**  
**18D0126-05RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 01:51

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>91.6</b>	mg/L	D



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Reported:  
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**4A18-200\_2A.d1**  
**18D0126-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:09

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.23</b>	ug/L	D
Nickel, Dissolved	7440-02-0	5	2.50	<b>722</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Reported:  
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**4A18-200\_2A.d1**  
**18D0126-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 13-Apr-2018 15:29

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.134</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0058</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0083</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>13.9</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.167</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>4.28</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.158</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.40</b>	mg/L	



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**Reported:**  
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**4A18-200\_2A.d1**  
**18D0126-06 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 15:00

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210  
Prepared: 10-Apr-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.19</b>	mg/L	



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Project: Art Brass  
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Project Manager: Delia Massey

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**4A18-200\_2A.d1**  
**18D0126-06 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/04/2018 17:20

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201  
Prepared: 10-Apr-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.03</b>	mg/L CaCO3	



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-200\_2A.d1**  
**18D0126-06RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 14:05

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>11.0</b>	mg/L	D



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**4A18-200\_2A.d1**  
**18D0126-06RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/04/2018 17:20

Instrument: DX2100 Analyzed: 18-Apr-2018 02:11

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214 Sample Size: 5 mL  
Prepared: 10-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>87.0</b>	mg/L	D



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-250\_2A.d1**  
**18D0126-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:14

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.78</b>	ug/L	D
Nickel, Dissolved	7440-02-0	5	2.50	<b>648</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-200\_2B.d1**  
**18D0126-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 11:45

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:19

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.63</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>118</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Manager: Delia Massey

Reported:  
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**4A18-200\_2B.d1**  
**18D0126-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/06/2018 11:45

Instrument: ICP2

Analyzed: 13-Apr-2018 16:34

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.112</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0061</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0056</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>6.94</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.118</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>2.04</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0192</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.13</b>	mg/L	



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Project Manager: Delia Massey

**Reported:**  
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**4A18-200\_2B.d1**  
**18D0126-08 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/06/2018 11:45

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 15:23

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>6.37</b>	mg/L	



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**4A18-200\_2B.d1**  
**18D0126-08 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/06/2018 11:45

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.32</b>	mg/L CaCO <sub>3</sub>	



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Project Number: [none]  
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**Reported:**  
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**4A18-200\_2B.d1**  
**18D0126-08RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 11:45

Instrument: DX2100

Analyzed: 13-Apr-2018 14:25

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>11.5</b>	mg/L	D



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-200\_2B.d1**  
**18D0126-08RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 11:45

Instrument: DX2100

Analyzed: 18-Apr-2018 02:32

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>90.7</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**4A18-200\_2C.d1**  
**18D0126-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:23

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>9.30</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>68.3</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Reported:  
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**4A18-200\_2C.d1**  
**18D0126-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 16-Apr-2018 13:10

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.444</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0170</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0037</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>2.91</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.201</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>0.693</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0054</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>2.88</b>	mg/L	



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-200\_2C.d1**  
**18D0126-09 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 15:42

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>13.10</b>	mg/L	



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**4A18-200\_2C.d1**  
**18D0126-09 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/04/2018 17:20

Instrument: Accumet AR60 Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>10.5</b>	mg/L CaCO3	



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**4A18-200\_2C.d1**  
**18D0126-09RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/04/2018 17:20

Instrument: DX2100 Analyzed: 13-Apr-2018 14:44

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214 Sample Size: 5 mL  
Prepared: 10-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>10.5</b>	mg/L	D



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-200\_2C.d1**  
**18D0126-09RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 02:52

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>85.9</b>	mg/L	D



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-300\_3A.d1**  
**18D0126-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:28

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.20</b>	ug/L	D
Nickel, Dissolved	7440-02-0	10	5.00	<b>1990</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>14.9</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**4A18-300\_3A.d1**  
**18D0126-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 16-Apr-2018 13:14

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0510</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0077</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0115</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>29.7</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.204</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>6.22</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.410</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.75</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>33.5</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-300\_3A.d1**  
**18D0126-10 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 16:01

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210  
Prepared: 10-Apr-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.63</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-300\_3A.d1**  
**18D0126-10 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/04/2018 17:20

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201  
Prepared: 10-Apr-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>1.16</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-300\_3A.d1**  
**18D0126-10RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 15:04

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>11.0</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-300\_3A.d1**  
**18D0126-10RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 03:12

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>87.3</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-300\_3B.d1**  
**18D0126-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:33

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.54</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>204</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-300\_3B.d1**  
**18D0126-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 16-Apr-2018 13:18

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0339</b>	mg/L	J
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0141</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0065</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>66.9</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0245</b>	mg/L	J
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>5.75</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0251</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.14</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>30.2</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-300\_3B.d1**  
**18D0126-11 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 16:20

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>6.58</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 23-Apr-2018 17:56
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**4A18-300\_3B.d1**  
**18D0126-11 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/04/2018 17:20

Instrument: Accumet AR60 Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.81</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**4A18-300\_3B.d1**  
**18D0126-11RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 15:24

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>9.99</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-300\_3B.d1**  
**18D0126-11RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 03:32

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>81.7</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-300\_3C.d1**  
**18D0126-12 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/04/2018 17:20

Instrument: ICPMS2

Analyzed: 17-Apr-2018 16:38

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>33.4</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**4A18-300\_3C.d1**  
**18D0126-12 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/04/2018 17:20

Instrument: ICP2

Analyzed: 16-Apr-2018 13:22

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0220  
Prepared: 11-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0419</b>	mg/L	J
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0163</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0073</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>108</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0033</b>	mg/L	J
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>4.39</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0046</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>4.53</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>27.4</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-300\_3C.d1**  
**18D0126-12 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/04/2018 17:20

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 16:42

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	5.77	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-300\_3C.d1**  
**18D0126-12 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/04/2018 17:20

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201  
Prepared: 10-Apr-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>4.84</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**4A18-300\_3C.d1**  
**18D0126-12RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 13-Apr-2018 15:44

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>8.84</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**4A18-300\_3C.d1**  
**18D0126-12RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/04/2018 17:20

Instrument: DX2100

Analyzed: 18-Apr-2018 03:53

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	72.2	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**4A18-000\_GW.d1**  
**18D0126-13 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 11:45

Instrument: ICPMS2

Analyzed: 17-Apr-2018 17:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0352 Sample Size: 25 mL  
Prepared: 17-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	<b>0.244</b>	ug/L	D
Copper, Dissolved	7440-50-8	2	1.00	<b>2.58</b>	ug/L	D
Nickel, Dissolved	7440-02-0	50	25.0	<b>3790</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>35.4</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0220 - WMN (No Prep)**

Instrument: ICP2 Analyst: MCB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0220-BLK1)</b>						Prepared: 11-Apr-2018 Analyzed: 11-Apr-2018 12:06					
Aluminum, Dissolved	ND	0.0085	0.0500	mg/L							U
Arsenic, Dissolved	ND	0.0047	0.0500	mg/L							U
Barium, Dissolved	ND	0.0007	0.0030	mg/L							U
Calcium, Dissolved	ND	0.0051	0.0500	mg/L							U
Iron, Dissolved	ND	0.0013	0.0500	mg/L							U
Magnesium, Dissolved	ND	0.0160	0.0500	mg/L							U
Manganese, Dissolved	ND	0.0003	0.0010	mg/L							U
Potassium, Dissolved	ND	0.0520	0.500	mg/L							U
Sodium, Dissolved	0.0222	0.0114	0.500	mg/L							J

<b>LCS (BGD0220-BS1)</b>						Prepared: 11-Apr-2018 Analyzed: 11-Apr-2018 12:31					
Aluminum, Dissolved	2.05	0.0085	0.0500	mg/L	2.00		102	80-120			
Arsenic, Dissolved	2.10	0.0047	0.0500	mg/L	2.00		105	80-120			
Barium, Dissolved	2.08	0.0007	0.0030	mg/L	2.00		104	80-120			
Calcium, Dissolved	9.78	0.0051	0.0500	mg/L	10.0		97.8	80-120			
Iron, Dissolved	1.98	0.0013	0.0500	mg/L	2.00		98.8	80-120			
Magnesium, Dissolved	10.3	0.0160	0.0500	mg/L	10.0		103	80-120			
Manganese, Dissolved	0.469	0.0003	0.0010	mg/L	0.500		93.8	80-120			
Potassium, Dissolved	10.0	0.0520	0.500	mg/L	10.0		100	80-120			
Sodium, Dissolved	10.1	0.0114	0.500	mg/L	10.0		101	80-120			
Sodium, Dissolved	10.2	1.90	50.0	mg/L	10.0		102	80-120			J



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0352 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: TCH

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0352-BLK1)</b>											
						Prepared: 17-Apr-2018 Analyzed: 17-Apr-2018 14:53					
Cadmium, Dissolved	111	ND	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.100	ug/L							U
Copper, Dissolved	63	ND	0.500	ug/L							U
Copper, Dissolved	65	ND	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.500	ug/L							U
Zinc, Dissolved	66	ND	4.00	ug/L							U
Zinc, Dissolved	67	ND	4.00	ug/L							U

<b>LCS (BGD0352-BS1)</b>											
						Prepared: 17-Apr-2018 Analyzed: 17-Apr-2018 15:36					
Cadmium, Dissolved	111	26.4	0.100	ug/L	25.0		106	80-120			
Cadmium, Dissolved	114	26.2	0.100	ug/L	25.0		105	80-120			
Copper, Dissolved	63	26.7	0.500	ug/L	25.0		107	80-120			
Copper, Dissolved	65	26.1	0.500	ug/L	25.0		104	80-120			
Nickel, Dissolved	60	25.9	0.500	ug/L	25.0		104	80-120			
Nickel, Dissolved	62	26.3	0.500	ug/L	25.0		105	80-120			
Zinc, Dissolved	66	83.5	4.00	ug/L	80.0		104	80-120			
Zinc, Dissolved	67	78.3	4.00	ug/L	80.0		97.9	80-120			



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**Wet Chemistry - Quality Control**

**Batch BGD0201 - No Prep Wet Chem**

Instrument: Accumet AR60 Analyst: U

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0201-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 10-Apr-2018 14:16					
Alkalinity, Total	ND	1.00	1.00	mg/L CaCO3							U
<b>Reference (BGD0201-SRM1)</b>						Prepared: 10-Apr-2018 Analyzed: 10-Apr-2018 14:16					
Alkalinity, Total	106	1.00	1.00	mg/L CaCO3	108		98.4	90.37-108.33			



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**Wet Chemistry - Quality Control**

**Batch BGD0209 - No Prep Wet Chem**

Instrument: TOC-LCSH Analyst: KK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0209-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 01:43					
Total Organic Carbon	ND	0.50	0.50	mg/L							U
<b>LCS (BGD0209-BS1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 02:06					
Total Organic Carbon	20.50	0.50	0.50	mg/L	20.00		103	90-110			



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**Wet Chemistry - Quality Control**

**Batch BGD0210 - No Prep Wet Chem**

Instrument: TOC-LCSH Analyst: KK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0210-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 13:11					
Total Organic Carbon	ND	0.50	0.50	mg/L							U
<b>LCS (BGD0210-BS1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 14:17					
Total Organic Carbon	20.09	0.50	0.50	mg/L	20.00		100	90-110			



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**Wet Chemistry - Quality Control**

**Batch BGD0214 - No Prep Wet Chem**

Instrument: DX2100 Analyst: SK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0214-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 14:05					
Chloride	ND	0.100	0.100	mg/L							U
Sulfate	ND	0.100	0.100	mg/L							U
<b>LCS (BGD0214-BS1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 14:24					
Chloride	1.46	0.100	0.100	mg/L	1.50		97.4	90-110			
Sulfate	1.44	0.100	0.100	mg/L	1.50		96.0	90-110			



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401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

### Certified Analyses included in this Report

Analyte	Certifications
<b>EPA 200.8 UCT-KED in Water</b>	
Cadmium-111	NELAP,WADOE,WA-DW,DoD-ELAP
Cadmium-114	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-63	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-65	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-60	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-62	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-66	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-67	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 300.0 in Water</b>	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
<b>EPA 6010C in Water</b>	
Aluminum	WADOE,NELAP
Arsenic	WADOE,NELAP
Barium	WADOE,NELAP
Calcium	WADOE,NELAP
Iron	WADOE,NELAP
Potassium	WADOE,NELAP
Magnesium	WADOE,NELAP
Manganese	WADOE,NELAP
Sodium	WADOE,NELAP
<b>EPA 9060A in Water</b>	
Total Organic Carbon	DoD-ELAP,WADOE,NELAP
<b>SM 2320 B-97 in Water</b>	
Alkalinity, Total	DoD-ELAP,WADOE,WA-DW,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	06/30/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2018
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: [none]

Project Manager: Delia Massey

Reported:

23-Apr-2018 17:56

### Notes and Definitions

- B This analyte was detected in the method blank.
- D The reported value is from a dilution
- J Estimated concentration value detected below the reporting limit.
- U This analyte is not detected above the applicable reporting or detection limit.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.



23 April 2018

Delia Massey  
Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle, WA 98104

RE: Art Brass

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
18D0136	N/A

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I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

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



# Chain of Custody Record & Laboratory Analysis Request



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

ARI Assigned Number: <b>18D0136</b>	Turn-around Requested:	Page: <b>1</b> of <b>2</b>
ARI Client Company: <b>Anchor For Aspect</b>	Phone: <b>503-972-5019</b>	Date: <b>09 April 18</b>
Client Contact: <b>Delia (Aspect) &amp; Jessica G. (Anchor)</b>		Ice Present?
Client Project Name: <b>Art Brass</b>		No. of Coolers: <b>1</b>
Client Project #:		Cooler Temps: <b>2, 2</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested						Notes/Comments	
					200.8 (Cd, Cu, Ni, Zn)	6010 (As, Br, Mn, Pb, Cr, Fe, Hg, K, Na)	310.1/310.2 (Alk + Acid)	300.1/300.0 (Cl, SO <sub>4</sub> )	9060 TOC			
6A18-100-1A.d3	4/6/18	1600	W	4	X	X	X	X	X			AIK Sample diluted 15.6x
6A18-150-1A.d3				1	X							
6A18-100-1B.d3				1	X							
6A18-100-1C.d3				1	X							
6A18-200-2A.d3				1	X							
6A18-250-2A.d3				1	X							
6A18-200-2B.d3				4	X	X	X	X	X			AIK Sample diluted 13.9x
6A18-200-2C.d3				1	X							
6A18-300-3A.d3				1	X							
6A18-300-3B.d3				4	X	X	X	X	X			AIK Sample diluted 13.2x

Comments/Special Instructions <b>Metals samples are 0.45um filtered.</b>	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <b>Stephanie Fishel</b>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Sasha Norwood</b>	Printed Name: <b>Stephanie Fishel</b>	Printed Name:	Printed Name:
	Company: <b>Anchor QEA</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>09 April 18 / 1100</b>	Date & Time: <b>4/10/18 1016</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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

# Chain of Custody Record & Laboratory Analysis Request



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

ARI Assigned Number: <b>18D0136</b>	Turn-around Requested:	Page: <b>2</b> of <b>2</b>
ARI Client Company: <b>Anchor for Aspect</b>	Phone: <b>503-972-5019</b>	Date: <b>09 April 18</b>
Client Contact: <b>Delia M (Aspect) &amp; Jessica G (Anchor)</b>		Ice Present? Cooler Temps: <b>2.2</b>
Client Project Name: <b>Art Brass</b>		No. of Coolers: <b>1</b>

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested							Notes/Comments	
					200.8 (Cd, Cu, Ni, Zn)	6010 (As, Br, Mn, Pb, Cu, Fe, Mg, K, Na)	310.1/310.2	Alk + ACID	300.1/300.0 (Cl, SO4)	9060 TOC			
6A18-300-3c.d3	4/4/18	1600	W	1	X								

Comments/Special Instructions <b>Metals samples are 0.45um filtered</b>	Relinquished by: (Signature) <i>Sasha Norwood</i>	Received by: (Signature) <i>Stephanie Fisnel</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Sasha Norwood</b>	Printed Name: <b>Stephanie Fisnel</b>	Printed Name:	Printed Name:
	Company: <b>Anchor QEA</b>	Company: <b>ARL</b>	Company:	Company:
	Date & Time: <b>09 April 18 / 1100</b>	Date & Time: <b>4/10/18 1016</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

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



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
6A18-100_1A.d3	18D0136-01	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-150_1A.d3	18D0136-02	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-100_1B.d3	18D0136-03	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-100_1C.d3	18D0136-04	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-200_2A.d3	18D0136-05	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-250_2A.d3	18D0136-06	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-200_2B.d3	18D0136-07	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-200_2C.d3	18D0136-08	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-300_3A.d3	18D0136-09	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-300_3B.d3	18D0136-10	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
6A18-300_3C.d3	18D0136-11	Water	06-Apr-2018 16:00	10-Apr-2018 10:16



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

## Case Narrative

### Sample receipt

Samples as listed on the preceding page were received April 10, 2018 under ARI workorder 18D0136. For details regarding sample receipt, please refer to the Cooler Receipt Form. The Acidity analysis was subcontracted to ETS Labs.

### Dissolved Metals - EPA Method 200.8

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits.

The LCS percent recoveries were within control limits.

### Dissolved Metals - EPA Method 6010C

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limits.

The LCS percent recoveries were within control limits.

### Wet Chemistry (Alkalinity, Anions, TOC)

The samples were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blanks were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The Alkalinity SRM percent recovery was within control limits.



WORK ORDER

18D0136

Client: Aspect Consulting, LLC.	Project Manager: Amanda Volgardsen
Project: Art Brass	Project Number: [none]

Preservation Confirmation

Container ID	Container Type	pH	
18D0136-01 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-01 B	Small OJ, 500 mL		P
18D0136-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0136-01 D	Glass NM, Amber, 250 mL		
18D0136-02 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-03 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-04 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-05 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-06 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-07 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-07 B	Small OJ, 500 mL		
18D0136-07 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0136-07 D	Glass NM, Amber, 250 mL		
18D0136-08 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-09 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-10 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0136-10 B	Small OJ, 500 mL		
18D0136-10 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0136-10 D	Glass NM, Amber, 250 mL		
18D0136-11 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P

Preservation Confirmed By BF

Date 4/10/18



# Cooler Receipt Form

ARI Client: Anchor for Aspect

Project Name: Art Brass

COC No(s): \_\_\_\_\_ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 18D0136

Tracking No: 7719 5234 9492 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) 2.2

Time: 1016

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D002565

Cooler Accepted by: SEF Date: 4/10/18 Time: 1016

*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  BF  NO

Date VOC Trip Blank was made at ARI..... NA

Was Sample Split by ARI :  NA YES Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by: \_\_\_\_\_

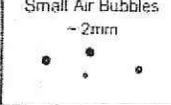
Samples Logged by: BF Date: 4/10/18 Time: 1330

**\*\* 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:**  
sample labels missing date + time  
all sample w/ limited volume

By: BF Date: 4/10/18

			Small → "sm" (< 2 mm)
			Peabubbles → "pb" (2 to < 4 mm)
			Large → "lg" (4 to < 6 mm)
			Headspace → "hs" (> 6 mm)

## Analytical Resources - Tukwila, WA

Sample Delivery Group: L985162  
Samples Received: 04/12/2018  
Project Number: 18D0136  
Description: Art Brass

Report To: Amanda Volgardsen  
4611 S. 134th PI  
Tukwila, WA 98168

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	<b>2</b> Tc
<b>Ss: Sample Summary</b>	<b>3</b>	<b>3</b> Ss
<b>Cn: Case Narrative</b>	<b>4</b>	<b>4</b> Cn
<b>Sr: Sample Results</b>	<b>5</b>	<b>5</b> Sr
18D0136-01 L985162-01	<b>5</b>	
18D0136-07 L985162-02	<b>6</b>	
18D0136-10 L985162-03	<b>7</b>	
<b>Qc: Quality Control Summary</b>	<b>8</b>	<b>6</b> Qc
Wet Chemistry by Method 2310 B-2011	<b>8</b>	
<b>Gl: Glossary of Terms</b>	<b>9</b>	<b>7</b> Gl
<b>Al: Accreditations &amp; Locations</b>	<b>10</b>	<b>8</b> Al
<b>Sc: Sample Chain of Custody</b>	<b>11</b>	<b>9</b> Sc

# SAMPLE SUMMARY



18D0136-01 L985162-01 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH

1  
Cp

2  
Tc

3  
Ss

18D0136-07 L985162-02 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH

4  
Cn

5  
Sr

18D0136-10 L985162-03 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1097363	1	04/15/18 16:00	04/15/18 16:00	TH

6  
Qc

7  
Gl

8  
Al

9  
Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
Technical Service Representative

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	78000		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985162-01 WG1097363: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	50000		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985162-02 WG1097363: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/15/2018 16:00	<a href="#">WG1097363</a>

Sample Narrative:

L985162-03 WG1097363: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Method Blank (MB)

(MB) R3302008-1 04/15/18 16:00

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Acidity	U		3630	10000

Sample Narrative:

BLANK: Endpoint pH 8.3

L985162-03 Original Sample (OS) • Duplicate (DUP)

(OS) L985162-03 04/15/18 16:00 • (DUP) R3302008-4 04/15/18 16:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

L985239-02 Original Sample (OS) • Duplicate (DUP)

(OS) L985239-02 04/15/18 16:00 • (DUP) R3302008-5 04/15/18 16:00

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3302008-2 04/15/18 16:00 • (LCSD) R3302008-3 04/15/18 16:00

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Acidity	20000	22000	22000	110	110	85.0-115			0.000	20

Sample Narrative:

LCS: Endpoint pH 8.3  
LCSD: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Page 15 of 53 18D0136 ARIS Sample FINAL 23 Apr 2018 1756



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 GI
- 8 AI
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

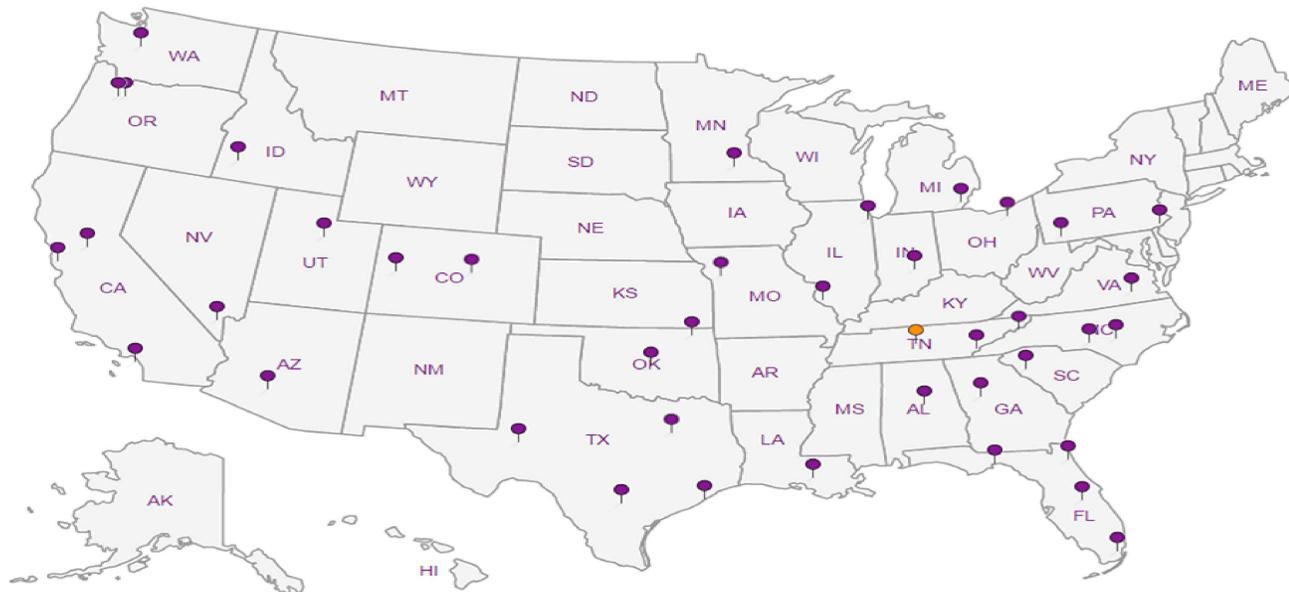
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP, LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.





**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
ARI Work Order: 18D0136

L985162

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone: (615) 773-9739  
Fax:

PLEASE SEND DATA TO [subdata@arilabs.com](mailto:subdata@arilabs.com)

Analysis	Due	Expires	Sub Laboratory ID	Comments
----------	-----	---------	-------------------	----------

Sample ID: 18D0136-01 Sampled: 04/06/18 16:00 Matrix: Water				Limited volume, Alk Sample diluted 1
--	--	--	--	--------------------------------------

Acidity, SM2310 Full Titration Curve (Subc) 04/24/18 04/20/18 16:00

Containers Supplied:

-01

Sample ID: 18D0136-07 Sampled: 04/06/18 16:00 Matrix: Water				Limited volume, Alk Sample diluted 1
--	--	--	--	--------------------------------------

Acidity, SM2310 Full Titration Curve (Subc) 04/24/18 04/20/18 16:00

Containers Supplied:

-02

Sample ID: 18D0136-10 Sampled: 04/06/18 16:00 Matrix: Water				Limited volume, Alk Sample diluted 1
--	--	--	--	--------------------------------------

Acidity, SM2310 Full Titration Curve (Subc) 04/24/18 04/20/18 16:00

Containers Supplied:

-03

EDD Needed  
May have limited volume  
and be field diluted  
7-10 day TAT

Released By

Date

Received By

Date

Released By

Date

Received By

Date



### Sample ID Cross Reference Report

**Client:** Aspect Consulting, LLC.

**Work Order:** 18D0136

**Project:** Art Brass

**Project Number:** [none]

<u>LabNumber</u>	<u>SampleName</u>	<u>ClientMatrix</u>	<u>Sampled</u>	<u>SampleReceived</u>
18D0136-01	6A18-100_1A.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-02	6A18-150_1A.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-03	6A18-100_1B.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-04	6A18-100_1C.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-05	6A18-200_2A.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-06	6A18-250_2A.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-07	6A18-200_2B.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-08	6A18-200_2C.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-09	6A18-300_3A.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-10	6A18-300_3B.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16
18D0136-11	6A18-300_3C.d3	Water	06-Apr-2018 16:00	10-Apr-2018 10:16

## ESC LAB SCIENCES Cooler Receipt Form

Client: <u>ANARESTWA</u>	SDG#	<u>L985162</u>	
Cooler Received/Opened On: <u>4/12/18</u>	Temperature:	<u>4.5</u>	
Received By: <u>Kelly Mercer</u>			
Signature: 			
Receipt Check List	NP	Yes	No
COC Seal Present / Intact?			
COC Signed / Accurate?		<input checked="" type="checkbox"/>	
Bottles arrive intact?		<input checked="" type="checkbox"/>	
Correct bottles used?		<input checked="" type="checkbox"/>	
Sufficient volume sent?		<input checked="" type="checkbox"/>	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-100\_1A.d3**  
**18D0136-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 12:11

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.69</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>354</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>8.34</b>	ug/L	D



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Project: Art Brass  
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Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-100\_1A.d3**  
**18D0136-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/06/2018 16:00

Instrument: ICP2

Analyzed: 18-Apr-2018 17:26

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0367  
Prepared: 17-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.119</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0069</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0066</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>10.3</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.111</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.33</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0876</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.65</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-100\_1A.d3**  
**18D0136-01 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/06/2018 16:00

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 21:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.78</b>	mg/L	



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**Reported:**  
23-Apr-2018 17:56

**6A18-100\_1A.d3**  
**18D0136-01 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/06/2018 16:00

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201  
Prepared: 10-Apr-2018

Sample Size: 100 mL  
Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>3.68</b>	mg/L CaCO <sub>3</sub>	



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Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-100\_1A.d3**  
**18D0136-01RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 16:00

Instrument: DX2100

Analyzed: 13-Apr-2018 16:04

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>11.1</b>	mg/L	D



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-100\_1A.d3**  
**18D0136-01RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 16:00

Instrument: DX2100

Analyzed: 18-Apr-2018 04:13

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>87.9</b>	mg/L	D



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-150\_1A.d3**  
**18D0136-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 12:54

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>3.38</b>	ug/L	D
Nickel, Dissolved	7440-02-0	10	5.00	<b>539</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-100\_1B.d3**  
**18D0136-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 12:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.13</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>454</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-100\_1C.d3**  
**18D0136-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 13:03

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.83</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>147</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-200\_2A.d3**  
**18D0136-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 13:08

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.59</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>442</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-250\_2A.d3**  
**18D0136-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 13:57

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>3.93</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>153</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Reported:  
23-Apr-2018 17:56

**6A18-200\_2B.d3**  
**18D0136-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 14:02

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>4.04</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>166</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-200\_2B.d3**  
**18D0136-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/06/2018 16:00

Instrument: ICP2

Analyzed: 18-Apr-2018 17:30

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0367  
Prepared: 17-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.124</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0073</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0043</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>5.02</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.170</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>1.39</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0153</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>4.30</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-200\_2B.d3**  
**18D0136-07 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/06/2018 16:00

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 22:55

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210  
Prepared: 10-Apr-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>8.41</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 23-Apr-2018 17:56
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**6A18-200\_2B.d3**  
**18D0136-07 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/06/2018 16:00

Instrument: Accumet AR60 Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>3.00</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-200\_2B.d3**  
**18D0136-07RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 16:00

Instrument: DX2100

Analyzed: 13-Apr-2018 17:06

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>10.1</b>	mg/L	D



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Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-200\_2B.d3**  
**18D0136-07RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 16:00

Instrument: DX2100

Analyzed: 18-Apr-2018 04:34

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>83.4</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-200\_2C.d3**  
**18D0136-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 14:07

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>17.5</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>115</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-300\_3A.d3**  
**18D0136-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 14:11

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.16</b>	ug/L	D
Nickel, Dissolved	7440-02-0	50	25.0	<b>2160</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>9.46</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-300\_3B.d3**  
**18D0136-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 14:16

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.70</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>133</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-300\_3B.d3**  
**18D0136-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/06/2018 16:00

Instrument: ICP2

Analyzed: 18-Apr-2018 17:34

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0367  
Prepared: 17-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0564</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0145</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0080</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>68.2</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0336</b>	mg/L	J
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>5.56</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0364</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.34</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>28.7</b>	mg/L	



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-300\_3B.d3**  
**18D0136-10 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/06/2018 16:00

Instrument: TOC-LCSH

Analyzed: 11-Apr-2018 23:14

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0210 Sample Size: 20 mL  
Prepared: 10-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>7.41</b>	mg/L	



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-300\_3B.d3**  
**18D0136-10 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/06/2018 16:00

Instrument: Accumet AR60

Analyzed: 10-Apr-2018 14:16

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0201 Sample Size: 100 mL  
Prepared: 10-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	2.42	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-300\_3B.d3**  
**18D0136-10RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 16:00

Instrument: DX2100

Analyzed: 13-Apr-2018 17:27

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	5	0.500	0.500	<b>9.66</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
23-Apr-2018 17:56

**6A18-300\_3B.d3**  
**18D0136-10RE3 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/06/2018 16:00

Instrument: DX2100

Analyzed: 18-Apr-2018 05:36

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0214  
Prepared: 10-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>79.5</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**6A18-300\_3C.d3**  
**18D0136-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/06/2018 16:00

Instrument: ICPMS2

Analyzed: 19-Apr-2018 14:21

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0385 Sample Size: 25 mL  
Prepared: 18-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>1.35</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>66.2</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0367 - WMN (No Prep)**

Instrument: ICP2 Analyst: MCB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0367-BLK1)</b>						Prepared: 17-Apr-2018 Analyzed: 17-Apr-2018 15:58					
Aluminum, Dissolved	ND	0.0085	0.0500	mg/L							U
Arsenic, Dissolved	ND	0.0047	0.0500	mg/L							U
Barium, Dissolved	ND	0.0007	0.0030	mg/L							U
Calcium, Dissolved	ND	0.0051	0.0500	mg/L							U
Iron, Dissolved	ND	0.0013	0.0500	mg/L							U
Magnesium, Dissolved	ND	0.0160	0.0500	mg/L							U
Manganese, Dissolved	ND	0.0003	0.0010	mg/L							U
Potassium, Dissolved	ND	0.0520	0.500	mg/L							U
Sodium, Dissolved	ND	0.0114	0.500	mg/L							U

<b>LCS (BGD0367-BS1)</b>						Prepared: 17-Apr-2018 Analyzed: 17-Apr-2018 16:27					
Aluminum, Dissolved	2.02	0.0085	0.0500	mg/L	2.00		101	80-120			
Arsenic, Dissolved	2.11	0.0047	0.0500	mg/L	2.00		105	80-120			
Barium, Dissolved	2.04	0.0007	0.0030	mg/L	2.00		102	80-120			
Calcium, Dissolved	9.91	0.0051	0.0500	mg/L	10.0		99.1	80-120			
Iron, Dissolved	1.93	0.0013	0.0500	mg/L	2.00		96.7	80-120			
Magnesium, Dissolved	10.4	0.0160	0.0500	mg/L	10.0		104	80-120			
Manganese, Dissolved	0.490	0.0003	0.0010	mg/L	0.500		98.1	80-120			
Potassium, Dissolved	10.0	0.0520	0.500	mg/L	10.0		100	80-120			
Sodium, Dissolved	10.3	0.0114	0.500	mg/L	10.0		103	80-120			
Sodium, Dissolved	9.78	1.90	50.0	mg/L	10.0		97.8	80-120			J



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0385 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: TCH

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0385-BLK1)</b>			Prepared: 18-Apr-2018 Analyzed: 18-Apr-2018 13:28								
Copper, Dissolved	63	ND	0.500	ug/L							U
Copper, Dissolved	65	ND	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.500	ug/L							U
<b>Blank (BGD0385-BLK2)</b>			Prepared: 18-Apr-2018 Analyzed: 19-Apr-2018 11:52								
Cadmium, Dissolved	111	ND	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.100	ug/L							U
Zinc, Dissolved	66	ND	4.00	ug/L							U
Zinc, Dissolved	67	ND	4.00	ug/L							U
<b>LCS (BGD0385-BS1)</b>			Prepared: 18-Apr-2018 Analyzed: 18-Apr-2018 14:04								
Copper, Dissolved	63	26.4	0.500	ug/L	25.0		106	80-120			
Copper, Dissolved	65	25.8	0.500	ug/L	25.0		103	80-120			
Nickel, Dissolved	60	25.2	0.500	ug/L	25.0		101	80-120			
Nickel, Dissolved	62	26.3	0.500	ug/L	25.0		105	80-120			
<b>LCS (BGD0385-BS2)</b>			Prepared: 18-Apr-2018 Analyzed: 19-Apr-2018 12:35								
Cadmium, Dissolved	111	27.9	0.100	ug/L	25.0		112	80-120			
Cadmium, Dissolved	114	27.8	0.100	ug/L	25.0		111	80-120			
Zinc, Dissolved	66	88.2	4.00	ug/L	80.0		110	80-120			
Zinc, Dissolved	67	79.7	4.00	ug/L	80.0		99.6	80-120			



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 23-Apr-2018 17:56
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**Wet Chemistry - Quality Control**

**Batch BGD0201 - No Prep Wet Chem**

Instrument: Accumet AR60 Analyst: U

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0201-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 10-Apr-2018 14:16					
Alkalinity, Total	ND	1.00	1.00	mg/L CaCO3							U
<b>Reference (BGD0201-SRM1)</b>						Prepared: 10-Apr-2018 Analyzed: 10-Apr-2018 14:16					
Alkalinity, Total	106	1.00	1.00	mg/L CaCO3	108		98.4	90.37-108.33			



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 23-Apr-2018 17:56
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**Wet Chemistry - Quality Control**

**Batch BGD0210 - No Prep Wet Chem**

Instrument: TOC-LCSH Analyst: KK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0210-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 13:11					
Total Organic Carbon	ND	0.50	0.50	mg/L							U
<b>LCS (BGD0210-BS1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 14:17					
Total Organic Carbon	20.09	0.50	0.50	mg/L	20.00		100	90-110			



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

Wet Chemistry - Quality Control

Batch BGD0214 - No Prep Wet Chem

Instrument: DX2100 Analyst: SK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0214-BLK1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 14:05					
Chloride	ND	0.100	0.100	mg/L							U
Sulfate	ND	0.100	0.100	mg/L							U
<b>LCS (BGD0214-BS1)</b>						Prepared: 10-Apr-2018 Analyzed: 11-Apr-2018 14:24					
Chloride	1.46	0.100	0.100	mg/L	1.50		97.4	90-110			
Sulfate	1.44	0.100	0.100	mg/L	1.50		96.0	90-110			



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
23-Apr-2018 17:56

### Certified Analyses included in this Report

Analyte	Certifications
<b>EPA 200.8 UCT-KED in Water</b>	
Cadmium-111	NELAP,WADOE,WA-DW,DoD-ELAP
Cadmium-114	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-63	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-65	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-60	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-62	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-66	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-67	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 300.0 in Water</b>	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
<b>EPA 6010C in Water</b>	
Aluminum	WADOE,NELAP
Arsenic	WADOE,NELAP
Barium	WADOE,NELAP
Calcium	WADOE,NELAP
Iron	WADOE,NELAP
Potassium	WADOE,NELAP
Magnesium	WADOE,NELAP
Manganese	WADOE,NELAP
Sodium	WADOE,NELAP
<b>EPA 9060A in Water</b>	
Total Organic Carbon	DoD-ELAP,WADOE,NELAP
<b>SM 2320 B-97 in Water</b>	
Alkalinity, Total	DoD-ELAP,WADOE,WA-DW,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	06/30/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2018
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: [none]

Project Manager: Delia Massey

**Reported:**

23-Apr-2018 17:56

### Notes and Definitions

- D The reported value is from a dilution
- J Estimated concentration value detected below the reporting limit.
- U This analyte is not detected above the applicable reporting or detection limit.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.



26 April 2018

Delia Massey  
Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle, WA 98104

RE: Art Brass

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
18D0171	N/A

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I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

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



# Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: <b>18D0171</b>	Turn-around Requested:	Page: <b>1</b> of <b>2</b>
ARI Client Company: <b>Anchor for Aspect</b>	Phone: <b>503-972-5019</b>	Date:
Client Contact: <b>Delia M (Aspect) &amp; Jessica G (Anchor)</b>		No. of Coolers:
Client Project Name: <b>Art Brass</b>		Cooler Temps:



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

Client Project #:	Samplers:				Analysis Requested						Notes/Comments
	Sample ID	Date	Time	Matrix	No. Containers	200.8 (Cd, Cu, Ni, Zn)	6010 (As, Ba, Mn, Al, Ca, Fe, Mg, K, Na)	310.1/310.2 (Alk & Acid)	300.1/300.0 (Cl, SO4)	9060 TOC	
10A18-100_1A.d7	4/10/2018	1230	W	4	X	X	X	X	X		Alk sample diluted 17.9x
10A18-150_1A.d7				1	X						
10A18-100_1B.d7				1	X						
10A18-100_1C.d7				1	X						
10A18-200_2A.d7				1	X						
10A18-250_2A.d7				1	X						
10A18-200_2B.d7				4	X	X	X	X	X		Alk sample diluted 14.7x
10A18-200_2C.d7				1	X						
10A18-300_3A.d7				1	X						
10A18-300_3B.d7				4	X	X	X	X	X		Alk sample diluted 12.5x

Comments/Special Instructions  Metals samples are 0.45µm filtered	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: <b>Sasha Norwood</b>	Printed Name: <b>Brandon Fisk</b>	Printed Name:	Printed Name:
	Company: <b>Anchor QEA</b>	Company: <b>ARI</b>	Company:	Company:
	Date & Time: <b>11 Apr 18 10935</b>	Date & Time: <b>4/12/18 940</b>	Date & Time:	Date & Time:

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.





Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
10A18-100_1A.d.7	18D0171-01	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-150_1A.d.7	18D0171-02	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-100_1B.d.7	18D0171-03	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-100_1C.d.7	18D0171-04	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-200_2A.d.7	18D0171-05	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-250_2A.d.7	18D0171-06	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-200_2B.d.7	18D0171-07	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-200_2C.d.7	18D0171-08	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-300_3A.d.7	18D0171-09	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-300_2B.d.7	18D0171-10	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
10A18-300_3C.d.7	18D0171-11	Water	10-Apr-2018 12:30	12-Apr-2018 09:40



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: [none]

Project Manager: Delia Massey

Reported:

26-Apr-2018 15:50

## Case Narrative

### Sample receipt

Samples as listed on the preceding page were received April 12, 2018 under ARI work order 18D0171. For details regarding sample receipt, please refer to the Cooler Receipt Form. The Acidity analysis was subcontracted to ESC Labs.

### Dissolved Metals - EPA Method 200.8

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank BGD0389 has Copper detected above the reporting limits. Associated detected results and QC have been flagged with "B" qualifiers. The Copper QC was reanalyzed with results within control limits. No further corrective action was taken.

The LCS percent recoveries were within control limits.

### Dissolved Metals - EPA Method 6010C

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank has Sodium detected below the reporting limit, but above the method detection limit. The Sodium has been flagged with a "J" qualifier on the method blank. There were no metals detected above the reporting limits. No further corrective action was taken.

The LCS percent recoveries were within control limits.

### Wet Chemistry (Alkalinity, TOC, Anions)

The samples were prepared and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The Anion method blank BGD0373 has Sulfate detected at the reporting limit. The Sulfate concentration does not exceed the reporting limit. No corrective action was taken. All other method blanks were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The Alkalinity SRM percent recovery was within QC limits.



WORK ORDER

18D0171

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: [none]

Preservation Confirmation

Container ID	Container Type	pH	
18D0171-01 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-01 B	Small OJ, 500 mL		
18D0171-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0171-01 D	Glass NM, Amber, 250 mL		
18D0171-02 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-03 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-04 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-05 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-06 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-07 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-07 B	Small OJ, 500 mL		
18D0171-07 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0171-07 D	Glass NM, Amber, 250 mL		
18D0171-08 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-09 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-10 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0171-10 B	Small OJ, 500 mL		
18D0171-10 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0171-10 D	Glass NM, Amber, 250 mL		
18D0171-11 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P

P = pass

Preservation Confirmed By BF

Date 4/12/18



# Cooler Receipt Form

ARI Client: Anchor/Aspect

Project Name: \_\_\_\_\_

COC No(s): \_\_\_\_\_ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 18120171

Tracking No: 7719 6573 8051 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: 940 3.6

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: V002565

Cooler Accepted by: BF Date: 4/12/18 Time: 940

*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 BF

Date VOC Trip Blank was made at ARI: NA

Was Sample Split by ARI : NA YES Date/Time: \_\_\_\_\_ Equipment: \_\_\_\_\_ Split by: \_\_\_\_\_

Samples Logged by: BF Date: 4/12/18 Time: 958

**\*\* 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:**

labels missing sample time  
all samples had limited ~~BF~~ limited volume

By: BF Date: 4/12/18



Small → "sm" (< 2 mm)  
Peabubbles → "pb" (2 to < 4 mm)  
Large → "lg" (4 to < 6 mm)  
Headspace → "hs" (> 6 mm)

April 26, 2018

## Analytical Resources - Tukwila, WA

Sample Delivery Group: L987235  
Samples Received: 04/19/2018  
Project Number: 18D0171  
Description: Art Brass

Report To: Amanda Volgardsen  
4611 S. 134th PI  
Tukwila, WA 98168

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>2</sup>Tc</b>
<b>Cn: Case Narrative</b>	<b>4</b>	
<b>Sr: Sample Results</b>	<b>5</b>	<b><sup>3</sup>Ss</b>
18D0171-01 L987235-01	<b>5</b>	
18D0171-07 L987235-02	<b>6</b>	<b><sup>4</sup>Cn</b>
18D0171-10 L987235-03	<b>7</b>	<b><sup>5</sup>Sr</b>
<b>Qc: Quality Control Summary</b>	<b>8</b>	
Wet Chemistry by Method 2310 B-2011	<b>8</b>	<b><sup>6</sup>Qc</b>
<b>Gl: Glossary of Terms</b>	<b>9</b>	<b><sup>7</sup>Gl</b>
<b>Al: Accreditations &amp; Locations</b>	<b>10</b>	<b><sup>8</sup>Al</b>
<b>Sc: Sample Chain of Custody</b>	<b>11</b>	<b><sup>9</sup>Sc</b>

# SAMPLE SUMMARY

18D0171-01 L987235-01 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1101645	1	04/24/18 13:22	04/24/18 13:22	TH

1  
Cp

2  
Tc

3  
Ss

18D0171-07 L987235-02 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1101645	1	04/24/18 13:22	04/24/18 13:22	TH

4  
Cn

5  
Sr

18D0171-10 L987235-03 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1101645	1	04/24/18 13:22	04/24/18 13:22	TH

6  
Qc

7  
Gl

8  
Al

9  
Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
Technical Service Representative

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/24/2018 13:22	<a href="#">WG1101645</a>

Sample Narrative:

L987235-01 WG1101645: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/24/2018 13:22	<a href="#">WG1101645</a>

Sample Narrative:

L987235-02 WG1101645: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U		3630	10000	1	04/24/2018 13:22	<a href="#">WG1101645</a>

Sample Narrative:

L987235-03 WG1101645: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3304978-1 04/24/18 13:22

Analyte	MB Result ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
Acidity	U		3630	10000

Sample Narrative:

BLANK: Endpoint pH 8.3

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3304978-2 04/24/18 13:22 • (LCSD) R3304978-3 04/24/18 13:22

Analyte	Spike Amount ug/l	LCS Result ug/l	LCSD Result ug/l	LCS Rec. %	LCSD Rec. %	Rec. Limits %	LCS Qualifier	LCSD Qualifier	RPD %	RPD Limits %
Acidity	20000	20000	20000	100	100	85.0-115			0.000	20

Sample Narrative:

LCS: Endpoint pH 8.3

LCSD: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc

Qualifier Description

The remainder of this page intentionally left blank, there are no qualifiers applied to this SDG.



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

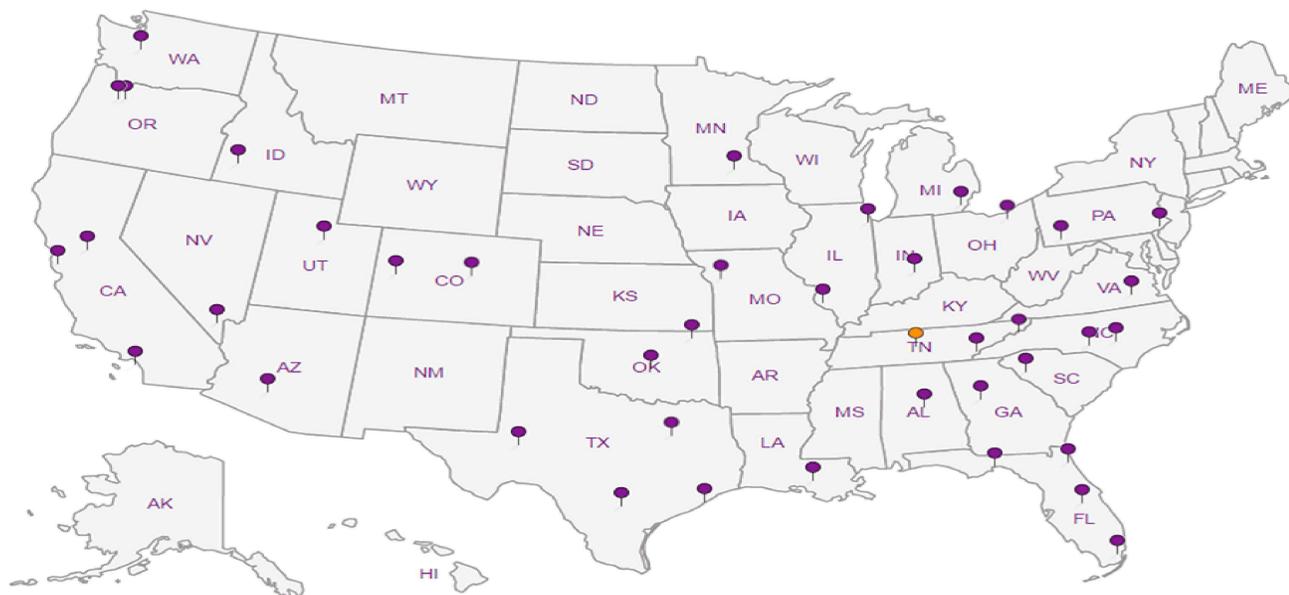
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup>Drinking Water <sup>2</sup>Underground Storage Tanks <sup>3</sup>Aquatic Toxicity <sup>4</sup>Chemical/Microbiological <sup>5</sup>Mold <sup>6</sup>Wastewater n/a Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.





Analytical Resources, Incorporated  
Analytical Chemists and Consultants

H061

**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
ARI Work Order: 18D0171

1987235

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone: (615) 773-9739  
Fax:

PLEASE SEND DATA TO [subdata@arilabs.com](mailto:subdata@arilabs.com)

Analysis	Due	Expires	Sub Laboratory ID	Comments
Sample ID: 18D0171-01 Sampled: 04/10/18 12:30 Matrix: Water				Limited sample. Alk sample Diluted to field diluted 17.9x
Acidity, SM2310 Full Titration Curve (Subc)	04/26/18	04/24/18 12:30		
Containers Supplied:				
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				
Sample ID: 18D0171-07 Sampled: 04/10/18 12:30 Matrix: Water				Limited sample. Alk sample Diluted to field diluted 14.7x
Acidity, SM2310 Full Titration Curve (Subc)	04/26/18	04/24/18 12:30		
Containers Supplied:				
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				
Sample ID: 18D0171-10 Sampled: 04/10/18 12:30 Matrix: Water				Limited sample. Alk sample Diluted to field diluted 12.5x
Acidity, SM2310 Full Titration Curve (Subc)	04/26/18	04/24/18 12:30		
Containers Supplied:				
<div style="border: 1px solid black; height: 20px; width: 100%;"></div>				

Client field diluted  
Some samples due to limited  
Volume.

EDD Needed

Count=3  
0.6 <sup>mg/L</sup> / 51

OK

TR# 12 832 695 01 5695 0920

*[Signature]* 4/18/18  
Released By Date

Received By *[Signature]* Date 4/19/18 1045

Released By Date Received By Date



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

L987235

## Sample ID Cross Reference Report

**Client:** Aspect Consulting, LLC.

**Work Order:** 18D0171

**Project:** Art Brass

**Project Number:** [none]

<u>LabNumber</u>	<u>SampleName</u>	<u>ClientMatrix</u>	<u>Sampled</u>	<u>SampleReceived</u>
18D0171-01	10A18-100_1A.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-02	10A18-150_1A.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-03	10A18-100_1B.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-04	10A18-100_1C.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-05	10A18-200_2A.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-06	10A18-250_2A.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-07	10A18-200_2B.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-08	10A18-200_2C.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-09	10A18-300_3A.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-10	10A18-300_2B.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40
18D0171-11	10A18-300_3C.d.7	Water	10-Apr-2018 12:30	12-Apr-2018 09:40

0.16 <sup>amt</sup> 5.0

## ESC LAB SCIENCES Cooler Receipt Form

Client: <u>ANARESTWA</u>	SDG#	<u>L987235</u>	
Cooler Received/Opened On: <u>04/19/18</u>	Temperature:	<u>0.6</u>	
Received By: Kathryn Cason			
Signature: <u>Kathryn Cason</u>			
<b>Receipt Check List</b>	<b>NP</b>	<b>Yes</b>	<b>No</b>
COC Seal Present / Intact?	/		
COC Signed / Accurate?		/	
Bottles arrive intact?		/	
Correct bottles used?		/	
Sufficient volume sent?		/	
If Applicable			
VOA Zero headspace?			
Preservation Correct / Checked?			



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**10A18-100\_1A.d.7**  
**18D0171-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 11:51

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>2.04</b>	ug/L	B, D
Nickel, Dissolved	7440-02-0	2	1.00	<b>286</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**10A18-100\_1A.d.7**  
**18D0171-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/10/2018 12:30

Instrument: ICP2

Analyzed: 24-Apr-2018 13:14

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0479  
Prepared: 20-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.169</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0055</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0088</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>9.92</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.222</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.27</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0738</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.96</b>	mg/L	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
26-Apr-2018 15:50

**10A18-100\_1A.d.7**  
**18D0171-01 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/10/2018 12:30

Instrument: DX2100

Analyzed: 17-Apr-2018 20:27

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0373  
Prepared: 17-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	17.9	mg/L	D



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
26-Apr-2018 15:50

**10A18-100\_1A.d.7**  
**18D0171-01 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/10/2018 12:30

Instrument: TOC-LCSH

Analyzed: 15-Apr-2018 00:29

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0310  
Prepared: 14-Apr-2018

Sample Size: 20 mL  
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>6.81</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 26-Apr-2018 15:50
--	---	---------------------------------------

**10A18-100\_1A.d.7**  
**18D0171-01 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/10/2018 12:30

Instrument: Accumet AR60 Analyzed: 12-Apr-2018 16:30

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0269 Sample Size: 100 mL  
Prepared: 12-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.25</b>	mg/L CaCO3	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
26-Apr-2018 15:50

**10A18-100\_1A.d.7**  
**18D0171-01RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/10/2018 12:30

Instrument: DX2100

Analyzed: 21-Apr-2018 18:00

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0373  
Prepared: 17-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>145</b>	mg/L	D



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**10A18-150\_1A.d.7**  
**18D0171-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 11:55

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>335</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
26-Apr-2018 15:50

**10A18-150\_1A.d.7**  
**18D0171-02RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS2

Analyzed: 26-Apr-2018 12:07

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	1	0.500	2.22	ug/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**10A18-100\_1B.d.7**  
**18D0171-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 11:59

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>418</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-100\_1B.d.7**  
**18D0171-03RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS2

Analyzed: 26-Apr-2018 12:49

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	2	1.00	<b>1.82</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**10A18-100\_1C.d.7**  
**18D0171-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:03

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>130</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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**10A18-100\_1C.d.7**  
**18D0171-04RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED Sampled: 04/10/2018 12:30

Instrument: ICPMS2 Analyzed: 26-Apr-2018 12:53

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	2	1.00	<b>4.09</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**10A18-200\_2A.d.7**  
**18D0171-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:07

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>479</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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**Reported:**  
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**10A18-200\_2A.d.7**  
**18D0171-05RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS2

Analyzed: 26-Apr-2018 12:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	2	1.00	2.22	ug/L	D



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-250\_2A.d.7**  
**18D0171-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:11

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Reported:  
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**10A18-250\_2A.d.7**  
**18D0171-06RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:58

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	20	10.0	<b>1020</b>	ug/L	D

Instrument: ICPMS2

Analyzed: 26-Apr-2018 13:03

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	2	1.00	<b>2.03</b>	ug/L	D



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Project Number: [none]  
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**Reported:**  
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**10A18-200\_2B.d.7**  
**18D0171-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:15

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>4.21</b>	ug/L	B, D
Nickel, Dissolved	7440-02-0	2	1.00	<b>98.1</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Manager: Delia Massey

Reported:  
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**10A18-200\_2B.d.7**  
**18D0171-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/10/2018 12:30

Instrument: ICP2

Analyzed: 23-Apr-2018 15:17

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0479  
Prepared: 20-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.142</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0091</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0039</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>4.83</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.182</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>1.44</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0099</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>4.74</b>	mg/L	



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Project Number: [none]  
Project Manager: Delia Massey

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**10A18-200\_2B.d.7**  
**18D0171-07 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/10/2018 12:30

Instrument: DX2100

Analyzed: 17-Apr-2018 21:29

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0373  
Prepared: 17-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	17.2	mg/L	D



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**10A18-200\_2B.d.7**  
**18D0171-07 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/10/2018 12:30

Instrument: TOC-LCSH Analyzed: 15-Apr-2018 00:48

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0310 Sample Size: 20 mL  
Prepared: 14-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>8.71</b>	mg/L	



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**10A18-200\_2B.d.7**  
**18D0171-07 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/10/2018 12:30

Instrument: Accumet AR60 Analyzed: 12-Apr-2018 16:30

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0269 Sample Size: 100 mL  
Prepared: 12-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.93</b>	mg/L CaCO3	



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**10A18-200\_2B.d.7**  
**18D0171-07RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/10/2018 12:30

Instrument: DX2100 Analyzed: 21-Apr-2018 18:20

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0373 Sample Size: 5 mL  
Prepared: 17-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>141</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-200\_2C.d.7**  
**18D0171-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:19

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>116</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-200\_2C.d.7**  
**18D0171-08RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS2

Analyzed: 26-Apr-2018 13:08

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	2	1.00	<b>23.4</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-300\_3A.d.7**  
**18D0171-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:46

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	<b>0.480</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>71.5</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**10A18-300\_3A.d.7**  
**18D0171-09RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 13:29

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	50	25.0	<b>4830</b>	ug/L	D

Instrument: ICPMS2

Analyzed: 26-Apr-2018 13:12

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	5	2.50	<b>10.3</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-300\_2B.d.7**  
**18D0171-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:50

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>3.95</b>	ug/L	B, D
Nickel, Dissolved	7440-02-0	2	1.00	<b>102</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
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**10A18-300\_2B.d.7**  
**18D0171-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/10/2018 12:30

Instrument: ICP2

Analyzed: 23-Apr-2018 15:21

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0479  
Prepared: 20-Apr-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0452</b>	mg/L	J
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0160</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0068</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>65.4</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0443</b>	mg/L	J
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>5.34</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0198</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.67</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>31.4</b>	mg/L	



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**10A18-300\_2B.d.7**  
**18D0171-10 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/10/2018 12:30

Instrument: DX2100 Analyzed: 17-Apr-2018 21:49

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0373 Sample Size: 5 mL  
Prepared: 17-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	15.7	mg/L	D



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**10A18-300\_2B.d.7**  
**18D0171-10 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/10/2018 12:30

Instrument: TOC-LCSH Analyzed: 15-Apr-2018 01:12

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0310 Sample Size: 20 mL  
Prepared: 14-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>7.11</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-300\_2B.d.7**  
**18D0171-10 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/10/2018 12:30

Instrument: Accumet AR60

Analyzed: 12-Apr-2018 16:30

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0269 Sample Size: 100 mL  
Prepared: 12-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.44</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
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**10A18-300\_2B.d.7**  
**18D0171-10RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/10/2018 12:30

Instrument: DX2100

Analyzed: 21-Apr-2018 18:40

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0373  
Prepared: 17-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>158</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**10A18-300\_3C.d.7**  
**18D0171-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS1

Analyzed: 25-Apr-2018 12:54

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0389 Sample Size: 25 mL  
Prepared: 24-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Nickel, Dissolved	7440-02-0	2	1.00	<b>50.7</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
26-Apr-2018 15:50

**10A18-300\_3C.d.7**  
**18D0171-11RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/10/2018 12:30

Instrument: ICPMS2

Analyzed: 26-Apr-2018 13:17

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0637 Sample Size: 25 mL  
Prepared: 26-Apr-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Copper, Dissolved	7440-50-8	2	1.00	<b>1.28</b>	ug/L	D



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401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0389 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS1 Analyst: TCH

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0389-BLK1)</b>						Prepared: 24-Apr-2018 Analyzed: 25-Apr-2018 11:47					
Cadmium, Dissolved	111	ND	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.100	ug/L							U
Copper, Dissolved	63	3.10	0.500	ug/L							
Copper, Dissolved	65	3.10	0.500	ug/L							
Nickel, Dissolved	60	ND	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.500	ug/L							U
Zinc, Dissolved	66	ND	4.00	ug/L							U
Zinc, Dissolved	67	ND	4.00	ug/L							U

<b>LCS (BGD0389-BS1)</b>						Prepared: 24-Apr-2018 Analyzed: 25-Apr-2018 12:23					
Cadmium, Dissolved	111	24.8	0.100	ug/L	25.0		99.2	80-120			
Cadmium, Dissolved	114	25.6	0.100	ug/L	25.0		103	80-120			
Copper, Dissolved	63	27.7	0.500	ug/L	25.0		111	80-120			B
Copper, Dissolved	65	27.7	0.500	ug/L	25.0		111	80-120			B
Nickel, Dissolved	60	27.2	0.500	ug/L	25.0		109	80-120			
Nickel, Dissolved	62	26.9	0.500	ug/L	25.0		108	80-120			
Zinc, Dissolved	66	86.6	4.00	ug/L	80.0		108	80-120			
Zinc, Dissolved	67	79.7	4.00	ug/L	80.0		99.6	80-120			



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0479 - WMN (No Prep)**

Instrument: ICP2 Analyst: MCB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0479-BLK1)</b>											
						Prepared: 20-Apr-2018 Analyzed: 23-Apr-2018 14:03					
Aluminum, Dissolved	ND	0.0085	0.0500	mg/L							U
Arsenic, Dissolved	ND	0.0047	0.0500	mg/L							U
Barium, Dissolved	ND	0.0007	0.0030	mg/L							U
Calcium, Dissolved	ND	0.0051	0.0500	mg/L							U
Iron, Dissolved	ND	0.0013	0.0500	mg/L							U
Magnesium, Dissolved	ND	0.0160	0.0500	mg/L							U
Manganese, Dissolved	ND	0.0003	0.0010	mg/L							U
Potassium, Dissolved	ND	0.0520	0.500	mg/L							U
Sodium, Dissolved	0.131	0.0114	0.500	mg/L							J

<b>LCS (BGD0479-BS1)</b>											
						Prepared: 20-Apr-2018 Analyzed: 23-Apr-2018 14:29					
Aluminum, Dissolved	2.06	0.0085	0.0500	mg/L	2.00		103	80-120			
Arsenic, Dissolved	2.25	0.0047	0.0500	mg/L	2.00		113	80-120			
Barium, Dissolved	2.07	0.0007	0.0030	mg/L	2.00		103	80-120			
Calcium, Dissolved	10.3	0.0051	0.0500	mg/L	10.0		103	80-120			
Iron, Dissolved	1.97	0.0013	0.0500	mg/L	2.00		98.4	80-120			
Magnesium, Dissolved	10.3	0.0160	0.0500	mg/L	10.0		103	80-120			
Manganese, Dissolved	0.468	0.0003	0.0010	mg/L	0.500		93.6	90-114			
Potassium, Dissolved	11.0	0.0520	0.500	mg/L	10.0		110	80-120			
Sodium, Dissolved	11.1	0.0114	0.500	mg/L	10.0		111	80-120			
Sodium, Dissolved	10.6	1.90	50.0	mg/L	10.0		106	80-120			J



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0637 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: TCH

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0637-BLK1)</b>			Prepared: 26-Apr-2018 Analyzed: 26-Apr-2018 13:55								
Copper, Dissolved	63	ND	0.500	ug/L							U
Copper, Dissolved	65	ND	0.500	ug/L							U
<b>LCS (BGD0637-BS1)</b>			Prepared: 26-Apr-2018 Analyzed: 26-Apr-2018 14:33								
Copper, Dissolved	63	27.0	0.500	ug/L	25.0		108	80-120			
Copper, Dissolved	65	27.7	0.500	ug/L	25.0		111	80-120			



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 26-Apr-2018 15:50
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**Wet Chemistry - Quality Control**

**Batch BGD0269 - No Prep Wet Chem**

Instrument: Accumet AR60 Analyst: U

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0269-BLK1)</b>						Prepared: 12-Apr-2018 Analyzed: 12-Apr-2018 16:30					
Alkalinity, Total	ND	1.00	1.00	mg/L CaCO3							U
<b>Reference (BGD0269-SRM1)</b>						Prepared: 12-Apr-2018 Analyzed: 12-Apr-2018 16:30					
Alkalinity, Total	105	1.00	1.00	mg/L CaCO3	108		97.5	90.37-108.33			



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 26-Apr-2018 15:50
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**Wet Chemistry - Quality Control**

**Batch BGD0310 - No Prep Wet Chem**

Instrument: TOC-LCSH Analyst: KK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0310-BLK1)</b>						Prepared: 14-Apr-2018 Analyzed: 14-Apr-2018 19:17					
Total Organic Carbon	ND	0.50	0.50	mg/L							U
<b>LCS (BGD0310-BS1)</b>						Prepared: 14-Apr-2018 Analyzed: 14-Apr-2018 19:36					
Total Organic Carbon	20.01	0.50	0.50	mg/L	20.00		100	90-110			



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 26-Apr-2018 15:50
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**Wet Chemistry - Quality Control**

**Batch BGD0373 - No Prep Wet Chem**

Instrument: DX2100 Analyst: KK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0373-BLK1)</b>						Prepared: 17-Apr-2018 Analyzed: 17-Apr-2018 17:49					
Chloride	ND	0.100	0.100	mg/L							U
Sulfate	ND	0.100	0.100	mg/L							*, U
<b>LCS (BGD0373-BS1)</b>						Prepared: 17-Apr-2018 Analyzed: 17-Apr-2018 18:08					
Chloride	1.47	0.100	0.100	mg/L	1.50		98.1	90-110			
Sulfate	1.47	0.100	0.100	mg/L	1.50		97.8	90-110			



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
26-Apr-2018 15:50

### Certified Analyses included in this Report

Analyte	Certifications
<b>EPA 200.8 UCT-KED in Water</b>	
Cadmium-111	NELAP,WADOE,WA-DW,DoD-ELAP
Cadmium-114	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-63	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-65	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-60	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-62	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-66	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-67	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 300.0 in Water</b>	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
<b>EPA 6010C in Water</b>	
Aluminum	WADOE,NELAP
Arsenic	WADOE,NELAP
Barium	WADOE,NELAP
Calcium	WADOE,NELAP
Iron	WADOE,NELAP
Potassium	WADOE,NELAP
Magnesium	WADOE,NELAP
Manganese	WADOE,NELAP
Sodium	WADOE,NELAP
<b>EPA 9060A in Water</b>	
Total Organic Carbon	DoD-ELAP,WADOE,NELAP
<b>SM 2320 B-97 in Water</b>	
Alkalinity, Total	DoD-ELAP,WADOE,WA-DW,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	06/30/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006	05/11/2018
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: [none]

Project Manager: Delia Massey

Reported:

26-Apr-2018 15:50

### Notes and Definitions

- \* Flagged value is not within established control limits.
- B This analyte was detected in the method blank.
- D The reported value is from a dilution
- J Estimated concentration value detected below the reporting limit.
- U This analyte is not detected above the applicable reporting or detection limit.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.



16 May 2018

Delia Massey  
Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle, WA 98104

RE: Art Brass

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
18D0388	N/A

-----

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

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



cooler 1/2

### Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: <b>B20388</b>	Turn-around Requested:	Page: <b>1</b> of <b>2</b>
ARI Client Company: <b>Anchor for Aspect</b>	Phone: <b>503-972-5019</b>	Date: <b>4/20/18</b>
Client Contact: <b>Delia M (Aspect) &amp; Jessica G (Anchor)</b>	No. of Coolers:	Ice Present? Cooler Temps:



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

Client Project Name: <b>Art Brass</b>					Analysis Requested						Notes/Comments	
Client Project #:	Samplers:				200.8 (Cd, Cu, Ni, Zn)	6010 (As, Ba, Mn, Al, Ca, Fe, Mg, K, Na)	310.1/310.2 (Alk & Acid)	300.1/300.0 (Cl, SO4)	9060 TOC			
Sample ID	Date	Time	Matrix	No. Containers								
17A18-100_1A.d14	4/17/2018	1400	W	4	X	X	X	X	X			AIK Sample diluted 2.5x
17A18-150_1A.d14				1	X							
17A18-100_1B.d14				4	X	X	X	X	X			AIK Sample diluted 3.1x
17A18-100_1C.d14				4	X	X	X	X	X			AIK Sample diluted 2x
17A18-200_2A.d14				4	X	X	X	X	X			AIK Sample diluted 2.4x
17A18-250_2A.d14				4	X	X	X	X	X			AIK Sample diluted 2.5x
17A18-200_2B.d14				4	X	X	X	X	X			AIK Sample diluted 2.01x
17A18-200_2C.d14				4	X	X	X	X	X			AIK Sample diluted 2x
17A18-300_3A.d14				4	X	X	X	X	X			AIK Sample diluted 2x
17A18-300_3B.d14				4	X	X	X	X	X			AIK Sample diluted 2x
Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>		Received by: (Signature) <i>[Signature]</i>		Relinquished by: (Signature)			Received by: (Signature)				
Metals samples are 0.45µm filtered	Printed Name: <i>Sasha Norwood</i>		Printed Name: <i>Stephanie Fisnel</i>		Printed Name:			Printed Name:				
	Company: <i>Anchor QEA</i>		Company: <i>ARI</i>		Company:			Company:				
	Date & Time: <i>20 April / 1200</i>		Date & Time: <i>4/21/18 0951</i>		Date & Time:			Date & Time:				

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Cooler 1/2

**Chain of Custody Record & Laboratory Analysis Request**



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

ARI Assigned Number: <b>18D0388</b>	Turn-around Requested:	Page: <b>2</b> of <b>2</b>
ARI Client Company: <b>Anchor for Aspect</b>	Phone: <b>503-972-5019</b>	Date: <b>4/20/18</b>
Client Contact: <b>Delia M (Aspect) &amp; Jessica G (Anchor)</b>		Ice Present?
		No. of Coolers: Cooler Temps:

Client Project Name: <b>Art Brass</b>					Analysis Requested						Notes/Comments	
Client Project #:		Samplers:			200.8 (Cd, Cu, Ni, Zn)	6010 (As, Ba, Mn, Al, Ca, Fe, Mg, K, Na)	310.1/310.2 (Alk & Acid)	300.1/300.0 (Cl, SO4)	9060 TOC			
Sample ID	Date	Time	Matrix	No. Containers								
17A18-300_3C.d14	4/17/2018	1400	W	4	X	X	X	X	X			
17A18-000_GW.d14	↓	↓	↓	1	X							Alk sample diluted 2x
Comments/Special Instructions		Relinquished by: (Signature)	Received by: (Signature)			Relinquished by: (Signature)			Received by: (Signature)			
Metals samples are 0.45µm filtered		Printed Name:	Printed Name:			Printed Name:			Printed Name:			
		Company:	Company:			Company:			Company:			
		Date & Time:	Date & Time:			Date & Time:			Date & Time:			
		<b>20 Apr 18 / 12:50</b>										

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

COPY

Original in other cooler

Cooler 2/2

### Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: <b>18D0388</b>	Turn-around Requested:	Page: <b>1</b> of <b>2</b>
ARI Client Company: <b>Anchor for Aspect</b>	Phone: <b>503-972-5019</b>	Date: <b>4/20/18</b>
Client Contact: <b>Delia M (Aspect) &amp; Jessica G (Anchor)</b>		Ice Present? <input type="checkbox"/>
		No. of Coolers: <input type="checkbox"/>
		Cooler Temps: <input type="checkbox"/>



**Analytical Resources, Incorporated**  
 Analytical Chemists and Consultants  
 4811 South 134th Place, Suite 100  
 Tukwila, WA 98168  
 206-695-6200 206-695-6201 (fax)

Client Project Name: <b>Art Brass</b>					Analysis Requested						Notes/Comments	
Client Project #:	Samplers:				200.8 (Cd, Cu, Ni, Zn)	6010 (As, Ba, Mn, Al, Ca, Fe, Mg, K, Na)	310.1/310.2 (Alk & Acid)	300.1/300.0 (Cl, SO4)	9060 TOC			
Sample ID	Date	Time	Matrix	No. Containers								
17A18-100_1A.d14	4/17/2018	1400	W	4	X	X	X	X	X			Alk Sample diluted 2.5x
17A18-150_1A.d14				1	X							
17A18-100_1B.d14				4	X	X	X	X	X			Alk Sample diluted 3.1x
17A18-100_1C.d14				4	X	X	X	X	X			Alk Sample diluted 2x
17A18-200_2A.d14				4	X	X	X	X	X			Alk Sample diluted 2.4x
17A18-250_2A.d14				4	X	X	X	X	X			Alk Sample diluted 2.5x
17A18-200_2B.d14				4	X	X	X	X	X			Alk Sample diluted 2.1x
17A18-200_2C.d14				4	X	X	X	X	X			Alk Sample diluted 2x
17A18-300_3A.d14				4	X	X	X	X	X			Alk Sample diluted 2x
17A18-300_3B.d14				4	X	X	X	X	X			Alk Sample diluted 2x
Comments/Special Instructions  Metals samples are 0.45µm filtered	Relinquished by: (Signature)	<i>[Signature]</i>			Received by: (Signature)	<i>[Signature]</i>			Relinquished by: (Signature)			
	Printed Name:	Sasha Norwood			Printed Name:	Brandon Fisk			Printed Name:			
	Company:	Anchor QEA			Company:	ARI			Company:			
	Date & Time:	20 April / 1200			Date & Time:	4/23/18 925			Date & Time:			

**Limits of Liability:** ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

**Sample Retention Policy:** Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.





Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**ANALYTICAL REPORT FOR SAMPLES**

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
17A18-100_1A.d14	18D0388-01	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-150_1A.d14	18D0388-02	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-100_1B.d14	18D0388-03	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-100_1C.d14	18D0388-04	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-200_2A.d14	18D0388-05	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-250_2A.d14	18D0388-06	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-200_2B.d14	18D0388-07	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-200_2C.d14	18D0388-08	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-300_3A.d14	18D0388-09	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-300_3B.d14	18D0388-10	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-300_3C.d14	18D0388-11	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
17A18-000_GW.d14	18D0388-12	Water	17-Apr-2018 14:00	21-Apr-2018 13:51



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

## Case Narrative

### Sample receipt

Samples as listed on the preceding page were received April 21, 2018 under ARI work order 18D0388. For details regarding sample receipt, please refer to the Cooler Receipt Form. The Acidity analysis was subcontracted to ESC Labs.

### Dissolved Metals - EPA Method 200.8

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank was clean at the reporting limit.

The LCS percent recoveries were within control limits.

### Dissolved Metals - EPA Method 6010C

The samples were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank has Aluminium and Sodium detected below the reporting limits, but above the method detection limits. These metals have been flagged with "J" qualifiers on the method blank. There were no metals detected above the reporting limits. No further corrective action was taken.

The LCS percent recoveries were within control limits.

### Wet Chemistry (Alkalinity, TOC, Anions)

The samples were prepared and analyzed within the recommended holding times.

The Alkalinity was diluted in the lab in order to reach a minimum volume needed for analysis and subcontract. The dilution factors are included in the report.

Initial and continuing calibrations were within method requirements.

The method blanks were clean at the reporting limits.

The LCS percent recoveries were within control limits.

The Alkalinity SRM percent recovery was within QC limits.



WORK ORDER

18D0388

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: [none]

Preservation Confirmation

Container ID	Container Type	pH
18D0388-01 A	VOA Vial, Clear, 40 mL	
18D0388-01 B	Glass NM, Amber, 250 mL	
18D0388-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-01 D	Small OJ, 500 mL	
18D0388-01 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-02 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-03 A	VOA Vial, Clear, 40 mL	
18D0388-03 B	Glass NM, Amber, 250 mL	
18D0388-03 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-03 D	Small OJ, 500 mL	
18D0388-03 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-04 A	VOA Vial, Clear, 40 mL	
18D0388-04 B	Glass NM, Amber, 250 mL	
18D0388-04 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-04 D	Small OJ, 500 mL	
18D0388-04 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-05 A	VOA Vial, Clear, 40 mL	
18D0388-05 B	Glass NM, Amber, 250 mL	
18D0388-05 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-05 D	Small OJ, 500 mL	
18D0388-05 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-06 A	VOA Vial, Clear, 40 mL	
18D0388-06 B	Glass NM, Amber, 250 mL	
18D0388-06 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-06 D	Small OJ, 500 mL	
18D0388-06 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-07 A	VOA Vial, Clear, 40 mL	
18D0388-07 B	Glass NM, Amber, 250 mL	
18D0388-07 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-07 D	Small OJ, 500 mL	
18D0388-07 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2 P
18D0388-08 A	VOA Vial, Clear, 40 mL	
18D0388-08 B	Glass NM, Amber, 250 mL	
18D0388-08 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2 P
18D0388-08 D	Small OJ, 500 mL	



WORK ORDER

18D0388

<b>Client:</b> Aspect Consulting, LLC.	<b>Project Manager:</b> Amanda Volgardsen
<b>Project:</b> Art Brass	<b>Project Number:</b> [none]

18D0388-08 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0388-09 A	VOA Vial, Clear, 40 mL		
18D0388-09 B	Glass NM, Amber, 250 mL		
18D0388-09 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0388-09 D	Small OJ, 500 mL		
18D0388-09 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0388-10 A	VOA Vial, Clear, 40 mL		
18D0388-10 B	Glass NM, Amber, 250 mL		
18D0388-10 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0388-10 D	Small OJ, 500 mL		
18D0388-10 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0388-11 A	VOA Vial, Clear, 40 mL		
18D0388-11 B	Glass NM, Amber, 250 mL		
18D0388-11 C	Glass NM, Amber, 250 mL, 9N H2SO4	< 2	P
18D0388-11 D	Small OJ, 500 mL		
18D0388-11 E	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P
18D0388-12 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	< 2	P

P = pass

BE

4/25/18

Preservation Confirmed By \_\_\_\_\_

Date \_\_\_\_\_



# Cooler Receipt Form

ARI Client: Anchor for Aspart

Project Name: Art Brass

COC No(s): \_\_\_\_\_ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: \_\_\_\_\_

Assigned ARI Job No: 18D0388

Tracking No: 7702 S301 743L NA

7707720 5301 8026  
BF

**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: 0951 7.0 10.4

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: D002505

Cooler Accepted by: SEF Date: 4/21/18 Time: 0951

*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: BF Date: 4/25/18 Time: 1350

**\*\* 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:**  
labels missing sample date + time  
COC's say 2 coolers only received 1 cooler 1 received + temp taken 4/21/18 cooler 2 received + temp taken 4/23/18 limited volume

By: BF Date: 4/25/18

Small Air Bubbles - 2mm	Peabubbles 2-4 mm	LARGE Air Bubbles > 4 mm	Small → "sm" (< 2 mm)
			Peabubbles → "pb" (2 to < 4 mm)
			Large → "lg" (4 to < 6 mm)
			Headspace → "hs" (> 6 mm)





ARI Job No.: 18D0388

Client ID: \_\_\_\_\_

Parameter: Alkalinity

Client Project: \_\_\_\_\_

List problems, concerns, corrective actions and any other pertinent information

Measured sample volume and brought it to 250 ml:

-01 = 43ml

-03 = 43ml

-04 = 42ml

-05 = 44ml

-06 = 42ml

-07 = 43ml

-08 = 44ml

-09 = 43ml

-10 = 43ml

-11 = 43ml

Used 100 ml for Alkalinity and returned left over volume to log-in.

Analyst Initials:

W

Date:

4-30-18

May 11, 2018

## Analytical Resources - Tukwila, WA

Sample Delivery Group: L990515  
Samples Received: 05/02/2018  
Project Number: 18D0388  
Description: Art Brass

Report To: Amanda Volgardsen  
4611 S. 134th PI  
Tukwila, WA 98168

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b>Cp: Cover Page</b>	<b>1</b>	<b>1</b> Cp
<b>Tc: Table of Contents</b>	<b>2</b>	<b>2</b> Tc
<b>Ss: Sample Summary</b>	<b>3</b>	<b>3</b> Ss
<b>Cn: Case Narrative</b>	<b>5</b>	<b>4</b> Cn
<b>Sr: Sample Results</b>	<b>6</b>	<b>5</b> Sr
18D0388-01 L990515-01	<b>6</b>	<b>6</b> Qc
18D0388-03 L990515-02	<b>7</b>	<b>7</b> Gl
18D0388-04 L990515-03	<b>8</b>	<b>8</b> Al
18D0388-05 L990515-04	<b>9</b>	<b>9</b> Sc
18D0388-06 L990515-05	<b>10</b>	
18D0388-07 L990515-06	<b>11</b>	
18D0388-08 L990515-07	<b>12</b>	
18D0388-09 L990515-08	<b>13</b>	
18D0388-10 L990515-09	<b>14</b>	
18D0388-11 L990515-10	<b>15</b>	
<b>Qc: Quality Control Summary</b>	<b>16</b>	
Wet Chemistry by Method 2310 B-2011	<b>16</b>	
<b>Gl: Glossary of Terms</b>	<b>17</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>18</b>	
<b>Sc: Sample Chain of Custody</b>	<b>19</b>	

# SAMPLE SUMMARY

## 18D0388-01 L990515-01 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

- 1  
Cp
- 2  
Tc
- 3  
Ss
- 4  
Cn
- 5  
Sr
- 6  
Qc
- 7  
Gl
- 8  
Al
- 9  
Sc

## 18D0388-03 L990515-02 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

## 18D0388-04 L990515-03 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

## 18D0388-05 L990515-04 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

## 18D0388-06 L990515-05 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

## 18D0388-07 L990515-06 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

## 18D0388-08 L990515-07 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

## 18D0388-09 L990515-08 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by  
Collected date/time  
Received date/time

# SAMPLE SUMMARY

18D0388-10 L990515-09 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

1  
Cp

2  
Tc

3  
Ss

18D0388-11 L990515-10 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

4  
Cn

5  
Sr

6  
Qc

7  
Gl

8  
Al

9  
Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
Technical Service Representative

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-01 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-02 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-03 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-04 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-05 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-06 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-07 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-08 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-09 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-10 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3308675-1 05/10/18 13:30

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Acidity	U		3630	10000

Sample Narrative:

BLANK: Endpoint pH 8.3

L990515-01 Original Sample (OS) • Duplicate (DUP)

(OS) L990515-01 05/10/18 13:30 • (DUP) R3308675-4 05/10/18 13:30

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

L991334-04 Original Sample (OS) • Duplicate (DUP)

(OS) L991334-04 05/10/18 13:30 • (DUP) R3308675-5 05/10/18 13:30

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	10000	10000	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3308675-2 05/10/18 13:30 • (LCSD) R3308675-3 05/10/18 13:30

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Acidity	20000	20000	20000	100	100	85.0-115			0.000	20

Sample Narrative:

LCS: Endpoint pH 8.3  
LCSD: Endpoint pH 8.3

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

Page 28 of 118 18D0388 ARISample FINAL 16 May 2018 1252



Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Ai
- 9 Sc

Qualifier	Description
T8	Sample(s) received past/too close to holding time expiration.



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.

\* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

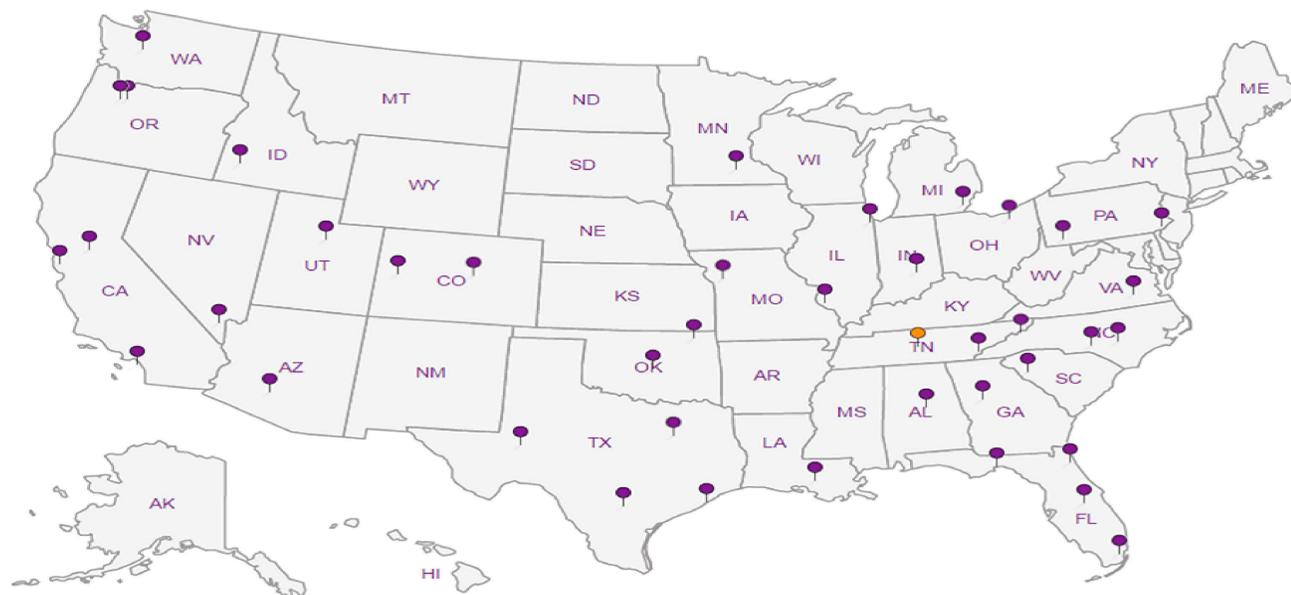
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup>Drinking Water <sup>2</sup>Underground Storage Tanks <sup>3</sup>Aquatic Toxicity <sup>4</sup>Chemical/Microbiological <sup>5</sup>Mold <sup>6</sup>Wastewater n/a Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.





Analytical Resources, Incorporated  
Analytical Chemists and Consultants

**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
**ARI Work Order: 18D0388**

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone : (615) 773-9739  
Fax:

PLEASE SEND DATA TO subdata@arilabs.com

Analysis	Due	Expires	Sub Laboratory ID	Comments
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Sample ID: 18D0388-01 Sampled: 04/17/18 14:00 Matrix: Water			L990515-01	Alk sample diluted 2.5x
--	--	--	------------	-------------------------

Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00

Containers Supplied:

Sample ID: 18D0388-03 Sampled: 04/17/18 14:00 Matrix: Water			02	Alk sample diluted 3.1x
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Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00

Containers Supplied:

Sample ID: 18D0388-04 Sampled: 04/17/18 14:00 Matrix: Water			03	Alk sample diluted 2x
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Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00

Containers Supplied:

Sample ID: 18D0388-05 Sampled: 04/17/18 14:00 Matrix: Water			04	Alk sample diluted 2.4x
--	--	--	----	-------------------------

Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00

Containers Supplied:

E146

Standard Report, EDD  
All Samples field deleted, and  
again deleted in the lab to  
bring to volume

	5/1/18		5/2/18
Released By	Date	Received By	Date

Released By	Date	Received By	Date

Calc 845 3.5



Analytical Resources, Incorporated  
Analytical Chemists and Consultants

SUBCONTRACT ORDER  
To: ESC Lab Sciences  
ARI Work Order: 18D0388

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18D0388-06</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 <i>Containers Supplied:</i> <input type="text"/>			L990516-06	Alk sample diluted 2.5x
<b>Sample ID: 18D0388-07</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 <i>Containers Supplied:</i> <input type="text"/>			06	Alk sample diluted 2.1x
<b>Sample ID: 18D0388-08</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 <i>Containers Supplied:</i> <input type="text"/>			07	Alk sample diluted 2x
<b>Sample ID: 18D0388-09</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 <i>Containers Supplied:</i> <input type="text"/>			08	Alk sample diluted 2x
<b>Sample ID: 18D0388-10</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 <i>Containers Supplied:</i> <input type="text"/>			09	Alk sample diluted 2x
<b>Sample ID: 18D0388-11</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 <i>Containers Supplied:</i> <input type="text"/>			10	Alk sample diluted 2x

Released By: Date: 5/1/18 Received By: Date: 5/2/18 845

Released By: \_\_\_\_\_ Date: \_\_\_\_\_ Received By: \_\_\_\_\_ Date: \_\_\_\_\_

L990615



**Analytical Resources, Incorporated**  
Analytical Chemists and Consultants

## Sample ID Cross Reference Report

**Client:** Aspect Consulting, LLC.

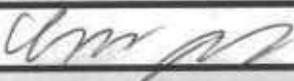
**Work Order:** 18D0388

**Project:** Art Brass

**Project Number:** [none]

<u>LabNumber</u>	<u>SampleName</u>	<u>ClientMatrix</u>	<u>Sampled</u>	<u>SampleReceived</u>
18D0388-01	17A18-100_1A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-02	17A18-150_1A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-03	17A18-100_1B.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-04	17A18-100_1C.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-05	17A18-200_2A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-06	17A18-250_2A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-07	17A18-200_2B.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-08	17A18-200_2C.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-09	17A18-300_3A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-10	17A18-300_3B.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-11	17A18-300_3C.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-12	17A18-000_GW.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51

## ESC LAB SCIENCES Cooler Receipt Form

Client:	ANARESTWA	SDG#	L990515	
Cooler Received/Opened On: 5/2 /18		Temperature:	3.5	
Received By: Christian Kacar				
Signature: 				
Receipt Check List		NP	Yes	No
COC Seal Present / Intact?			/	
COC Signed / Accurate?			/	
Bottles arrive intact?			/	
Correct bottles used?			/	
Sufficient volume sent?			/	
If Applicable				
VOA Zero headspace?				
Preservation Correct / Checked?				



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1A.d14**  
**18D0388-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 14:17

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	<b>2.95</b>	ug/L	
Nickel, Dissolved	7440-02-0	1	0.500	<b>237</b>	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1A.d14**  
**18D0388-01 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 13:53

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.211</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0069</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>9.35</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.218</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.02</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0370</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.28</b>	mg/L	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-100\_1A.d14**  
**18D0388-01 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 01-May-2018 15:52

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	17.8	mg/L	D



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 16-May-2018 12:52
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**17A18-100\_1A.d14**  
**18D0388-01 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH Analyzed: 28-Apr-2018 00:20

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>7.80</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-100\_1A.d14**  
**18D0388-01 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/17/2018 14:00

Instrument: Accumet AR60 Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>2.48</b>	mg/L CaCO3	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 16-May-2018 12:52
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**17A18-100\_1A.d14**  
**18D0388-01 (Water)**

\*\*\* DEFAULT GENERAL METHOD \*\*\*

Method: SM 2310B Sampled: 04/17/2018 14:00

Instrument: ELSC Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation: Preparation Method: \*\*\* DEFAULT PREP \*\*\*  
Preparation Batch: B051018  
Prepared: 10-May-2018 Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-100\_1A.d14**  
**18D0388-01RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 04:32

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>153</b>	mg/L	D



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-150\_1A.d14**  
**18D0388-02 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 14:22

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	3.22	ug/L	
Nickel, Dissolved	7440-02-0	1	0.500	197	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1B.d14**  
**18D0388-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 13:32

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	5	0.500	ND	ug/L	U
Copper, Dissolved	7440-50-8	5	2.50	<b>2.85</b>	ug/L	D
Nickel, Dissolved	7440-02-0	5	2.50	<b>878</b>	ug/L	D
Zinc, Dissolved	7440-66-6	5	20.0	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1B.d14**  
**18D0388-03 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 13:57

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.133</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0103</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>12.9</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.149</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.74</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.227</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>6.26</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-100\_1B.d14**  
**18D0388-03 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/17/2018 14:00

Instrument: DX2100 Analyzed: 01-May-2018 16:12

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704 Sample Size: 5 mL  
Prepared: 27-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	<b>18.3</b>	mg/L	D



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1B.d14**  
**18D0388-03 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH

Analyzed: 28-Apr-2018 00:44

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>8.96</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-100\_1B.d14**  
**18D0388-03 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/17/2018 14:00

Instrument: Accumet AR60 Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	ND	mg/L CaCO3	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1B.d14**  
**18D0388-03 (Water)**

\*\*\* DEFAULT GENERAL METHOD \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1B.d14**  
**18D0388-03RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 14:26

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	<b>2.54</b>	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	<b>5.96</b>	ug/L	



Aspect Consulting, LLC.  
401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-100\_1B.d14**  
**18D0388-03RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 04:52

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>186</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-100\_1C.d14**  
**18D0388-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 14:31

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	<b>5.66</b>	ug/L	
Nickel, Dissolved	7440-02-0	1	0.500	<b>109</b>	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-100\_1C.d14**  
**18D0388-04 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:01

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.217</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0114</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0082</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>10.7</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.277</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.18</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0144</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.78</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-100\_1C.d14**  
**18D0388-04 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/17/2018 14:00

Instrument: DX2100 Analyzed: 01-May-2018 16:32

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704 Sample Size: 5 mL  
Prepared: 27-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	<b>17.8</b>	mg/L	D



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 16-May-2018 12:52
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**17A18-100\_1C.d14**  
**18D0388-04 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH Analyzed: 28-Apr-2018 01:03

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>10.50</b>	mg/L	



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**17A18-100\_1C.d14**  
**18D0388-04 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/17/2018 14:00

Instrument: Accumet AR60 Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>52.6</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-100\_1C.d14**  
**18D0388-04 (Water)**

\*\*\* **DEFAULT GENERAL METHOD** \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-100\_1C.d14**  
**18D0388-04RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 05:13

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>149</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 14:36

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	3.12	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	4.19	ug/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:05

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.142</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0070</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>13.0</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.172</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.83</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.139</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.66</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 01-May-2018 17:34

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	17.6	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH

Analyzed: 28-Apr-2018 01:28

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.64</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/17/2018 14:00

Instrument: Accumet AR60

Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	ND	mg/L CaCO3	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05 (Water)**

\*\*\* DEFAULT GENERAL METHOD \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:23

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	5	2.50	642	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2A.d14**  
**18D0388-05RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 05:34

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>150</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-250\_2A.d14**  
**18D0388-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 14:41

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	1	0.100	ND	ug/L	U
Copper, Dissolved	7440-50-8	1	0.500	<b>2.68</b>	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-250\_2A.d14**  
**18D0388-06 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:10

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.194</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	ND	mg/L	U
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0086</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>12.8</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.199</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.80</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.148</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.37</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-250\_2A.d14**  
**18D0388-06 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/17/2018 14:00

Instrument: DX2100 Analyzed: 01-May-2018 17:54

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704 Sample Size: 5 mL  
Prepared: 27-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	17.5	mg/L	D



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-250\_2A.d14**  
**18D0388-06 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH Analyzed: 28-Apr-2018 01:48

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>5.55</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-250\_2A.d14**  
**18D0388-06 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/17/2018 14:00

Instrument: Accumet AR60

Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	ND	mg/L CaCO3	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-250\_2A.d14**  
**18D0388-06 (Water)**

\*\*\* DEFAULT GENERAL METHOD \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-250\_2A.d14**  
**18D0388-06RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:28

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	5	2.50	<b>669</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-250\_2A.d14**  
**18D0388-06RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 05:54

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>153</b>	mg/L	D



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401 Second Avenue South, Suite 201  
Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:37

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>7.79</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>119</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:14

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.198</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0072</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0060</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>4.91</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.344</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>1.37</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0084</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>4.31</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 01-May-2018 18:15

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	17.4	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH

Analyzed: 28-Apr-2018 02:09

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>12.14</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/17/2018 14:00

Instrument: Accumet AR60

Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>4.36</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07 (Water)**

\*\*\* DEFAULT GENERAL METHOD \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation: Preparation Method: \*\*\* DEFAULT PREP \*\*\*  
Preparation Batch: B051018  
Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2B.d14**  
**18D0388-07RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 06:14

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>152</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2C.d14**  
**18D0388-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:42

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	<b>29.0</b>	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	<b>122</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2C.d14**  
**18D0388-08 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:18

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.502</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0389</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0057</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>4.07</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.681</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>0.848</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0092</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>3.67</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2C.d14**  
**18D0388-08 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 01-May-2018 18:36

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	16.7	mg/L	D



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-200\_2C.d14**  
**18D0388-08 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH Analyzed: 28-Apr-2018 02:30

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>26.71</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-200\_2C.d14**  
**18D0388-08 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/17/2018 14:00

Instrument: Accumet AR60 Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>11.4</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-200\_2C.d14**  
**18D0388-08 (Water)**

\*\*\* DEFAULT GENERAL METHOD \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-200\_2C.d14**  
**18D0388-08RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 06:33

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	100	10.0	10.0	<b>162</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:47

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	<b>0.916</b>	ug/L	D
Copper, Dissolved	7440-50-8	2	1.00	<b>64.9</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>149</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:22

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>5.60</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0150</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0819</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>108</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.670</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>10.2</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.877</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>8.38</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>33.3</b>	mg/L	



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**17A18-300\_3A.d14**  
**18D0388-09 (Water)**

**Wet Chemistry**

Method: EPA 300.0 Sampled: 04/17/2018 14:00

Instrument: DX2100 Analyzed: 01-May-2018 18:56

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704 Sample Size: 5 mL  
Prepared: 27-Apr-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	<b>16.7</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH

Analyzed: 28-Apr-2018 02:55

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>3.94</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97

Sampled: 04/17/2018 14:00

Instrument: Accumet AR60

Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	ND	mg/L CaCO3	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09 (Water)**

\*\*\* **DEFAULT GENERAL METHOD** \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 16:28

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	50	25.0	<b>6060</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3A.d14**  
**18D0388-09RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 06:52

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	200	20.0	20.0	427	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3B.d14**  
**18D0388-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:52

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	<b>0.486</b>	ug/L	D
Copper, Dissolved	7440-50-8	2	1.00	<b>11.1</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>53.5</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3B.d14**  
**18D0388-10 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:27

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.869</b>	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0179</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0365</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>163</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>2.42</b>	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>8.07</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.458</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>6.65</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>30.2</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3B.d14**  
**18D0388-10 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 01-May-2018 19:17

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	<b>16.0</b>	mg/L	D



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 16-May-2018 12:52
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**17A18-300\_3B.d14**  
**18D0388-10 (Water)**

**Wet Chemistry**

Method: EPA 9060A Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH Analyzed: 28-Apr-2018 03:15

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>6.87</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	<b>Reported:</b> 16-May-2018 12:52
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**17A18-300\_3B.d14**  
**18D0388-10 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/17/2018 14:00

Instrument: Accumet AR60 Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	ND	mg/L CaCO3	U



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401 Second Avenue South, Suite 201  
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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3B.d14**  
**18D0388-10 (Water)**

\*\*\* **DEFAULT GENERAL METHOD** \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3B.d14**  
**18D0388-10RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 16:32

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	20	10.0	<b>2080</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3B.d14**  
**18D0388-10RE1 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 03-May-2018 07:12

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	500	50.0	50.0	<b>505</b>	mg/L	D



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Seattle WA, 98104

Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3C.d14**  
**18D0388-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 15:56

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	ND	ug/L	U
Copper, Dissolved	7440-50-8	2	1.00	33.3	ug/L	D
Nickel, Dissolved	7440-02-0	2	1.00	37.6	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-300\_3C.d14**  
**18D0388-11 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 6010C

Sampled: 04/17/2018 14:00

Instrument: ICP2

Analyzed: 03-May-2018 14:31

Sample Preparation: Preparation Method: WMN (No Prep)  
Preparation Batch: BGD0695  
Prepared: 02-May-2018

Sample Size: 25 mL  
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Aluminum, Dissolved	7429-90-5	1	0.0085	0.0500	<b>0.0249</b>	mg/L	J
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	<b>0.0206</b>	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	<b>0.0128</b>	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	<b>226</b>	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	<b>0.0034</b>	mg/L	J
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	<b>3.05</b>	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	<b>0.0083</b>	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	<b>5.54</b>	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	<b>25.5</b>	mg/L	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3C.d14**  
**18D0388-11 (Water)**

**Wet Chemistry**

Method: EPA 300.0

Sampled: 04/17/2018 14:00

Instrument: DX2100

Analyzed: 01-May-2018 19:37

Sample Preparation:

Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0704  
Prepared: 27-Apr-2018

Sample Size: 5 mL  
Final Volume: 5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	5.00	<b>14.2</b>	mg/L	D

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	5.00	<b>111</b>	mg/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3C.d14**  
**18D0388-11 (Water)**

**Wet Chemistry**

Method: EPA 9060A

Sampled: 04/17/2018 14:00

Instrument: TOC-LCSH

Analyzed: 28-Apr-2018 03:39

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0716 Sample Size: 20 mL  
Prepared: 27-Apr-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	0.50	<b>9.10</b>	mg/L	



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: [none] Project Manager: Delia Massey	Reported: 16-May-2018 12:52
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**17A18-300\_3C.d14**  
**18D0388-11 (Water)**

**Wet Chemistry**

Method: SM 2320 B-97 Sampled: 04/17/2018 14:00

Instrument: Accumet AR60 Analyzed: 30-Apr-2018 14:51

Sample Preparation: Preparation Method: No Prep Wet Chem  
Preparation Batch: BGD0762 Sample Size: 100 mL  
Prepared: 30-Apr-2018 Final Volume: 100 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Alkalinity, Total		1	1.00	1.00	<b>5.15</b>	mg/L CaCO3	



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-300\_3C.d14**  
**18D0388-11 (Water)**

\*\*\* **DEFAULT GENERAL METHOD** \*\*\*

Method: SM 2310B

Sampled: 04/17/2018 14:00

Instrument: ELSC

Analyzed: 10-May-2018 13:30

**Analysis by: ESC Lab Sciences**

Sample Preparation:

Preparation Method: \*\*\* DEFAULT PREP \*\*\*

Preparation Batch: B051018

Prepared: 10-May-2018

Final Volume:

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Acidity		1	10000	ND	ug/L	U



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**17A18-000\_GW.d14**  
**18D0388-12 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 16:01

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Cadmium, Dissolved	7440-43-9	2	0.200	<b>0.700</b>	ug/L	D
Copper, Dissolved	7440-50-8	2	1.00	<b>9.80</b>	ug/L	D
Zinc, Dissolved	7440-66-6	2	8.00	<b>81.1</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

**Reported:**  
16-May-2018 12:52

**17A18-000\_GW.d14**  
**18D0388-12RE1 (Water)**

**Metals and Metallic Compounds (dissolved)**

Method: EPA 200.8 UCT-KED

Sampled: 04/17/2018 14:00

Instrument: ICPMS2

Analyzed: 02-May-2018 16:37

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix  
Preparation Batch: BGD0639 Sample Size: 25 mL  
Prepared: 01-May-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nickel, Dissolved	7440-02-0	50	25.0	<b>6300</b>	ug/L	D



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0639 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix**

Instrument: ICPMS2 Analyst: MCB

QC Sample/Analyte	Isotope	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0639-BLK1)</b>											
						Prepared: 01-May-2018 Analyzed: 02-May-2018 13:13					
Cadmium, Dissolved	111	ND	0.100	ug/L							U
Cadmium, Dissolved	114	ND	0.100	ug/L							U
Copper, Dissolved	63	ND	0.500	ug/L							U
Copper, Dissolved	65	ND	0.500	ug/L							U
Nickel, Dissolved	60	ND	0.500	ug/L							U
Nickel, Dissolved	62	ND	0.500	ug/L							U
Zinc, Dissolved	66	ND	4.00	ug/L							U
Zinc, Dissolved	67	ND	4.00	ug/L							U

<b>LCS (BGD0639-BS1)</b>											
						Prepared: 01-May-2018 Analyzed: 02-May-2018 15:00					
Cadmium, Dissolved	111	24.6	0.100	ug/L	25.0		98.6	80-120			
Cadmium, Dissolved	114	24.5	0.100	ug/L	25.0		98.2	80-120			
Copper, Dissolved	63	28.6	0.500	ug/L	25.0		114	80-120			
Copper, Dissolved	65	29.0	0.500	ug/L	25.0		116	80-120			
Nickel, Dissolved	60	28.3	0.500	ug/L	25.0		113	80-120			
Nickel, Dissolved	62	27.2	0.500	ug/L	25.0		109	80-120			
Zinc, Dissolved	66	88.8	4.00	ug/L	80.0		111	80-120			
Zinc, Dissolved	67	83.3	4.00	ug/L	80.0		104	80-120			



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**Metals and Metallic Compounds (dissolved) - Quality Control**

**Batch BGD0695 - WMN (No Prep)**

Instrument: ICP2 Analyst: TCH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0695-BLK1)</b>						Prepared: 02-May-2018 Analyzed: 03-May-2018 14:44					
Aluminum, Dissolved	0.0113	0.0085	0.0500	mg/L							J
Arsenic, Dissolved	ND	0.0047	0.0500	mg/L							U
Barium, Dissolved	ND	0.0007	0.0030	mg/L							U
Calcium, Dissolved	ND	0.0051	0.0500	mg/L							U
Iron, Dissolved	ND	0.0013	0.0500	mg/L							U
Magnesium, Dissolved	ND	0.0160	0.0500	mg/L							U
Manganese, Dissolved	ND	0.0003	0.0010	mg/L							U
Potassium, Dissolved	ND	0.0520	0.500	mg/L							U
Sodium, Dissolved	0.101	0.0114	0.500	mg/L							J

<b>LCS (BGD0695-BS1)</b>						Prepared: 02-May-2018 Analyzed: 03-May-2018 15:14					
Aluminum, Dissolved	2.05	0.0085	0.0500	mg/L	2.00		103	80-120			
Arsenic, Dissolved	2.25	0.0047	0.0500	mg/L	2.00		112	80-120			
Barium, Dissolved	2.18	0.0007	0.0030	mg/L	2.00		109	80-120			
Calcium, Dissolved	10.5	0.0051	0.0500	mg/L	10.0		105	80-120			
Iron, Dissolved	2.10	0.0013	0.0500	mg/L	2.00		105	80-120			
Magnesium, Dissolved	10.6	0.0160	0.0500	mg/L	10.0		106	80-120			
Manganese, Dissolved	0.507	0.0003	0.0010	mg/L	0.500		101	80-120			
Potassium, Dissolved	10.3	0.0520	0.500	mg/L	10.0		103	80-120			
Sodium, Dissolved	10.4	0.0114	0.500	mg/L	10.0		104	80-120			



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

Wet Chemistry - Quality Control

Batch BGD0704 - No Prep Wet Chem

Instrument: DX2100 Analyst: KK

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0704-BLK1)</b>						Prepared: 27-Apr-2018 Analyzed: 01-May-2018 13:54					
Chloride	ND	0.100	0.100	mg/L							U
Sulfate	ND	0.100	0.100	mg/L							U
<b>LCS (BGD0704-BS1)</b>						Prepared: 27-Apr-2018 Analyzed: 01-May-2018 14:13					
Chloride	1.45	0.100	0.100	mg/L	1.50		96.9	90-110			
Sulfate	1.38	0.100	0.100	mg/L	1.50		91.7	90-110			



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

Wet Chemistry - Quality Control

Batch BGD0716 - No Prep Wet Chem

Instrument: TOC-LCSH Analyst: AGW

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0716-BLK1)</b>						Prepared: 27-Apr-2018 Analyzed: 27-Apr-2018 20:24					
Total Organic Carbon	ND	0.50	0.50	mg/L							U
<b>LCS (BGD0716-BS1)</b>						Prepared: 27-Apr-2018 Analyzed: 27-Apr-2018 20:43					
Total Organic Carbon	21.08	0.50	0.50	mg/L	20.00		105	90-110			
<b>LCS (BGD0716-BS2)</b>						Prepared: 27-Apr-2018 Analyzed: 27-Apr-2018 21:02					
Total Organic Carbon	21.41	0.50	0.50	mg/L	20.00		107	90-110			



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

**Wet Chemistry - Quality Control**

**Batch BGD0762 - No Prep Wet Chem**

Instrument: Accumet AR60 Analyst: U

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
<b>Blank (BGD0762-BLK1)</b>						Prepared: 30-Apr-2018 Analyzed: 30-Apr-2018 14:51					
Alkalinity, Total	ND	1.00	1.00	mg/L CaCO3							U
<b>Reference (BGD0762-SRM1)</b>						Prepared: 30-Apr-2018 Analyzed: 30-Apr-2018 14:51					
Alkalinity, Total	104	1.00	1.00	mg/L CaCO3	108		96.5	90.37-108.33			



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Project: Art Brass  
Project Number: [none]  
Project Manager: Delia Massey

Reported:  
16-May-2018 12:52

### Certified Analyses included in this Report

Analyte	Certifications
<b>EPA 200.8 UCT-KED in Water</b>	
Cadmium-111	NELAP,WADOE,WA-DW,DoD-ELAP
Cadmium-114	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-63	NELAP,WADOE,WA-DW,DoD-ELAP
Copper-65	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-60	NELAP,WADOE,WA-DW,DoD-ELAP
Nickel-62	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-66	NELAP,WADOE,WA-DW,DoD-ELAP
Zinc-67	NELAP,WADOE,WA-DW,DoD-ELAP
<b>EPA 300.0 in Water</b>	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
<b>EPA 6010C in Water</b>	
Aluminum	WADOE,NELAP
Arsenic	WADOE,NELAP
Barium	WADOE,NELAP
Calcium	WADOE,NELAP
Iron	WADOE,NELAP
Potassium	WADOE,NELAP
Magnesium	WADOE,NELAP
Manganese	WADOE,NELAP
Sodium	WADOE,NELAP
<b>EPA 9060A in Water</b>	
Total Organic Carbon	DoD-ELAP,WADOE,NELAP
<b>SM 2320 B-97 in Water</b>	
Alkalinity, Total	DoD-ELAP,WADOE,WA-DW,NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	UST-033	05/11/2018
CALAP	California Department of Public Health CAELAP	2748	06/30/2018
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/07/2019
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-011	05/12/2019
WADOE	WA Dept of Ecology	C558	06/30/2018
WA-DW	Ecology - Drinking Water	C558	06/30/2018



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: [none]

Project Manager: Delia Massey

Reported:

16-May-2018 12:52

### Notes and Definitions

- \* Flagged value is not within established control limits.
- D The reported value is from a dilution
- J Estimated concentration value detected below the reporting limit.
- U This analyte is not detected above the applicable reporting or detection limit.
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.

May 11, 2018

## Analytical Resources - Tukwila, WA

Sample Delivery Group: L990515  
Samples Received: 05/02/2018  
Project Number: 18D0388  
Description: Art Brass

Report To: Amanda Volgardsen  
4611 S. 134th PI  
Tukwila, WA 98168

Entire Report Reviewed By:



Brian Ford  
Technical Service Representative

Results relate only to the items tested or calibrated and are reported as rounded values. This test report shall not be reproduced, except in full, without written approval of the laboratory. Where applicable, sampling conducted by ESC is performed per guidance provided in laboratory standard operating procedures: 060302, 060303, and 060304.



<b>Cp: Cover Page</b>	<b>1</b>	<b><sup>1</sup>Cp</b>
<b>Tc: Table of Contents</b>	<b>2</b>	<b><sup>2</sup>Tc</b>
<b>Ss: Sample Summary</b>	<b>3</b>	<b><sup>3</sup>Ss</b>
<b>Cn: Case Narrative</b>	<b>5</b>	<b><sup>4</sup>Cn</b>
<b>Sr: Sample Results</b>	<b>6</b>	<b><sup>5</sup>Sr</b>
18D0388-01 L990515-01	<b>6</b>	<b><sup>6</sup>Qc</b>
18D0388-03 L990515-02	<b>7</b>	<b><sup>7</sup>Gl</b>
18D0388-04 L990515-03	<b>8</b>	<b><sup>8</sup>Al</b>
18D0388-05 L990515-04	<b>9</b>	<b><sup>9</sup>Sc</b>
18D0388-06 L990515-05	<b>10</b>	
18D0388-07 L990515-06	<b>11</b>	
18D0388-08 L990515-07	<b>12</b>	
18D0388-09 L990515-08	<b>13</b>	
18D0388-10 L990515-09	<b>14</b>	
18D0388-11 L990515-10	<b>15</b>	
<b>Qc: Quality Control Summary</b>	<b>16</b>	
Wet Chemistry by Method 2310 B-2011	<b>16</b>	
<b>Gl: Glossary of Terms</b>	<b>17</b>	
<b>Al: Accreditations &amp; Locations</b>	<b>18</b>	
<b>Sc: Sample Chain of Custody</b>	<b>19</b>	

# SAMPLE SUMMARY



## 18D0388-01 L990515-01 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45



## 18D0388-03 L990515-02 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45



## 18D0388-04 L990515-03 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45



## 18D0388-05 L990515-04 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45



## 18D0388-06 L990515-05 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45

## 18D0388-07 L990515-06 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45

## 18D0388-08 L990515-07 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45

## 18D0388-09 L990515-08 GW

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

Collected by \_\_\_\_\_ Collected date/time 04/17/18 14:00 Received date/time 05/02/18 08:45

# SAMPLE SUMMARY



18D0388-10 L990515-09 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

<sup>1</sup>Cp

<sup>2</sup>Tc

<sup>3</sup>Ss

18D0388-11 L990515-10 GW

Collected by  
Collected date/time  
Received date/time

Method	Batch	Dilution	Preparation date/time	Analysis date/time	Analyst
Wet Chemistry by Method 2310 B-2011	WG1106405	1	05/10/18 13:30	05/10/18 13:30	TH

<sup>4</sup>Cn

<sup>5</sup>Sr

<sup>6</sup>Qc

<sup>7</sup>Gl

<sup>8</sup>Al

<sup>9</sup>Sc



All sample aliquots were received at the correct temperature, in the proper containers, with the appropriate preservatives, and within method specified holding times, unless qualified or notated within the report. Where applicable, all MDL (LOD) and RDL (LOQ) values reported for environmental samples have been corrected for the dilution factor used in the analysis. All radiochemical sample results for solids are reported on a dry weight basis with the exception of tritium, carbon-14 and radon, unless wet weight was requested by the client. All Method and Batch Quality Control are within established criteria except where addressed in this case narrative, a non-conformance form or properly qualified within the sample results. By my digital signature below, I affirm to the best of my knowledge, all problems/anomalies observed by the laboratory as having the potential to affect the quality of the data have been identified by the laboratory, and no information or data have been knowingly withheld that would affect the quality of the data.

Brian Ford  
Technical Service Representative

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-01 WG1106405: Endpoint pH 8.3

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-02 WG1106405: Endpoint pH 8.3

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-03 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-04 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-05 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-06 WG1106405: Endpoint pH 8.3

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Al
- 9 Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-07 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-08 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-09 WG1106405: Endpoint pH 8.3

- <sup>1</sup> Cp
- <sup>2</sup> Tc
- <sup>3</sup> Ss
- <sup>4</sup> Cn
- <sup>5</sup> Sr
- <sup>6</sup> Qc
- <sup>7</sup> Gl
- <sup>8</sup> Al
- <sup>9</sup> Sc



Wet Chemistry by Method 2310 B-2011

Analyte	Result	Qualifier	MDL	RDL	Dilution	Analysis date / time	Batch
Acidity	U	<u>T8</u>	3630	10000	1	05/10/2018 13:30	<a href="#">WG1106405</a>

Sample Narrative:

L990515-10 WG1106405: Endpoint pH 8.3

<sup>1</sup> Cp

<sup>2</sup> Tc

<sup>3</sup> Ss

<sup>4</sup> Cn

<sup>5</sup> Sr

<sup>6</sup> Qc

<sup>7</sup> Gl

<sup>8</sup> Al

<sup>9</sup> Sc



Method Blank (MB)

(MB) R3308675-1 05/10/18 13:30

Analyte	MB Result	MB Qualifier	MB MDL	MB RDL
Acidity	U		3630	10000

Sample Narrative:

BLANK: Endpoint pH 8.3

L990515-01 Original Sample (OS) • Duplicate (DUP)

(OS) L990515-01 05/10/18 13:30 • (DUP) R3308675-4 05/10/18 13:30

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	U	ND	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

L991334-04 Original Sample (OS) • Duplicate (DUP)

(OS) L991334-04 05/10/18 13:30 • (DUP) R3308675-5 05/10/18 13:30

Analyte	Original Result	DUP Result	Dilution	DUP RPD	DUP Qualifier	DUP RPD Limits
Acidity	10000	10000	1	0.000		20

Sample Narrative:

OS: Endpoint pH 8.3  
DUP: Endpoint pH 8.3

Laboratory Control Sample (LCS) • Laboratory Control Sample Duplicate (LCSD)

(LCS) R3308675-2 05/10/18 13:30 • (LCSD) R3308675-3 05/10/18 13:30

Analyte	Spike Amount	LCS Result	LCSD Result	LCS Rec.	LCSD Rec.	Rec. Limits	LCS Qualifier	LCSD Qualifier	RPD	RPD Limits
Acidity	20000	20000	20000	100	100	85.0-115			0.000	20

Sample Narrative:

LCS: Endpoint pH 8.3  
LCSD: Endpoint pH 8.3





Guide to Reading and Understanding Your Laboratory Report

The information below is designed to better explain the various terms used in your report of analytical results from the Laboratory. This is not intended as a comprehensive explanation, and if you have additional questions please contact your project representative.

Abbreviations and Definitions

MDL	Method Detection Limit.
ND	Not detected at the Reporting Limit (or MDL where applicable).
RDL	Reported Detection Limit.
Rec.	Recovery.
RPD	Relative Percent Difference.
SDG	Sample Delivery Group.
U	Not detected at the Reporting Limit (or MDL where applicable).
Analyte	The name of the particular compound or analysis performed. Some Analyses and Methods will have multiple analytes reported.
Dilution	If the sample matrix contains an interfering material, the sample preparation volume or weight values differ from the standard, or if concentrations of analytes in the sample are higher than the highest limit of concentration that the laboratory can accurately report, the sample may be diluted for analysis. If a value different than 1 is used in this field, the result reported has already been corrected for this factor.
Limits	These are the target % recovery ranges or % difference value that the laboratory has historically determined as normal for the method and analyte being reported. Successful QC Sample analysis will target all analytes recovered or duplicated within these ranges.
Original Sample	The non-spiked sample in the prep batch used to determine the Relative Percent Difference (RPD) from a quality control sample. The Original Sample may not be included within the reported SDG.
Qualifier	This column provides a letter and/or number designation that corresponds to additional information concerning the result reported. If a Qualifier is present, a definition per Qualifier is provided within the Glossary and Definitions page and potentially a discussion of possible implications of the Qualifier in the Case Narrative if applicable.
Result	The actual analytical final result (corrected for any sample specific characteristics) reported for your sample. If there was no measurable result returned for a specific analyte, the result in this column may state "ND" (Not Detected) or "BDL" (Below Detectable Levels). The information in the results column should always be accompanied by either an MDL (Method Detection Limit) or RDL (Reporting Detection Limit) that defines the lowest value that the laboratory could detect or report for this analyte.
Case Narrative (Cn)	A brief discussion about the included sample results, including a discussion of any non-conformances to protocol observed either at sample receipt by the laboratory from the field or during the analytical process. If present, there will be a section in the Case Narrative to discuss the meaning of any data qualifiers used in the report.
Quality Control Summary (Qc)	This section of the report includes the results of the laboratory quality control analyses required by procedure or analytical methods to assist in evaluating the validity of the results reported for your samples. These analyses are not being performed on your samples typically, but on laboratory generated material.
Sample Chain of Custody (Sc)	This is the document created in the field when your samples were initially collected. This is used to verify the time and date of collection, the person collecting the samples, and the analyses that the laboratory is requested to perform. This chain of custody also documents all persons (excluding commercial shippers) that have had control or possession of the samples from the time of collection until delivery to the laboratory for analysis.
Sample Results (Sr)	This section of your report will provide the results of all testing performed on your samples. These results are provided by sample ID and are separated by the analyses performed on each sample. The header line of each analysis section for each sample will provide the name and method number for the analysis reported.
Sample Summary (Ss)	This section of the Analytical Report defines the specific analyses performed for each sample ID, including the dates and times of preparation and/or analysis.

- 1 Cp
- 2 Tc
- 3 Ss
- 4 Cn
- 5 Sr
- 6 Qc
- 7 Gl
- 8 Ai
- 9 Sc

Qualifier	Description
T8	Sample(s) received past/too close to holding time expiration.



ESC Lab Sciences is the only environmental laboratory accredited/certified to support your work nationwide from one location. One phone call, one point of contact, one laboratory. No other lab is as accessible or prepared to handle your needs throughout the country. Our capacity and capability from our single location laboratory is comparable to the collective totals of the network laboratories in our industry. The most significant benefit to our one location design is the design of our laboratory campus. The model is conducive to accelerated productivity, decreasing turn-around time, and preventing cross contamination, thus protecting sample integrity. Our focus on premium quality and prompt service allows us to be YOUR LAB OF CHOICE.

\* Not all certifications held by the laboratory are applicable to the results reported in the attached report.  
 \* Accreditation is only applicable to the test methods specified on each scope of accreditation held by ESC Lab Sciences.

## State Accreditations

Alabama	40660	Nebraska	NE-OS-15-05
Alaska	17-026	Nevada	TN-03-2002-34
Arizona	AZ0612	New Hampshire	2975
Arkansas	88-0469	New Jersey-NELAP	TN002
California	2932	New Mexico <sup>1</sup>	n/a
Colorado	TN00003	New York	11742
Connecticut	PH-0197	North Carolina	Env375
Florida	E87487	North Carolina <sup>1</sup>	DW21704
Georgia	NELAP	North Carolina <sup>3</sup>	41
Georgia <sup>1</sup>	923	North Dakota	R-140
Idaho	TN00003	Ohio-VAP	CL0069
Illinois	200008	Oklahoma	9915
Indiana	C-TN-01	Oregon	TN200002
Iowa	364	Pennsylvania	68-02979
Kansas	E-10277	Rhode Island	LA000356
Kentucky <sup>1,6</sup>	90010	South Carolina	84004
Kentucky <sup>2</sup>	16	South Dakota	n/a
Louisiana	AI30792	Tennessee <sup>1,4</sup>	2006
Louisiana <sup>1</sup>	LA180010	Texas	T 104704245-17-14
Maine	TN0002	Texas <sup>5</sup>	LAB0152
Maryland	324	Utah	TN00003
Massachusetts	M-TN003	Vermont	VT2006
Michigan	9958	Virginia	460132
Minnesota	047-999-395	Washington	C847
Mississippi	TN00003	West Virginia	233
Missouri	340	Wisconsin	9980939910
Montana	CERT0086	Wyoming	A2LA

1 Cp

2 Tc

3 Ss

4 Cn

5 Sr

6 Qc

7 Gl

8 Al

9 Sc

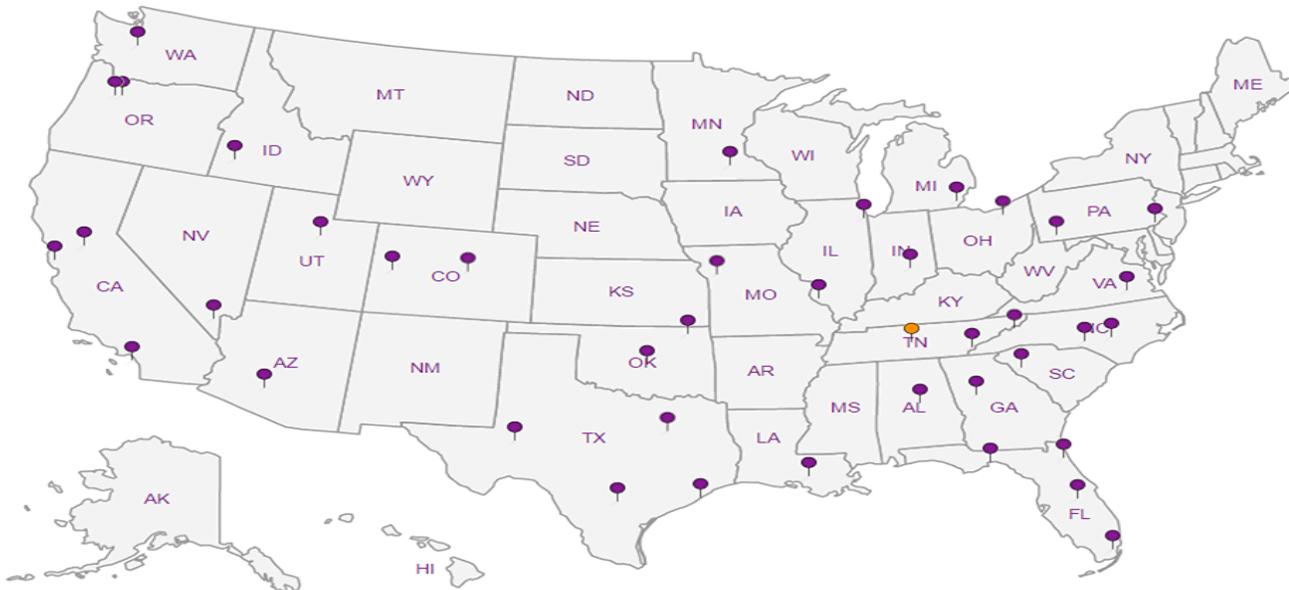
## Third Party Federal Accreditations

A2LA – ISO 17025	1461.01	AIHA-LAP,LLC EMLAP	100789
A2LA – ISO 17025 <sup>5</sup>	1461.02	DOD	1461.01
Canada	1461.01	USDA	P330-15-00234
EPA-Crypto	TN00003		

<sup>1</sup> Drinking Water <sup>2</sup> Underground Storage Tanks <sup>3</sup> Aquatic Toxicity <sup>4</sup> Chemical/Microbiological <sup>5</sup> Mold <sup>6</sup> Wastewater n/a Accreditation not applicable

## Our Locations

ESC Lab Sciences has sixty-four client support centers that provide sample pickup and/or the delivery of sampling supplies. If you would like assistance from one of our support offices, please contact our main office. ESC Lab Sciences performs all testing at our central laboratory.





**SUBCONTRACT ORDER**  
To: ESC Lab Sciences  
**ARI Work Order: 18D0388**

**SENDING LABORATORY:**

Analytical Resources, Inc.  
4611 S. 134th Place, Suite 100  
Tukwila, WA 98168  
Phone: (206) 695-6200  
Fax: (206) 695-6201  
Project Manager: Amanda Volgardsen  
E-Mail: amandav@arilabs.com

**RECEIVING LABORATORY:**

ESC Lab Sciences  
12065 Lebanon Road  
Mt Juliet, TN 37122  
Phone: (615) 773-9739  
Fax:

PLEASE SEND DATA TO subdata@arilabs.com

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18D0388-01</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			L990515-01	All sample diluted 2.5x
<b>Sample ID: 18D0388-03</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			02	All sample diluted 3.1x
<b>Sample ID: 18D0388-04</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			03	All sample diluted 2x
<b>Sample ID: 18D0388-05</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			04	All sample diluted 2.4x

E146

Standard Report, EDD  
 All Samples field deleted, and  
 again deleted in the lab to  
 bring to volume

Released By: *[Signature]* Date: 5/1/18 Received By: *[Signature]* Date: 5/2/18

Col 57  
845 3.9 mm

Released By: \_\_\_\_\_ Date: \_\_\_\_\_ Received By: \_\_\_\_\_ Date: \_\_\_\_\_



SUBCONTRACT ORDER  
To: ESC Lab Sciences  
ARI Work Order: 18D0388

Analysis	Due	Expires	Sub Laboratory ID	Comments
<b>Sample ID: 18D0388-06</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			L990515-06	Alk sample diluted 2.5x
<b>Sample ID: 18D0388-07</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			06	Alk sample diluted 2.1x
<b>Sample ID: 18D0388-08</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			07	Alk sample diluted 2x
<b>Sample ID: 18D0388-09</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			08	Alk sample diluted 2x
<b>Sample ID: 18D0388-10</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			09	Alk sample diluted 2x
<b>Sample ID: 18D0388-11</b> <b>Sampled: 04/17/18 14:00 Matrix: Water</b> Acidity, SM2310 Full Titration Curve (Subc) 05/07/18 05/01/18 14:00 Containers Supplied: <input type="text"/>			10	Alk sample diluted 2x




 5/1/18
 
 5/2/18
 

Released By \_\_\_\_\_ Date \_\_\_\_\_ Received By \_\_\_\_\_ Date \_\_\_\_\_



L990615

### Sample ID Cross Reference Report

**Client:** Aspect Consulting, LLC.

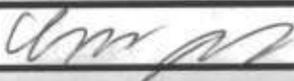
**Work Order:** 18D0388

**Project:** Art Brass

**Project Number:** [none]

<u>LabNumber</u>	<u>SampleName</u>	<u>ClientMatrix</u>	<u>Sampled</u>	<u>SampleReceived</u>
18D0388-01	17A18-100_1A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-02	17A18-150_1A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-03	17A18-100_1B.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-04	17A18-100_1C.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-05	17A18-200_2A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-06	17A18-250_2A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-07	17A18-200_2B.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-08	17A18-200_2C.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-09	17A18-300_3A.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-10	17A18-300_3B.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-11	17A18-300_3C.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51
18D0388-12	17A18-000_GW.d14	Water	17-Apr-2018 14:00	21-Apr-2018 13:51

## ESC LAB SCIENCES Cooler Receipt Form

Client:	ANARESTWA	SDG#	L990515	
Cooler Received/Opened On: 5/2 /18	Temperature:		3.5	
Received By: Christian Kacar				
Signature: 				
Receipt Check List	NP	Yes	No	
COC Seal Present / Intact?		/		
COC Signed / Accurate?		/		
Bottles arrive intact?		/		
Correct bottles used?		/		
Sufficient volume sent?		/		
If Applicable				
VOA Zero headspace?				
Preservation Correct / Checked?				





**ALS Environmental**  
 8620 Holly Drive, Suite 100  
 Everett, WA 98208  
 Phone (425) 356-2600  
 Fax (425) 356-2626  
 http://www.alsglobal.com

# Chain Of Custody/ Laboratory Analysis Request

ALS Job# \_\_\_\_\_ (Laboratory Use Only)

Date 1/30/18 Page 2 Of 3

PROJECT ID: <u>Art Brass</u> REPORT TO COMPANY: <u>Aspect</u> PROJECT MANAGER: <u>Adam Griffin</u> ADDRESS: <u>See pg 1</u> PHONE: _____ P.O. #: _____ E-MAIL: _____ INVOICE TO COMPANY: _____ ATTENTION: _____ ADDRESS: _____					ANALYSIS REQUESTED												OTHER (Specify)															
					NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX by EPA 8021 <input type="checkbox"/>	BTEX by EPA 8260 <input type="checkbox"/>	MTBE by EPA 8021 <input type="checkbox"/>	MTBE by EPA 8260 <input type="checkbox"/>	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 <input type="checkbox"/>	Pesticides by EPA 8081 <input type="checkbox"/>	Metals-MTCA-5 <input type="checkbox"/>	RCRA-8 <input type="checkbox"/>	Pri Pol <input type="checkbox"/>	TAL <input type="checkbox"/>	Metals Other (Specify)	TCLP-Metals <input type="checkbox"/>	VOA <input type="checkbox"/>	Semi-Vol <input type="checkbox"/>	Pest <input type="checkbox"/>	Herbs <input type="checkbox"/>	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?	
					1. <u>IW-1-20-20.5</u>	<u>1/29/18</u>	<u>1110</u>	<u>Soil</u>																							<u>1</u>	
					2. <u>IW-1-19.5-20</u>		<u>1110</u>																									
					3. <u>IW-2-10-10.5</u>		<u>1355</u>																									
					4. <u>IW-2-11-11.5</u>		<u>1315</u>																									
					5. <u>IW-2-12.5-13</u>		<u>1420</u>																									
					6. <u>IW-2-13.5-14</u>		<u>1435</u>																									
					7. <u>IW-2-14-14.5</u>		<u>1435</u>																									
					8. <u>IW-2-15-15.5</u>		<u>1445</u>																									
9. <u>IW-2-15.5-16</u>		<u>1445</u>																														
10. <u>IW-2-16-16.5</u>		<u>1500</u>																														

**SPECIAL INSTRUCTIONS**

**SIGNATURES (Name, Company, Date, Time):**

1. Relinquished By: Adam Griffin, ASPECT, 01/30/18, 1038

Received By: Arthur PEA, 30 Jan 18, 1040

2. Relinquished By: \_\_\_\_\_

Received By: \_\_\_\_\_

**TURNAROUND REQUESTED in Business Days\***

Organic, Metals & Inorganic Analysis      OTHER: \_\_\_\_\_

10     5     3     2     1     SAME DAY  
Standard

Fuels & Hydrocarbon Analysis

5     3     1     SAME DAY  
Standard

Specify: \_\_\_\_\_

\*Turnaround request less than standard may incur Rush Charges



**ALS Environmental**  
 8620 Holly Drive, Suite 100  
 Everett, WA 98208  
 Phone (425) 356-2600  
 Fax (425) 356-2626  
 http://www.alsglobal.com

# Chain Of Custody/ Laboratory Analysis Request

ALS Job# \_\_\_\_\_ (Laboratory Use Only)

Date 1/30/18 Page 3 Of 3

PROJECT ID: <u>Art Brass</u>					ANALYSIS REQUESTED														OTHER (Specify)																				
REPORT TO COMPANY: <u>ASPECT</u>					NWTPH-HCID	NWTPH-DX	NWTPH-GX	BTEX by EPA 8021 <input type="checkbox"/> BTEX by EPA 8260 <input type="checkbox"/>	MTBE by EPA 8021 <input type="checkbox"/> MTBE by EPA 8260 <input type="checkbox"/>	Halogenated Volatiles by EPA 8260	Volatile Organic Compounds by EPA 8260	EDB / EDC by EPA 8260 SIM (water)	EDB / EDC by EPA 8260 (soil)	Semivolatile Organic Compounds by EPA 8270	Polycyclic Aromatic Hydrocarbons (PAH) by EPA 8270 SIM	PCB by EPA 8082 <input type="checkbox"/> Pesticides by EPA 8081 <input type="checkbox"/>	Metals-MTCA-5 <input type="checkbox"/> RCRA-8 <input type="checkbox"/> Pri Pol <input type="checkbox"/> TAL <input type="checkbox"/>	Metals Other (Specify)	TCLP-Metals <input type="checkbox"/> VOA <input type="checkbox"/> Semi-Vol <input type="checkbox"/> Pest <input type="checkbox"/> Herbs <input type="checkbox"/>	NUMBER OF CONTAINERS	RECEIVED IN GOOD CONDITION?																		
PROJECT MANAGER: <u>Andrew Griffin</u>																																							
ADDRESS: <u>1000 1st St</u>																																							
PHONE: _____ FAX: _____																																							
P.O. #: _____ E-MAIL: _____																																							
INVOICE TO COMPANY: _____																																							
ATTENTION: _____																																							
ADDRESS: _____																																							
SAMPLE I.D.	DATE	TIME	TYPE	LAB#																																			
1. <u>IN-2-17-17 S</u>	<u>1/29/18</u>	<u>1500</u>	<u>Soil</u>																																				
2. <u>IN-2-175-18</u>		<u>1515</u>	<u> </u>																																				
3. <u>IN-2-185-19</u>		<u>1515</u>	<u> </u>																																				
4. <u>IN-2-195-20</u>		<u>1530</u>	<u> </u>																																				
5.																																							
6.																																							
7.																																							
8.																																							
9.																																							
10.																																							

**SPECIAL INSTRUCTIONS**

SIGNATURES (Name, Company, Date, Time):

1. Relinquished By: Luella Kahan - ASPECT, 1/30/18, 10:39  
 Received By: Johnnie Archer - VEA, 3/20/18 1:40

2. Relinquished By: \_\_\_\_\_  
 Received By: \_\_\_\_\_

TURNAROUND REQUESTED in Business Days\*

Organic, Metals & Inorganic Analysis

OTHER:

10 Standard   
  5   
  3   
  2   
  1   
  SAME DAY

Specify: \_\_\_\_\_

Fuels & Hydrocarbon Analysis

5 Standard   
  3   
  1   
  SAME DAY

\_\_\_\_\_  
 \_\_\_\_\_

\*Turnaround request less than standard may incur Rush Charges

# DATA VALIDATION REPORT

Art Brass Plating

Pilot Testing

January 2018-February 2018

SDG 18B0022, L968458

*Prepared by:*

Aspect Consulting, LLC

401 Second Ave South, Suite 201

Seattle, WA 98104

Project No. 050067 • February 2018

S:\Art Brass Plating 050067\Lab Data\2018\_01\_Pilot Test\Metals\DV Report -PT metals.docx

# 1 Introduction

This report summarizes the findings of the United States Environmental Protection Agency (USEPA) Stage 2A data validation performed on analytical data for the groundwater samples collected on January 29 – February 1, 2018 for Art Brass Pilot Test sampling. This data quality review is divided into sections by sample delivery group (SDG). A complete list of samples and analyses for each SDG is provided in the Sample Index at the beginning of each section.

This data quality review was performed by a validator in a different organizational unit of Aspect Consulting than those who make use of the Art Brass Plating data for site decisions. The validator works independently, with no interference from those who collect and use the Art Brass Plating site data.

Samples were analyzed for assorted analytes by Analytical Resources, Inc. (ARI), and Acidity by ESC Lab Sciences (ESC). The analytical methods are summarized below:

<b>Analysis</b>	<b>Method</b>	<b>Laboratory</b>
Acidity	SM 2310B	ESC
Alkalinity	SM 2320B	ARI
Anions	EPA 300.0	ARI
Dissolved Gasses	RSK-175	ARI
Metals	EPA 200.8/SW 6010C	ARI
VOC	SW 8260C	ARI
TOC	SW 9060	ARI

The validation followed the procedures documented in the analytical methods, the Quality Assurance Project Plan (QAPP; in Appendix A to Aspect, 2013), the *National Functional Guidelines for Organic Data Review* (USEPA, 2017), and *Contract Laboratory Program SOW* (USEPA, 2016). Data assigned a J qualifier (estimated) may be used for site evaluation purposes but the reasons for qualification should be taken into account when interpreting sample concentrations. Data marked as rejected (R) should not be used under any circumstances. Values without qualification meet all data measurement quality objectives and are suitable for use.

Data qualifier definitions and a summary table of the qualified data are included in the Qualified Data Summary at the end of this report. Data qualifiers have been incorporated into the project chemistry database to reflect the validation in this report.

## 2 Data Validation Findings for SDG 18B0022

Groundwater samples in this SDG, and the chemical analyses performed on them, are tabulated below. The sections below describe the results of the data quality review by analyte group (analysis).

### Sample Index

Sample ID	Sample Date	Type	Analyses				
			EPA200.8	EPA300.0	SM2320B	SW6010C	SW9060
IW-1-020118	2/1/2018	N	X	X	X	X	X
IW-2-020118	2/1/2018	N	X	X	X	X	X
IW-7-020118	2/1/2018	N	X				
IW-7-020118-D	2/1/2018	FD	X				
MW-1-013118	1/31/2018	N	X	X	X	X	X
MW-3-012918	1/29/2018	N	X	X	X	X	X
MW-3-30-013118	1/31/2018	N	X	X	X	X	X
MW-8-013118	1/31/2018	N	X	X	X	X	X
PSW-6-020118	2/1/2018	N	X	X	X	X	X
PSW-7-020118	2/1/2018	N		X	X	X	X
PSW-8-020118	2/1/2018	N	X	X	X	X	X

### 2.1 Receiving

---

Samples were received in good condition. No action or qualification was needed.

### 2.2 Anions (EPA 300.0)

---

#### 2.2.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

#### 2.2.2 Method Blanks/Detection Levels

Target analytes were not detected at or above the reporting levels in the method blank.

An MRL check standard was reported with the analysis, and met control criteria.

No further qualification or action was needed.

### **2.2.3 Laboratory Control Samples (LCS)**

All LCS %R were within the control limits. No qualification or action was needed.

### **2.2.4 Matrix Spike (MS)**

All MS %R were within control limits. No qualification or action was needed.

### **2.2.5 Lab Duplicate (DUP)**

All DUP RPDs were within control limits. No qualification or action was needed.

### **2.2.6 Overall Assessment**

Accuracy was acceptable based on the LCS and MS %Rs. Precision was acceptable based on the DUP RPD values. The data are acceptable for use as qualified.

## **2.3 Metals (EPA 200.8/SW 6010C)**

---

### **2.3.1 Holding Times**

Samples were analyzed within the requisite holding time limit.

No actions needed.

### **2.3.2 Method Blanks/Detection Levels**

Target analytes were not detected at or above the reporting levels in the method blank.

Results detected between the RL and MDL have been qualified as estimated (J).

No further qualification or action was needed.

### **2.3.3 Laboratory Control Samples (LCS)**

All LCS %R were within the control limits. No qualification or action was needed.

### **2.3.4 Matrix Spike/Matrix Spike Duplicate (MS/MSD)**

All MS/MSD %R and RPD were within control limits. No further action was needed.

### **2.3.5 Lab Duplicate (DUP)**

All DUP RPDs were within control limits. No qualification or action was needed.

### **2.3.6 Field Duplicate (FD)**

A field duplicate was collected of sample IW-7-020118. The RPD between the parent and duplicated were within control limits. No action needed.

### **2.3.7 Overall Assessment**

Accuracy was acceptable based on the LCS/LCSD and MS/MSD. Precision was acceptable based on the LCS/LCSD, MS/MSD, FD and DUP RPD values. The data are acceptable for use as qualified.

## **2.4 Alkalinity (SM 2023B)**

---

### **2.4.1 Holding Times**

Samples were analyzed within the requisite holding time limit.

No actions needed.

### **2.4.2 Method Blanks/Detection Levels**

Target analytes were not detected at or above the reporting levels in the method blank.

An MRL check standard was reported with the analysis, and met control criteria.

No further qualification or action was needed.

### **2.4.3 Certified Reference Material (RM)**

All RM %R were within the control limits. No qualification or action was needed.

### **2.4.4 Lab Duplicate (DUP)**

All DUP RPDs were within control limits. No qualification or action was needed.

### **2.4.5 Overall Assessment**

Accuracy was acceptable based on the RM and MRL. Precision was acceptable based on the DUP RPD values. The data are acceptable for use as qualified.

## **2.5 Total Organic Carbon (SW 9060)**

---

### ***2.5.1 Holding Times***

Samples were analyzed within the requisite holding time limit.

No actions needed.

### ***2.5.2 Method Blanks/Detection Levels***

Target analytes were not detected at or above the reporting levels in the method blank.

An MRL check standard was reported with the analysis, and met control criteria.

No further qualification or action was needed.

### ***2.5.3 Laboratory Control Samples (LCS)***

All LCS %R were within the control limits. No qualification or action was needed.

### ***2.5.4 Matrix Spike (MS)***

All MS %R were within control limits. No qualification or action was needed.

### ***2.5.5 Overall Assessment***

Accuracy was acceptable based on the LCS and MS. Precision was acceptable based on the DUP RPD values. The data are acceptable for use as qualified.

### 3 Data Validation Findings for SDG L968458

Groundwater samples in this SDG, and the chemical analyses performed on them, are tabulated below. The sections below describe the results of the data quality review by analyte group (analysis).

#### Sample Index

Sample ID	Sample Date	Type	Analysis
			SM2310B
IW-1-020118	2/1/2018	N	X
IW-2-020118	2/1/2018	N	X
MW-1-013118	1/31/2018	N	X
MW-3-012918	1/29/2018	N	X
MW-3-30-013118	1/31/2018	N	X
MW-8-013118	1/31/2018	N	X
PSW-6-020118	2/1/2018	N	X
PSW-7-020118	2/1/2018	N	X
PSW-8-020118	2/1/2018	N	X

#### 3.1 Receiving

---

Samples were subcontracted from ARI to ESC for analysis, and received in good condition.

No action or qualification was needed.

#### 3.2 Acidity (SM 2310B)

---

##### *3.2.1 Holding Times*

Samples were analyzed within the requisite holding time limit.

No actions needed.

##### *3.2.2 Method Blanks/Detection Levels*

Target analytes were not detected at or above the reporting levels in the method blank.

No further qualification or action was needed.

### ***3.2.3 Laboratory Control Samples/Laboratory Control Sample Duplicates (LCS/LCSD)***

All LCS and LCSD %R and RPD were within the control limits. No qualification or action was needed.

### ***3.2.4 Lab Duplicate (DUP)***

All DUP RPDs were within control limits. No qualification or action was needed.

### ***3.2.5 Overall Assessment***

Accuracy was acceptable based on the LCS/LCSD %Rs. Precision was acceptable based on the LCS/LCSD and DUP RPD values. The data are acceptable for use as qualified.

## 4 Qualified Data Summary

Qualified sample results are listed below. This list does not include non-detected values simply qualified U. This list also does not include results that were rejected in favor of a better ranged dilution.

### Qualified Sample Results

Sample	SDG	Analyte	Qualifier	Reason
IW-2-020118	10B0022	Arsenic	J	Result detected below RL
MW-3-012918	10B0022	Arsenic	J	Result detected below RL
MW-8-013118	10B0022	Aluminum	J	Result detected below RL
PSW-6-020118	10B0022	Arsenic	J	Result detected below RL
PSW-7-020118	10B0022	Arsenic	J	Result detected below RL

### Data Qualifier Definitions

Data Qualifier	Definition
J	The analyte was detected above the reported quantitation limit, and the reported concentration was an estimated value.
R	The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
U	The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.
UJ	The analyte was analyzed for, and the associated quantitation limit was an estimated value.

## 5 References

Aspect, 2013, Remedial Investigation Work Plan, Art Brass Plating, Seattle, Washington, September 25, 2008.

U.S. Environmental Protection Agency (USEPA), 2017 National Functional Guidelines for Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation (OSRTI), USEPA Publication No. 540-R-2017-002, January.

U.S. Environmental Protection Agency (USEPA), Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.4, October 2016.

# DATA VALIDATION REPORT

Art Brass Plating

Pilot Testing

February 2018

SDG 18B0133

*Prepared by:*

Aspect Consulting, LLC

401 Second Ave South, Suite 201

Seattle, WA 98104

Project No. 050067 • March 2018

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# 1 Introduction

This report summarizes the findings of the United States Environmental Protection Agency (USEPA) Stage 2A data validation performed on analytical data for the composite soil samples collected on February 8, 2018 for Art Brass Pilot Test sampling. This data quality review is divided into sections by sample delivery group (SDG). A complete list of samples and analyses for each SDG is provided in the Sample Index at the beginning of each section.

This data quality review was performed by a validator in a different organizational unit of Aspect Consulting than those who make use of the Art Brass Plating data for site decisions. The validator works independently, with no interference from those who collect and use the Art Brass Plating site data.

Samples were analyzed for assorted analytes by Analytical Resources, Inc. (ARI), and Sulfur by Hazen Research Inc. (Hazen). The analytical methods are summarized below:

<b>Analysis</b>	<b>Method</b>	<b>Laboratory</b>
Metals	SW 6010C	ARI
Solids	PSEP/SM 2540G	ARI
Sulfide	SM 4500 S2D	ARI
Sulfur	ASTM E1915	Hazen
Total Carbons	PLUMB81TC	ARI

The validation followed the procedures documented in the analytical methods, the Quality Assurance Project Plan (QAPP; in Appendix A to Aspect, 2013), the *National Functional Guidelines for Organic Data Review* (USEPA, 2017), and *Contract Laboratory Program SOW* (USEPA, 2016). Data assigned a J qualifier (estimated) may be used for site evaluation purposes but the reasons for qualification should be taken into account when interpreting sample concentrations. Data marked as rejected (R) should not be used under any circumstances. Values without qualification meet all data measurement quality objectives and are suitable for use.

Data qualifier definitions and a summary table of the qualified data are included in the Qualified Data Summary at the end of this report. Data qualifiers have been incorporated into the project chemistry database to reflect the validation in this report.

## 2 Data Validation Findings for SDG 18B0133

Soil composite samples in this SDG, and the chemical analyses performed on them, are tabulated below. The sections below describe the results of the data quality review by analyte group (analysis).

### Sample Index

Sample Index			Analyses					
Sample ID	Sample Date	Type	PLUMB81TC	PSEP-PS	SM 2540G	SM 4500S2D	SW 6010C	ASTM E1915
8F18_AB_1001	2/8/2018	N	X	X	X	X	X	X
8F18_AB_1002	2/8/2018	N	X	X	X	X	X	X

### 2.1 Receiving

---

Samples were composited by Anchor QEA before being sent to ARI for analysis. Samples were received in good condition. No action or qualification was needed.

### 2.2 Total Carbons (PLUMB81TC)

---

#### 2.2.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

#### 2.2.2 Method Blanks/Detection Levels

Target analytes were not detected at or above the reporting levels in the method blank.

No further qualification or action was needed.

#### 2.2.3 Certified Reference Materials (RM)

All RM %R were within the control limits. No qualification or action was needed.

#### 2.2.4 Matrix Spike (MS)

All MS %R were within control limits, with the exception of Total Organic Carbon (TOC), which was low. Associated TOC results have been qualified as estimated (J/UJ). No further qualification or action was needed.

### ***2.2.5 Lab Duplicate (DUP)***

All DUP RPDs were within control limits, with the exception of Total Organic Carbon (TOC), which exceeded the RPD control limit. TOC results have been qualified as estimated (J/UJ). No further qualification or action was needed.

### ***2.2.6 Reanalyses/Reextractions***

The lab reextracted and reanalyzed sample 8F18\_AB\_1001 due to matrix interference concerns. The initial extraction/analysis has been flagged as non-reportable/rejected (R), in preference of the reextraction results.

### ***2.2.7 Overall Assessment***

Accuracy was acceptable based on the RM and MS %Rs, except as noted above. Precision was acceptable based on the DUP RPD values, except as noted above. The data are acceptable for use as qualified.

## **2.3 Total Solids (PSEP-PS/SM2540G)**

---

### ***2.3.1 Holding Times***

Samples were analyzed within the requisite holding time limit.

No actions needed.

### ***2.3.2 Method Blanks/Detection Levels***

Target analytes were not detected at or above the reporting levels in the method blank.

No further qualification or action was needed.

### ***2.3.3 Lab Duplicate (DUP)***

All DUP RPDs were within control limits. No qualification or action was needed.

### ***2.3.4 Overall Assessment***

Precision was acceptable based on the DUP RPD values. The data are acceptable for use as qualified.

## **2.4 Sulfide (SM 4500S2D)**

---

### **2.4.1 Holding Times**

Samples were analyzed within the requisite holding time limit.

No actions needed.

### **2.4.2 Method Blanks/Detection Levels**

Target analytes were not detected at or above the reporting levels in the method blank.

No further qualification or action was needed.

### **2.4.3 Laboratory Control Samples (LCS)**

All LCS %R were within the control limits. No qualification or action was needed.

### **2.4.4 Matrix Spike (MS)**

All MS %R were below control limits. Results have been qualified as estimated (J/UJ).

No further action was needed.

### **2.4.5 Lab Duplicate (DUP)**

All DUP RPDs were within control limits. No qualification or action was needed.

### **2.4.6 Overall Assessment**

Accuracy was acceptable based on the LCS and MS, except as noted above. Precision was acceptable based on the DUP RPD values. The data are acceptable for use as qualified.

## **2.5 Metals (SW 6010C)**

---

### **2.5.1 Holding Times**

Samples were analyzed within the requisite holding time limit.

No actions needed.

### **2.5.2 Method Blanks/Detection Levels**

Target analytes were not detected at or above the reporting levels in the method blank.

Analytes detected between the RL and MDL have been qualified as estimated (J).

No further qualification or action was needed.

### ***2.5.3 Laboratory Control Samples (LCS)***

All LCS %R were within the control limits. No qualification or action was needed.

### ***2.5.4 Overall Assessment***

Accuracy was acceptable based on the LCS. The data are acceptable for use as qualified.

## **2.6 Sulfur (ASTM E1915)**

---

### ***2.6.1 Subcontract***

Hazen Research Inc was subcontracted by ARI to perform sulfur analysis on the samples. Samples were split by ARI and sent on to Hazen. Results and reports from Hazen did not include any QC results.

### ***2.6.2 Holding Times***

Based on report dates, samples were analyzed within the requisite holding time limit.

No actions needed.

### ***2.6.3 Overall Assessment***

Insufficient information received to perform level 2 data validation on this analysis.

### 3 Qualified Data Summary

Qualified sample results are listed below. This list does not include non-detected values simply qualified U. This list also does not include results that were rejected in favor of a better ranged dilution.

#### Qualified Sample Results

Sample	Analyte	Qualifier	Reason
8F18_AB_1001	Cadmium	J	Detected below RL
8F18_AB_1001	Sulfide	UJ	MS %R Low
8F18_AB_1001	Total Inorganic Carbon	R	Rejected in favor of reextraction
8F18_AB_1001	Total Organic Carbon	J	MS %R Low; Dup RPD high
8F18_AB_1002	Cadmium	J	Detected below RL
8F18_AB_1002	Sulfide	UJ	MS %R Low
8F18_AB_1002	Total Organic Carbon	J	MS %R Low; Dup RPD high

#### Data Qualifier Definitions

Data Qualifier	Definition
J	The analyte was detected above the reported quantitation limit, and the reported concentration was an estimated value.
R	The sample results are unusable due to the quality of the data generated because certain criteria were not met. The analyte may or may not be present in the sample.
U	The analyte was analyzed for, but was considered not detected at the reporting limit or reported value.
UJ	The analyte was analyzed for, and the associated quantitation limit was an estimated value.

## 4 References

Aspect, 2013, Remedial Investigation Work Plan, Art Brass Plating, Seattle, Washington, September 25, 2008.

U.S. Environmental Protection Agency (USEPA), 2017 National Functional Guidelines for Organic Methods Data Review, Office of Superfund Remediation and Technology Innovation (OSRTI), USEPA Publication No. 540-R-2017-002, January.

U.S. Environmental Protection Agency (USEPA), Contract Laboratory Program (CLP) Statement of Work (SOW) for Organic Superfund Methods, Multi-Media, Multi-Concentration, SOM02.4, October 2016.

## **APPENDIX D**

### **Sampling and Analysis Plan/Supplemental QAPP**

## **APPENDIX E**

### **Groundwater Sampling Logs**



Sample number

IW-1-020118

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: IW-1

Page: 1 of 1

Project Name: Art Brass Plating

Project Number: 050067

Date: 2/11/18

Starting Water Level (ft TOC): 5.14'

Sampled by: ACC

Casing Stickup (ft):

Measuring Point of Well: N-TOC

Total Depth (ft TOC): 21.56'

Screened Interval (ft. TOC):

Casing Diameter (inches): 4"

Filter Pack Interval (ft. TOC):

Casing Volume 16.42 (ft Water) x 0.65 (Lpfv)(gpf) = 10.67 (L)(gal)

Casing volumes: 3/4" = 0.02 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf

Sample Intake Depth (ft TOC):

3/4" = 0.09 Lpf 2" = 0.62 Lpf 4" = 2.46 Lpf 6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Criteria:	Typical 0.1-0.5 Lpm	Stable	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
0830	0.0	0.3	5.14							Start purge
0835	0.25		5.14	13.7	375.8	0.53	5.27	156.0	43	CLEAR
0840	0.50		5.14	13.7	373.7	0.44	5.30	169.3	50	
0845	0.75		5.14	13.7	374.3	0.35	5.27	170.8	46	
0850	1.00		5.14	13.8	372.6	0.33	5.25	175.5	47	
0855	1.25		5.14	13.8	376.2	0.34	5.26	177.4	45	
0900	1.50		5.14	13.9	377.1	0.30	5.25	179.7	37	

Total Gallons Purged: 2.00

Total Casing Volumes Removed: 0.2

Ending Water Level (ft TOC): 5.14'

Ending Total Depth (ft TOC): 21.56'

**SAMPLE INVENTORY**

Time	Volume (ml)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
0905	250	Amber	1	-	H <sub>2</sub> SO <sub>4</sub>	clear	32	TOC
0905	500	HDPE	3	Y	HNO <sub>3</sub>	↓	↓	Diss. Metals
0905	500	OS	3	-	-	↓	↓	Alk, Acidity, Cl/SO <sub>4</sub>

**METHODS**

Parameters measured with (instrument model & serial number): XE Pro Plus (Geotech), 2100P Turbidimeter

Purging Equipment: Peri. Pump Decon Equipment: Alconox, H<sub>2</sub>O

Disposal of Discharged Water: Drum on Site

Observations/Comments:



Sample number IW-2-020118

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: IW-2 Page: 1 of 1

Project Name: Art Brass Plating  
 Date: 2/1/18  
 Sampled by: AOO  
 Measuring Point of Well: N TOC  
 Screened Interval (ft. TOC): \_\_\_\_\_  
 Filter Pack Interval (ft. TOC): \_\_\_\_\_

Project Number: 050067  
 Starting Water Level (ft TOC): 4.94'  
 Casing Stickup (ft): \_\_\_\_\_  
 Total Depth (ft TOC): 21.15'  
 Casing Diameter (inches): 4"

Casing Volume 16.21 (ft Water) x 0.65 (Lpfv)(gpf) = 10.5 (L)(gal)  
 Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf  
 3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf

Sample Intake Depth (ft TOC): \_\_\_\_\_

**PURGING MEASUREMENTS**

Criteria:	Typical 0.1-0.5 Lpm	Stable	na	± 3%	± 10%	± 0.1	± 10 mV	± 10%		
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1405	0.0	0.9	4.94							Started purge
1410			4.94	14.0	373.0	0.54	5.27	171.5	12	H <sub>2</sub> O CLEAR
1415			4.94	14.1	375.9	0.33	5.30	172.4	12	
1420			4.94	14.3	376.0	0.28	5.28	175.0	11	4.94 = H <sub>2</sub> O LVL
1425			4.94	14.1	375.2	0.29	5.23	178.7	10	
1430			4.94	14.2	375.4	0.27	5.19	181.6	10	
1435			4.94	14.3	376.6	0.26	5.19	182.2	10	

Total Gallons Purged: \_\_\_\_\_ Total Casing Volumes Removed: \_\_\_\_\_  
 Ending Water Level (ft TOC): 4.94 Ending Total Depth (ft TOC): 21.2'

**SAMPLE INVENTORY**

Time	Volume mL	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1440	250	AMBER	1	NO	H2SO4	clear	11	T.O.C.
1440	500	HDPE	3	YES	HNO3			METALS (DISSOLVED)
1446	500	OU	3	NO	NO			ACID/Cl/504/ALK

**METHODS**

Parameters measured with (instrument model & serial number): PRO PLUS YSI (GEOTECH) / 2100P HACH  
 Purging Equipment: PERISTALTIC Decon Equipment: ALCONOX/H<sub>2</sub>O  
 Disposal of Discharged Water: DRUM ON SITE  
 Observations/Comments: \_\_\_\_\_

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: PSW-6

Page: 1 of 1

Project Name: Art Brass Pkting

Project Number: 050067

Date: 2/1/18

Starting Water Level (ft TOC): 4.68'

Sampled by: AOO

Casing Stickup (ft):

Measuring Point of Well: N TOC

Total Depth (ft TOC): 20.01

Screened Interval (ft. TOC)

Casing Diameter (inches): 2"

Filter Pack Interval (ft. TOC)

Casing Volume 15.3 (ft Water) x 0.16 (Lpfv)(gpf) = 2.45 (L)(gal)

Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf

Sample Intake Depth (ft TOC):

3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
0940	0.0	0.3	4.68							Started purge clean
0945	0.25		4.68	14.0	573	0.41	5.28	175.2	17	
0950	0.50		4.68	14.4	587	0.26	5.32	174.0	15	
0955	0.75		4.69	14.6	593	0.20	5.33	173.9	12	
1000	1.00		4.69	14.5	590	0.18	5.31	173.9	10	
1005	1.25		4.69	14.6	590	0.16	5.28	174.6	10	
1010	1.50		4.68	14.7	593	0.14	5.27	174.5	7	

Total Gallons Purged: 1.75 Gall.

Total Casing Volumes Removed: ~0.7

Ending Water Level (ft TOC): 4.68

Ending Total Depth (ft TOC): 19.99

**SAMPLE INVENTORY**

Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1015	250	Amber	1	-	H <sub>2</sub> SO <sub>4</sub>	clear	5	TOC
1015	500	OS	3	-		↓	↓	Alk, Acidity, Cl/SO <sub>4</sub>
1015	500	HDPE	3	Y	HNO <sub>3</sub>	↓	↓	Diss. Metals

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (Hantech), 2100P Turbidity Meter (Red)

Purging Equipment: Peri Pump    Decon Equipment: Alconox + H<sub>2</sub>O

Disposal of Discharged Water: Drain on site

Observations/Comments:



Sample number PSW-7-020118

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: PSW-7

Page: 1 of 1

Project Name: ABP

Project Number: \_\_\_\_\_

Date: 02/01/18

Starting Water Level (ft TOC): 4.83'

Sampled by: ACO/JTL

Casing Stickup (ft): \_\_\_\_\_

Measuring Point of Well: N TOC

Total Depth (ft TOC): 20.05'

Screened Interval (ft. TOC) \_\_\_\_\_

Casing Diameter (inches): 2 1/2

Filter Pack Interval (ft. TOC) \_\_\_\_\_

Casing Volume 15.2 (ft Water) x 0.16 (Lpfv)(gpf) = 2.43 (L)(gal)

Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf

Sample Intake Depth (ft TOC): \_\_\_\_\_

3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1249	0.25	~.3	4.83							START
1250	0.5		4.83	14.1	444.2	0.41	4.96	180.7	8	CLEAR H <sub>2</sub> O
1255	0.75		4.84	14.2	444.3	0.26	5.01	192.6	6	
1300	1		4.84	14.2	500.0	0.19	4.99	200.5	5	
1305	1.25		4.84	14.3	444.0	0.17	4.97	202.7	4	
1310	1.50		4.84	14.2	444.7	0.17	4.94	205.3	4	
1315	1.75		4.84	14.4	445.6	0.16	4.97	205.1	3	

Total Gallons Purged: 2.75

Total Casing Volumes Removed: ~1.1

Ending Water Level (ft TOC): 4.82

Ending Total Depth (ft TOC): 20.05'

**SAMPLE INVENTORY**

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1320	250	Amber	1	-	H <sub>2</sub> SO <sub>4</sub>	clear	2	TOC
1320	500	OJ	3	-	-			Alk, Cl/SO <sub>4</sub> , Acidity
1320	500	HDPE	5	Y	HNO <sub>3</sub>			MS/MSD - Diss. Metals
1320	500	HDPE	1	Y	HNO <sub>3</sub>			PSW-7-020118-D

-Duplicate

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (Grock), HACH 2100P turbidimeter

Purging Equipment: Per. Pump    Decon Equipment: Alconox + H<sub>2</sub>O

Disposal of Discharged Water: Drum on Site

Observations/Comments: \_\_\_\_\_



Sample number PSW-8-020118

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: PSW-8

Page: 1 of 1

Project Name: Art Brass plating

Project Number: \_\_\_\_\_

Date: 2/1/18

Starting Water Level (ft TOC): 4.87

Sampled by: aco

Casing Stickup (ft): \_\_\_\_\_

Measuring Point of Well: N TOC

Total Depth (ft TOC): 20.01

Screened Interval (ft. TOC) \_\_\_\_\_

Casing Diameter (inches): 2"

Filter Pack Interval (ft. TOC) \_\_\_\_\_

Casing Volume 15.4 (ft Water) x 0.16 (Lpfv)(gpf) = 2.4 (L)(gal)

Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf

Sample Intake Depth (ft TOC): \_\_\_\_\_

3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Criteria:										
Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1050	0.0	0.3	4.87							Started purge CLEAR
1055	0.25		4.87	14.5	430.8	0.28	4.96	235.4	15	
1100	0.50		4.87	14.5	432.8	0.16	4.99	243.4	16	
1105	0.75		4.88	14.6	434.7	0.14	4.98	244.0	21	
1110	1.00		4.88	14.7	436.7	0.13	4.96	245.2	15	
1115	1.25		4.88	14.7	435.9	0.12	4.96	243.8	13	
1120	1.50		4.88	14.7	437.2	0.12	4.97	243.3	11	
1125	1.75		4.88	14.7	436.1	0.11	4.94	245.4	11	

Total Gallons Purged: ~3

Total Casing Volumes Removed: ~1.25

Ending Water Level (ft TOC): 4.88

Ending Total Depth (ft TOC): 20.05

**SAMPLE INVENTORY**

Time	Volume mL	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1130	250	AMBER	1	NO	H2SO4	CLEAR	13	TOC Diss. Metals Alk. Acidity, Cl/SO4
1130	500	HDPE	3	YES	HNO3			
1136	500	OJ	3	NO				

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (Geotech), Hach 2100P Turbiditymeter

Purging Equipment: Peri Pump Decon Equipment: Aliconox + H2O

Disposal of Discharged Water: Drum on site

Observations/Comments: \_\_\_\_\_



Sample number MW-1-01318

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: MW-1 Page: 1 of 1

Project Name: ART Brass Plating  
 Date: 1/31/18  
 Sampled by: acc  
 Measuring Point of Well: \_\_\_\_\_  
 Screened Interval (ft. TOC): \_\_\_\_\_  
 Filter Pack Interval (ft. TOC): \_\_\_\_\_

Project Number: 050067  
 Starting Water Level (ft TOC): 6.29  
 Casing Stickup (ft): \_\_\_\_\_  
 Total Depth (ft TOC): \_\_\_\_\_  
 Casing Diameter (inches): 2"

Casing Volume \_\_\_\_\_ (ft Water) x \_\_\_\_\_ (Lpfv)(gpf) = \_\_\_\_\_ (L)(gal)  
 Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf    Sample Intake Depth (ft TOC): \_\_\_\_\_  
 3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1425	0.25	0.4	6.29							
1430	0.50		6.28	16.4	690	1.59	4.32	179.2	28	clear
1435	0.75		6.29	16.3	653	1.56	4.11	237.5	24	
1440	1.00		6.29	17.0	596	1.15	4.16	241.4	20	
1445	1.25		6.30	17.2	552	0.88	4.21	248.4	17	
1450	1.50		6.29	17.2	535	0.77	4.20	256.9	15	
1455	1.75		6.29	17.2	520	0.66	4.18	266.9	13	

recalibrated XI to check measurements

Total Gallons Purged: 1.75 Total Casing Volumes Removed: \_\_\_\_\_  
 Ending Water Level (ft TOC): 6.28' Ending Total Depth (ft TOC): 12.52'

**SAMPLE INVENTORY**

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1500	250	Amber	1	-	H2SO4	clear		TOC
1500	500	OJ	3	-	-	↓	↓	alk, acidity, Cl/SO4
1500	500	HOPE	2	γ	HNO3	↓	↓	Diss. Metals

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (5836) (pretech), 2100P Turbidimeter  
 Purging Equipment: Peri Pump Decon Equipment: Alconox + H2O  
 Disposal of Discharged Water: Down on Site  
 Observations/Comments: \_\_\_\_\_



Sample number MW-3-012918

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: MW-3 Page: 1 of 1

Project Name: Art + Brass Planting  
 Date: 1/29/18  
 Sampled by: acc  
 Measuring Point of Well: N TOC  
 Screened Interval (ft. TOC): \_\_\_\_\_  
 Filter Pack Interval (ft. TOC): \_\_\_\_\_

Project Number: 050067  
 Starting Water Level (ft TOC): 4.81'  
 Casing Stickup (ft): \_\_\_\_\_  
 Total Depth (ft TOC): \_\_\_\_\_  
 Casing Diameter (inches): 2"

Casing Volume \_\_\_\_\_ (ft Water) x \_\_\_\_\_ (Lpfv)(gpf) = \_\_\_\_\_ (L)(gal)  
 Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf    Sample Intake Depth (ft TOC): \_\_\_\_\_  
 3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1725	0.0	0.4	4.85							Start purging
1730	0.50		4.83	13.3	0.305	5.43	5.00	82.5	47.5	
1735	0.75		4.85	13.4	0.308	3.30	5.06	83.3	49.4	
1740	1.00		4.84	13.4	0.312	3.10	5.03	85.9	43.2	black flecks in water
1745	1.25		4.83	13.5	0.315	2.85	4.94	90.2	48.5	
1750	1.50		4.84	13.6	0.320	2.67	4.87	93.9	41.9	

Total Gallons Purged: 1.75 gal    Total Casing Volumes Removed: —  
 Ending Water Level (ft TOC): 4.85    Ending Total Depth (ft TOC): —

**SAMPLE INVENTORY**

Time	Volume	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1800	2.5ml	Cubitainer	1	—	—	clear	1.2	Anchor in Portland
1810	500mL	HDPE	3	Y	HNO3			Diss Metals (200.8, 4010)
1820	500ml	DJ	3	=	—			Alk, Acidity, Chloride, Sulfate
1830	250ml	Amber	1	=	H2SO4			TOC

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (Geotech) + Turbidimeter 2100P  
 Purging Equipment: Peri Pump    Decon Equipment: Alconox + H2O  
 Disposal of Discharged Water: Drums on Site  
 Observations/Comments: \_\_\_\_\_



Sample number MW-3-30-013118

**GROUNDWATER SAMPLING RECORD**

WELL NUMBER: MW-3-30 Page: 1 of 1

Project Name: Art Brass Planting  
 Date: 1/31/18  
 Sampled by: ADD  
 Measuring Point of Well: N TOC  
 Screened Interval (ft. TOC): \_\_\_\_\_  
 Filter Pack Interval (ft. TOC): \_\_\_\_\_

Project Number: \_\_\_\_\_  
 Starting Water Level (ft TOC): 4.86  
 Casing Stickup (ft): \_\_\_\_\_  
 Total Depth (ft TOC): \_\_\_\_\_  
 Casing Diameter (inches): 2"

Casing Volume \_\_\_\_\_ (ft Water) x \_\_\_\_\_ (Lpfv)(gpf) = \_\_\_\_\_ (L)(gal)  
 Casing volumes: 3/4" = 0.02 gpf    2" = 0.16 gpf    4" = 0.65 gpf    6" = 1.47 gpf  
 3/4" = 0.09 Lpf    2" = 0.62 Lpf    4" = 2.46 Lpf    6" = 5.56 Lpf  
 Sample Intake Depth (ft TOC): \_\_\_\_\_

**PURGING MEASUREMENTS**

Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1545	0.0	<del>4.0</del>	4.86							
1550	0.25	0.4	4.89	14.4	229.9	0.64	6.14	104.7	40	Started purging
1555	0.50	↓	4.89	14.7	226.4	0.32	6.09	95.0	38	
1600	0.75	↓	4.88	14.6	225.7	0.22	6.12	72.2	52	black flecks in H <sub>2</sub> O
1605	1.00	↓	4.89	14.7	238.9	0.15	6.19	52.8	32	
1610	1.25	↓	4.88	14.7	253.6	0.12	6.26	41.2	20	
1615	1.50	↓	4.88	14.8	271.6	0.10	6.33	29.6	8	

Total Gallons Purged: 2.0 Total Casing Volumes Removed: -  
 Ending Water Level (ft TOC): 24.87' Ending Total Depth (ft TOC): N/A

**SAMPLE INVENTORY**

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1620	250	Amber	1	-	H <sub>2</sub> SO <sub>4</sub>	clear	8	TOC
1620	500	OJ	3	-	-	↓	↓	Alk, Acidity, Cl/SO <sub>4</sub>
1620	500	HDPE	2	Y	HNO <sub>3</sub>	↓	↓	Diss. Metals

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (Geotech), 2100P Turbidimeter (rad)  
 Purging Equipment: Pert Pump Decon Equipment: Alconox + H<sub>2</sub>O  
 Disposal of Discharged Water: Drum on site  
 Observations/Comments: \_\_\_\_\_



Sample number MW-8-013108

**GROUNDWATER SAMPLING RECORD** WELL NUMBER: MW-8 Page: 1 of 1

Project Name: AA Brass Planting Project Number: 050067  
 Date: 1/31/18 Starting Water Level (ft TOC): 5.06  
 Sampled by: acc Casing Stickup (ft): \_\_\_\_\_  
 Measuring Point of Well: N TOC Total Depth (ft TOC): \_\_\_\_\_  
 Screened Interval (ft. TOC) \_\_\_\_\_ Casing Diameter (inches): 21"  
 Filter Pack Interval (ft. TOC) \_\_\_\_\_

Casing Volume \_\_\_\_\_ (ft Water) x \_\_\_\_\_ (Lpfv)(gpf) = \_\_\_\_\_ (L)(gal)  
 Casing volumes: 3/4" = 0.02 gpf 2" = 0.16 gpf 4" = 0.65 gpf 6" = 1.47 gpf Sample Intake Depth (ft TOC): \_\_\_\_\_  
 3/4" = 0.09 Lpf 2" = 0.62 Lpf 4" = 2.46 Lpf 6" = 5.56 Lpf

**PURGING MEASUREMENTS**

Time	Cumul. Volume (gal or L)	Purge Rate (gpm or Lpm)	Water Level (ft)	Temp. (°C)	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	pH	ORP (mv)	Turbidity (NTU)	Comments
1310	0.0	0.4	5.06							Started purging clear
1315	0.25		5.15	13.2	335.4	1.36	6.82	41.7	44	
1320	0.50		5.19	13.4	413.2	0.68	6.62	51.1	18	
1325	0.75		5.19	13.4	448.9	0.53	6.51	53.9	13	
1330	1.00		5.19	13.4	469.3	0.42	6.42	56.1	9	
1335	1.25		5.19	13.3	491.2	0.31	6.29	59.5	5	
1340	1.50		5.18	13.7	502	0.27	6.24	61.4	6	

Total Gallons Purged: 1.75 Total Casing Volumes Removed: \_\_\_\_\_  
 Ending Water Level (ft TOC): 5.09 Ending Total Depth (ft TOC): N/A

**SAMPLE INVENTORY**

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1345	250	Amber	1	-	H <sub>2</sub> SO <sub>4</sub>	clear	5	TOC
1345	500	OJ	3	-	-	↓	↓	Acidity, Alkalinity, Chloride/Sulfate
1345	500	HDPE	2	Y	HNO <sub>3</sub>	↓	↓	Diss. Metals

**METHODS**

Parameters measured with (instrument model & serial number): YSI Pro Plus (Geotech), 2100P Turbidimeter,  
 Purging Equipment: Peri Pump Decon Equipment: Allonox + H<sub>2</sub>O  
 Disposal of Discharged Water: Drum on Site  
 Observations/Comments: \_\_\_\_\_

## **APPENDIX F**

### ***In Situ* Metals Immobilization Bench-Scale Pilot Test Laboratory Report – Anchor QEA**

# Memorandum

June 4, 2018

To: Dana Cannon and Adam Griffin, Aspect Consulting  
From: Jessica Goin and Dimitri Vlassopoulos, Anchor QEA LLC

**Re: In Situ Metals Immobilization Bench-Scale Pilot Testing Laboratory Report**

This technical memorandum summarizes the laboratory testing performed by Anchor QEA LLC (Anchor QEA) as described in the In Situ Metals Immobilization – Pilot Testing Work Plan, West of 4<sup>th</sup> Site, Site Unit 1 (Aspect Consulting, 2017).

The laboratory pilot study was performed as described in Section 4.2 of the Work Plan, with the modifications as noted in the Field Implementation Work Plan.

## Materials and Methods

### *Samples*

Soil samples were collected by Aspect Consulting (Aspect) from borings IW-1 and IW-2 as described in section 4.1.2 of the Work Plan. Groundwater samples were collected by Aspect as described in 4.1.3, with the substitution of an inflatable Cubitainer rather than a carboy to minimize exposure to oxygen. All samples were sealed in barrier bags as described and maintained at 4 degrees Celsius (°C) for handling and storage. Samples were delivered to Anchor QEA by Aspect. All sample processing was performed under a nitrogen atmosphere. The baseline Monitoring Well 3 (MW-3) groundwater sample was submitted directly to Analytical Resources Inc. (ARI) [Laboratories](#).

### *Alkaline Reagents*

The alkaline reagents tested in the laboratory pilot study include purified grade sodium hydroxide and sodium bicarbonate obtained from ChemProducts, and Calmet ® (27-29 percent calcium polysulfide solution) obtained from Tessenderlo Kerley. The reagents were prepared as 0.1 molar (M) sodium hydroxide solution, 1.0 M sodium bicarbonate solution, and a 1/100 volume/volume dilution of Calmet using Type I reagent water.

### *Soil Processing*

Each 6-inch soil core interval was homogenized ~~individually~~individually, and soil pH measured in a 1 M potassium chloride slurry. The soil depth intervals from 11 to 18 and 10 to 18 feet below ground surface for IW-1 and IW-2, respectively, were homogenized to generate a single composite sample for each location. The soil pH was determined for each composite sample. Subsamples from each composite were submitted to ARI for analysis as described in section 4.2.1 of the Work Plan.

### *Titration Batch Testing*

Titration batch testing was performed as described in section 4.2.2 of the Work Plan. Alkaline reagents were added to stirred groundwater or groundwater-soil slurries in increments (0.1 to 10 milliliters), and the volume was adjusted as needed between addition steps to target an approximately 1 pH unit change with each step. The groundwater-only tests were equilibrated for a minimum of 15 minutes following each reagent addition, and the groundwater-soil slurry tests were equilibrated for a minimum of 45 minutes following each reagent addition. At each measurement point the final pH reading value was recorded after it remained stable for at least 5 minutes.

The data was used to produce titration curves, and the pH of the slurries was measured again after 24 and 48 hours~~X~~ to determine whether the pH had rebounded and additional reagent would be needed to maintain the target pH for the longer 14 day reaction period of the treatment batch testing.

### *Treatment Batch Testing*

Treatment batch testing was performed as described in section 4.2.3 of the Work Plan, with the modifications noted in Section 2.2.3 of the Field Implementation Work Plan. Multiple additions of alkaline reagent were required to maintain the pH over the course of the 14-day reaction period for the sodium hydroxide and calcium polysulfide treatments.

## **Results**

### *Baseline Soil and Groundwater Chemistry*

The analytical results for baseline sampling of Monitoring Well 3 groundwater data are summarized in Table 3 of the Field Implementation Work Plan. The analytical results for total metals, organic and inorganic carbon, sulfide and total sulfur for the IW-1 and IW-2 soil composites are summarized in Table 5 of the Field Implementation Work Plan.

### *Titration Batch Testing*

The pH of groundwater and groundwater-soil slurries was adjusted incrementally to pH 10 or until further additions did not increase pH. The sodium hydroxide titration tests were stopped at pH 10. The sodium bicarbonate titration tests stabilized below pH 9 and further reagent addition did not result in increased pH. The calcium polysulfide titration tests stabilized at approximately pH 9.5 and further additions did not result in increased pH. For all of the alkaline reagents, a greater volume was required to achieve a given pH increase in the groundwater-soil slurries as compared to the groundwater only titration tests.

The titration results are summarized in Tables 1a-1c and presented in Figure 5 of the Field Implementation Work Plan.

The pH of the groundwater-soil slurry titration tests with sodium bicarbonate remained stable for 48 hours without further reagent addition. The sodium hydroxide titrations required additional reagent after 24 and 48 hours due to rebound. The calcium polysulfide titrations also required additional reagent additions after 24 and 48 hours of reaction due to pH rebound.

### *Treatment Batch Testing*

The target pH was achieved and maintained except for the calcium polysulfide treatment tests at Day 7 and Day 14 (Table 2). Samples were submitted to ARI for analysis as described in section 4.2.3 and Table 2 of the Work Plan. Due to limited sample volumes available, samples for alkalinity and acidity were diluted prior to submission to ARI. Note that dilution is not recommended for alkalinity samples, and the reported values should be considered an approximation. For the same reason, total dissolved solids (TDS) was calculated from specific conductance (Table 3). The field parameters and analytical results are summarized in Table [7](#) of the Field Implementation Work Plan.

For all alkaline reagents, dissolved metals concentrations decreased as compared to the control when the groundwater-soil slurry pH was neutralized to pH six and, except for copper, concentrations remained low with further increase in pH (Figure 1). The pH of the control decreased between Day 1 and Day 14, and metals concentrations were greater in the control at Day 14 than Day 1.

Nickel concentration was approximately 6 milligrams per liter (mg/L) in the control at Day 14. Sodium hydroxide and sodium bicarbonate treatments decreased nickel concentration by a factor of 50 ~~as~~ (compared to the control) when the pH was neutralized to pH eight or greater. Calcium polysulfide amendment in the pH ten batch tests decreased the [nickel](#) concentration to less than 0.1 mg/L. However, for the calcium polysulfide tests for which the final pH was less than that of the control, nickel concentrations were similar to the control.

Zinc concentration was 80 µg/L in the control at Day 14, and the concentrations were decreased by an order of magnitude in all treatment tests except for the acidic calcium polysulfide tests, in which concentrations were similar to or slightly increased as compared to the control. Zinc was not detected in any test with a pH greater than seven.

Copper concentrations were less than 10 micrograms per liter (µg/L) in the control, and for sodium hydroxide and sodium bicarbonate tests, concentrations were decreased by a factor of 3 for the pH six tests, and by a factor of 1.5 for the pH eight tests as compared to the control. Copper concentrations were elevated as compared to the control in the pH ten tests and in the acidic calcium polysulfide tests.

Cadmium concentrations were less than 1 µg/L in the control and less than the detection limit for all treatment tests, except the calcium polysulfide treatments in which the pH decreased to less than

that of the control. Cadmium concentrations in the acidic calcium polysulfide tests were similar to the control.

## Summary

Addition of alkaline reagents successfully neutralized the acidity of site groundwater in contact with site soil. At circumneutral pH, this neutralization resulted in an order of magnitude decrease in concentrations of nickel and zinc, a factor of three decrease in copper concentrations, and cadmium concentrations less than the detection limit. When the treatment tests were amended to a basic pH, nickel concentrations were decreased by two orders of magnitude, and cadmium and zinc concentrations were less than the detection limit, however, copper concentrations were elevated compared to the control.

## References

Aspect Consulting, IN SITU METALS IMMOBILIZATION - PILOT TESTING WORK PLAN West of 4th Site  
- Site Unit 1, December 21, 2017

## Tables

**Table 1a**  
**Sodium Bicarbonate Titrations**

Step	Groundwater		Groundwater-Soil Slurry	
	1.0 molar NaHCO <sub>3</sub> added (μL)	pH	1.0 molar NaHCO <sub>3</sub> added (μL)	pH
0	0	4.74	0	4.36
1	100	5.97	100	5.31
2	100	6.34	100	5.89
3	250	7.04	250	6.17
4	500	7.96	500	6.40
5	500	8.21	1,000	7.58
6	500	8.37	1,000	7.71
7	500	8.45	1,000	8.03
8	2,000	8.60	1,000	8.15
9	5,000	8.84	1,000	8.27
10	5,000	8.76	1,000	8.43
11	--	--	2,000	8.46
12	--	--	10,000	8.59
13	--	--	10,000	8.56

Note:

NaHCO<sub>3</sub> = sodium bicarbonate

μL = microliter

**Table 1b**  
**Sodium Hydroxide Titrations**

Step	Groundwater		Groundwater-Soil Slurry	
	0.1 molar NaOH added (μL)	pH	0.1 molar NaOH added (μL)	pH
0	0	4.60	0	4.54
1	300	5.31	300	5.02
2	300	5.82	300	5.32
3	300	6.68	300	5.40
4	600	8.51	900	5.74
5	500	8.93	2,000	7.30
6	600	9.27	1,500	8.90
7	600	9.60	1,000	9.46
8	600	9.81	1,000	9.67
9	600	10.04	1,500	10.02

Note:

NaOH = sodium hydroxide

μL = microliter

**Table 1c**  
**Calcium Polysulfide (Calmet) Titrations**

Step	Groundwater		Groundwater-Soil Slurry	
	1/100 Calmet added (μL)	pH	1/100 Calmet added (μL)	pH
0	0	4.71	0	4.61
1	1,000	5.37	1,000	5.07
2	1,000	6.23	1,000	5.23
3	1,000	7.55	1,000	5.33
4	1,500	8.45	2,000	5.46
5	1,500	8.89	3,000	5.80
6	2,000	9.33	4,000	7.04
7	2,000	9.40	3,500	7.85
8	3,000	9.44	4,000	8.78
9	4,000	9.14	4,000	9.50
10	4,000	9.25	--	--

Note:

μL = microliter

**Table 2**  
**Total Alkaline Reagent Volumes Added and Final pH for Treatment Tests**

Reagent	Batch	Target pH	Total Reagent Volume Added ( $\mu\text{L}$ )	Day	Final pH	
Sodium Bicarbonate 1.0 M	1A	6	250	1	6.52	
	1A			3	6.58	
	1A			7	6.39	
	1A			14	6.34	
	1B			1	6.39	
	1B			3	5.95	
	1B			7	5.74	
	1B			14	5.61	
	1C	8	1,980	1	7.98	
	1C			3	7.74	
	1C			7	7.73	
	1C			14	8.37	
	Sodium Hydroxide 0.1 M	2A	6	1,300	1	5.97
		2A			3	6.04
2A		7			6.19	
2A		14			5.78	
2B		8	2,500	1	7.89	
2B			3,200	3	7.82	
2B			3,950	7	8.42	
2B			3,950	14	7.75	
2C		10	6,000	1	10.37	
2C			6,000	3	10.06	
2C			6,750	7	9.73	
2C			7,250	14	9.84	
Calmet 1/100 dilution		3A	6	2,250	1	5.75
		3A		2,750	3	6.06
	3A	4,750		7	3.69	
	3A	9,750		14	3.15	
	3B	8	12,500	1	8.52	
	3B		13,500	3	7.75	
	3B		13,500	7	7.84	
	3B		23,500	14	4.12	
	3C	10	25,000	1	10.05	
	3C		30,000	3	9.10	
	3C		34,000	7	9.49	
	3C		44,000	14	8.59	

Note:  
 $\mu\text{L}$  = microliters  
M=molar

**Table 3**  
**Equations for Calculation of Total Dissolved Solids from ~~Specific~~ Specific Conductance in Groundwater-Soil Slurries**

Reagent	Equation
Sodium Bicarbonate	$TDS (mg/L) = 0.00175 * SC (uS/cm) - 0.256$
Sodium Hydroxide	$TDS = 0.00095 * SC + 0.111$
Calmet	$TDS = 0.00042 * SC - 0.095$

Notes:

Equation developed by linear regression of TDS and SC results for a range of alkaline reagent additions in water-soil slurries

$\mu S/cm$  = microsiemens per centimeter

mg/L = milligrams per liter

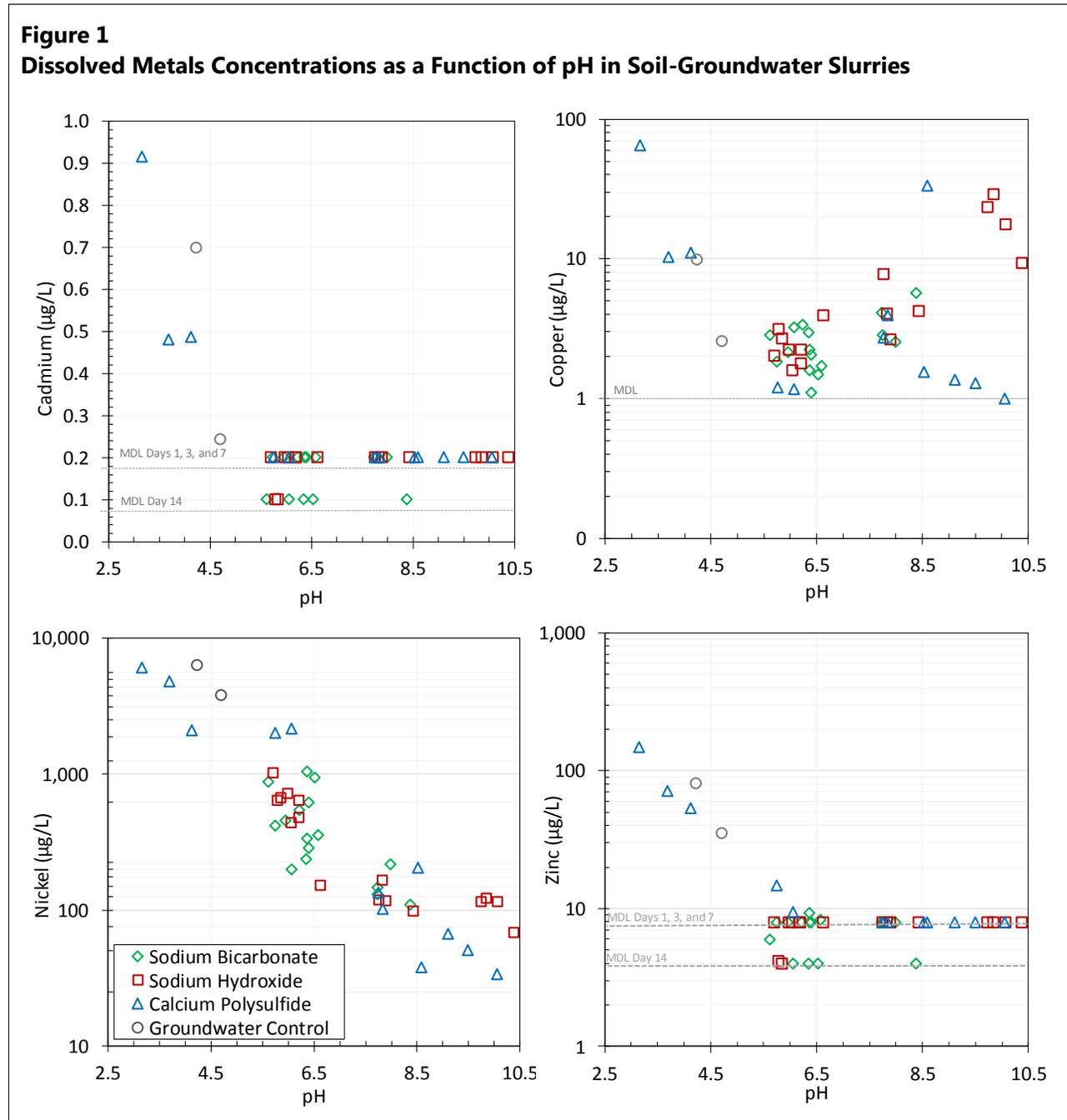
$R^2$  = coefficient of determination

TDS = total dissolved solids

SC = specific conductance

Figure

**Figure 1**  
**Dissolved Metals Concentrations as a Function of pH in Soil-Groundwater Slurries**



## **APPENDIX G**

### **Vendor Technical Specs**

### PRODUCT DATA SHEET

January, 2007

### 6500 GALLON POLY TANK (Original Style and Total Drain)

#### GENERAL INFORMATION

This type of tank is not to be used for food applications. Potable water applications are generally not acceptable and must be reviewed by the Corporate office first for approval.

#### WEIGHTS AND MEASURES

» Capacity:	– 6500 gallons (nominal)
» Height <sup>‡</sup> :	– 10'-6" (to top tangent line) 11'-11" (to top of dome) 12'-4" (to highest point on top lid)
» Diameter:	– 10'-0" (nominal)
» Weight*:	– Tank: 1700 lbs. – 1975 lbs. Pad: 400 lbs. - 450 lbs.

\*Varies with origin of manufacture

‡ Does not include height of pad. Add four inches for pad thickness to determine heights from grade when pad is used.

#### DESIGN PARAMETERS

» Tank Material:	– High Density Polyethylene
» Design Pressure:	– 0 psi – vented to atmosphere
» Design Vacuum:	– 0 psi – vented to atmosphere
» Spec. Gravity Limit:	– Original Style – 1.65 Total Drain – 1.9
» Temp. Limit:	– 150° F
» Certification:	– ASTM D1998 (not UL listed)

#### RESTRICTIONS

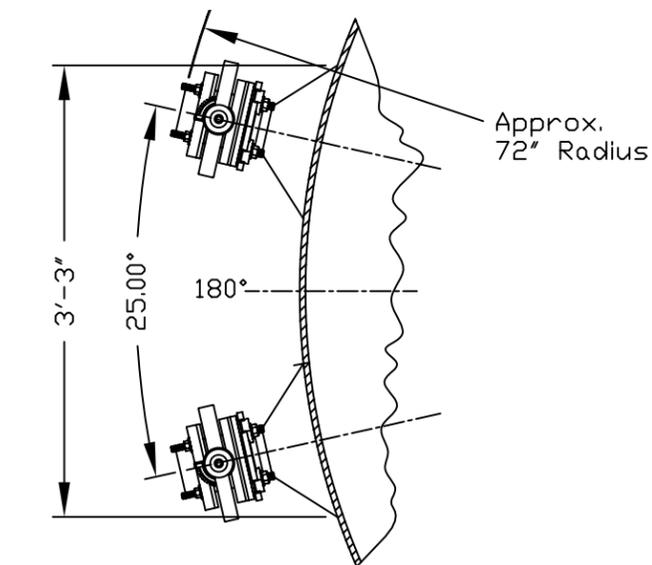
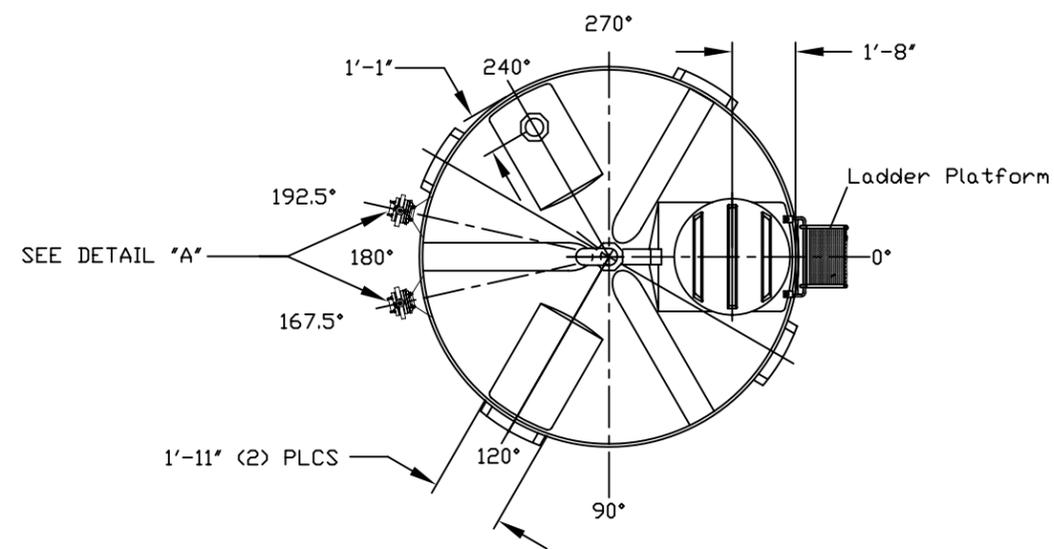
» Sulfuric Acid Storage:	–	<ul style="list-style-type: none"> <li>• 80% concentration maximum</li> <li>• Use only tanks with equipment numbers <math>\geq</math> 7376</li> <li>• Previously repaired tank cannot be used (equipment number should have "W" at end)</li> <li>• 100° F maximum temperature</li> <li>• Top fill only</li> <li>• Top manway must be open during pneumatic filling of tank</li> <li>• Use flexible plumbing fixtures resistant to sulfuric acid</li> </ul>
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#### FEATURES

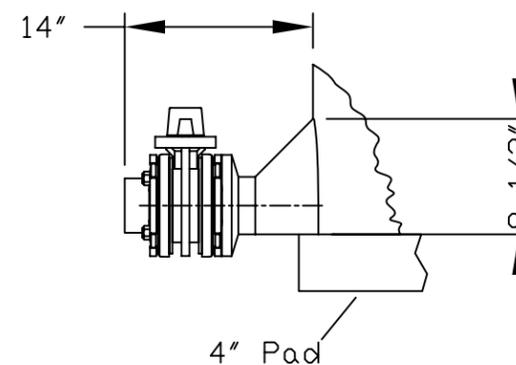
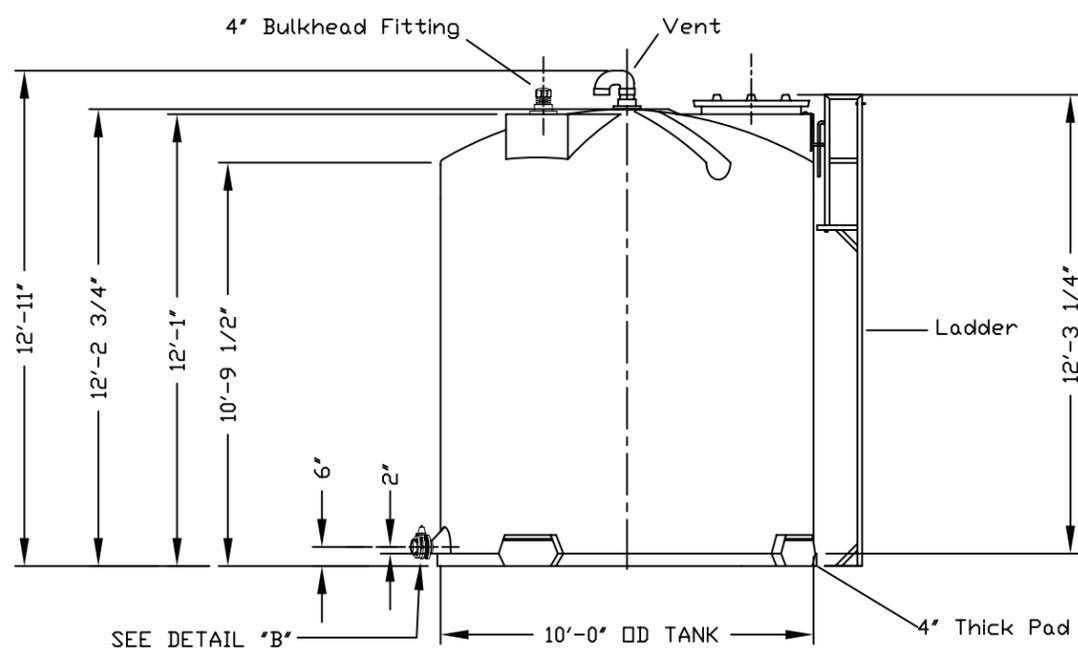
» Top Vent:	– 2" PVC U-vent (two threaded street elbows)
» Manway:	– Top mounted with 24" opening (34 inch diameter screw-on cover)
» Valves:	– 3" butterfly valve with PVC body and disc, Viton O-Ring seal and 316 SS stem.
» Ladder:	– Top mounted bracket for ladder hook-up. Ladder is not permanently mounted to tank.
» Piping Connections:	– Inlet – 3" with butterfly valve Outlet – 3" with butterfly valve Top – 4" PVC adapter and PVC cap

#### MISCELLANEOUS

» Options:	– Secondary containment berm
------------	------------------------------



DETAIL "A"  
(VALVE LAYOUT & CLEARANCE)  
SCALE: NONE



DETAIL "B"  
INTEGRALLY MOLDED FLANGED OUTLET (IMFO)  
SCALE: NONE

**SULFURIC ACID RESTRICTIONS**

1. Do not store sulfuric acid above 80% concentration. For concentrations equal to or less than 80%, use tanks with equipment numbers equal to or greater than P7376. Do not use tanks with lower equipment numbers for sulfuric acid. Concentrations greater than 80% require Corporate approval.
2. Sulfuric acid must be less than 100 degrees to be stored in this tank.
3. Sulfuric acid must be filled through the top of the tank only.
4. Tank vent must always be open when storing sulfuric acid.

- NOTES:
1. THIS IS A COMPUTER GENERATED DRAWING. DO NOT REVISE BY HAND.
  2. DIMENSIONS WILL VARY ±3% DUE TO VARIATIONS IN MULTIPLE MOLDS & CONDITIONS PREVALENT DURING MANUFACTURE & USAGE.
  3. DESIGN TANK WALL THICKNESS 1.9 SpG PRODUCT.
  4. SEE DRAWING "BK65HUF", TITLED "BAKER 6500 GALLON STORAGE TANK TYPICAL FITTING INSTALLATION", FOR FITTING LOCATIONS.

**SPECIFICATIONS:**

- 1) Tank Weight: 1650 lbs.
- 2) Pad Weight: 450 lbs.
- 3) Tank Material: HDPE
- 4) Design Pressure: 0 psig
- 5) Vacuum Rating: Atmospheric only
- 6) Temperature limit: 150°F
- 7) Specific Gravity limit: Original Style - 1.65; Total Drain - 1.90

**NOTES:**

1. This drawing is a baseline representation for this model of tank. Variations between this drawing and the actual equipment in the field can and do exist, primarily with appurtenance locations, sizes and quantities. Consult your local BakerCorp representative if specific needs exist.
2. THIS TANK IS *NOT DESIGNED FOR TRANSPORTING LIQUIDS*. It should be moved only when empty..

The information contained herein is proprietary to BakerCorp and shall not be reproduced or disclosed in whole or in part, or used for any design or manufacture except when user obtains direct written authorization from BakerCorp.				 3020 OLD RANCH PARKWAY SEAL BEACH, CA 90740-2751	
G				SCALE: Do Not Scale	SIZE B
F					ORIGINAL DWG. DATE 05SEP02
E				DRAWN BY: P.J.B.	APPROVED BY: -
D	Revised dimensions	10/9/06	PJB		CAT/CLASS --
C	Added ladder & add'l dimensions	6/2/06	PJB	TITLE 6500 GALLON POLY TANK	SHEET 1 OF 1
B	Fixed lineweights	7/12/05	Z.E.R		
A	Added pad, valves, vent & bulkhead fitting.	3/10/05	PJB	DRAWING NO. S-3-M0002-1-	REV. D
REV.	DESCRIPTION	DATE	BY		



# Technical Specification

## Sodium Bicarbonate Industrial #3 Fine Powder

NATURAL SODA

Revision Date: 03/16/2015

**CHEMICAL NAME:** Sodium Bicarbonate  
**FORMULA:** NaHCO<sub>3</sub>  
**MOLECULAR WEIGHT:** 84.01  
**CAS NAME:** Carbonic acid monosodium salt  
**CAS NUMBER:** 144-55-8  
**DESCRIPTION:** White, crystalline powder  
**GRADE:** Industrial No. 3 Fine Powder



**PROPERTIES:**

**SCREEN ANALYSIS**

**Cumulative Percent Retained**

<u>U. S. Std. Sieve No.</u>	<u>Minimum</u>	<u>Maximum</u>
- 325	75	100

**BULK DENSITY:**      poured  
 Typical range: 55 to 65 lbs. / ft<sup>3</sup>

**THEORETICAL PROPERTIES:**

The following properties are provided for convenience and reference only. These properties are not normally tested in the commercial product and no representation is made relative to the commercial product.

**THERMAL DECOMPOSITION:** Decomposes (without melting) into Na<sub>2</sub>CO<sub>3</sub>, H<sub>2</sub>O, and CO<sub>2</sub>  
**ALKALI EQUIVALENT:** 1 lb. NaHCO<sub>3</sub> = 0.369 lb. Na<sub>2</sub>O  
**CARBON DIOXIDE EQUIVALENT:** 1 lb. NaHCO<sub>3</sub> = 0.524 lb. CO<sub>2</sub>  
**SPECIFIC GRAVITY:** 2.16 g / cm<sup>3</sup>  
**SPECIFIC HEAT @ 25 °C:** 20.94 cal / deg mol  
**SOLUBILITY IN WATER @ 60 °C:** 16.4 g / 100 g H<sub>2</sub>O  
**SOLUBILITY IN OTHER SOLVENTS:** Insoluble in alcohol  
**HEAT OF FORMATION:** - 227.25 K cal / mol  
**HEAT OF SOLUTION:** 3.81 K cal / mol  
**TASTE:** Slightly alkaline

**HANDLING:**

Information concerning the handling and use of this product is provided in a material data sheet (MSDS). This MSDS must be fully read and understood prior to any exposure, handling, or use of the product.

**SHELF LIFE:** 2 years from manufacturing date

**APPLICATIONS:** Deodorant powders, dry fire extinguishers, rubber and plastics manufacturing

The information herein is believed to be reliable. However, no warranty, expressed or implied, is made as to the accuracy or completeness and none is made as to merchantability of the material or its fitness for any purpose. The manufacturer shall not be liable for consequential damages or for damage to persons or property resulting from its use. Nothing herein shall be construed as a recommendation for use in violation of any patent.

## **APPENDIX H**

### **Operational Logs**

# **APPENDIX I**

## **Health and Safety Plan (HASP)**



## PROJECT-SPECIFIC HEALTH AND SAFETY PLAN

Property Name:	Art Brass Plating		
Project Number:	050067		
Prepared By:	Delia Massey	Date:	6/8/18
Reviewed By:	Name	Date:	Name

### 1 INTRODUCTION

This project-specific health and safety plan (HASP) establishes procedures and practices to protect employees of Aspect Consulting, LLC (Aspect) from potential hazards posed by field activities at the subject site. In this HASP, measures are provided to minimize potential exposure, accidents, and physical injuries that may occur during daily activities and adverse conditions. Contingency arrangements are also provided for emergency situations.

### 2 EMERGENCY CONTACT INFORMATION

<b>PROPERTY LOCATION</b>	Art Brass Plating 5516 3rd Avenue South Seattle, WA
<b>NEAREST HOSPITAL</b>	Harborview Medical Center 325 9th Ave, Seattle, WA 98104  <b>Attached figure F-1 shows route to hospital.</b>
<b>EMERGENCY RESPONDERS</b>	Police, Ambulance, Fire ..... <b>911</b>
<b>OTHER CONTACTS</b>	Bob Hanford (mobile) .....(206) 276-9256 Doug Hillman, Aspect Consulting (cell).....(206) 399-0318 Dana Cannon, Aspect Consulting (cell).....(206) 718-9547 Aspect, Seattle Office .....(206) 328-7443 Mike Merryfield, Art Brass Plating.....(206) 767-4443
<b>IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE</b>	Give the following information: <ul style="list-style-type: none"> <li>✓ <b>Where You Are:</b> address, cross streets, or landmarks</li> <li>✓ <b>Phone Number</b> you are calling from</li> <li>✓ <b>What Happened:</b> type of accident, injury</li> <li>✓ <b>How Many Persons</b> need help</li> <li>✓ <b>What is Being Done</b> for the victims</li> <li>✓ <b>You Hang Up Last:</b> let whomever you called hang up first</li> </ul>

**In case of serious injuries or other emergency, immediately call Bob Hanford, Aspect Corporate Safety Officer, at (206) 780-7729 or (206)-276-9256. If no response, call Doug Hillman at (206) 399-0318 or Tim Flynn at (206) 780-7730.**

### 3 PERSONNEL ORGANIZATION AND CHAIN OF COMMAND

The Aspect Project Manager assigns the Site Safety Supervisor and other field personnel for this project, has ultimate responsibility for developing this project-specific HASP, and ensuring it is complied with during project execution. The Aspect Site Safety Supervisor has responsibility and authority for Aspect employees' safety during site activities. Other Aspect personnel on site have the responsibility to comply with this project-specific HASP in coordination with the Site Safety Supervisor.

Aspect Personnel			
Role	Name	Office Phone	Mobile/Cell Phone
Project Manager	Doug Hillman	206-838-5833	206-399-0318
Project Engineer	Adam Griffin	206-780-7746	865-696-7658
Site Safety Supervisor	Bob Hanford	206-780-7729	206-276-9256
Other Field Personnel	Amelia Oates	206-413-5409	585-613-5158
Other Field Personnel	Breeyn Greer	206-812-4739	612-232-7343
Aspect's Subcontractors Working On-Site			
Name	Task/Role	Contact	Phone
Applied Professional Services	Private utility locate	Bill Phillips	206-571-1857
Holt Drilling	Drilling contractor	Dale Smith	253-604-4878

Aspect will inform its subcontractors working on-site of potential fire, explosion, health, safety, or other hazards associated with planned site activities, and can make available to them this project-specific HASP. **However, all subcontractors are solely responsible for preparation of their own HASP, and for the safety of their employees.**

### 4 SITE CONTROL PLAN

#### 4.1 Property Description

<b>Property Name:</b>	Art Brass Plating	
<b>Property Location or Address:</b>	5516 3 <sup>rd</sup> Ave South	
<b>Owners/Tenants:</b>	Dean Allstrom/Art Brass Plating	
<b>Current Property Use:</b>	Metal Finishing (including plating, polishing, and powder coating)	
<b>Past Use of Property (if different):</b>	Residential	
<b>Designated Hazardous Waste Site?</b>	No	If yes, specify federal, state, or other:
<b>Industrial Site?</b>	Yes	

<b>Topography:</b>	Flat
<b>Surround Land Use/Nearest Population:</b>	Primarily commercial/light industrial with a few residences; nearest population to north and west
<b>Drinking Water/Sanitary Facilities:</b>	On-site
<b>Site Map:</b>	Available in Field Implementation Work Plan

#### 4.2 Site Access Control

Describe controls to be used to prevent entry by unauthorized persons:

- The property is closed to the public (fenced with secured gate).
- Traffic cones, barriers, chain-link fence, and caution tape used, as needed.

Describe how exclusion zones and contamination reduction zones will be designated:

- Injection activities will be performed in multiple areas of the property.
- The area immediately adjacent to each injection well location will be considered an exclusion zone.
- The subcontractor will mark the limits of the exclusion zone using cones, caution tape, etc.
- Aspect field personnel will remain vigilant about preventing unauthorized persons from approaching the exclusion zone.

#### 4.3 Worker Hygiene Practices

Aspect personnel will use the following hygiene practices while working on-site:

- No person will eat, drink, or chew gum or tobacco in potentially contaminated areas. Drinking of replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Smoking is prohibited except in designated areas of the site.
- Long hair will be secured away from the face so that it does not interfere with any activities.

#### 4.4 Emergency Communications

Aspect workers on-site will have a mobile (cell) phone on-site that will be used for communications should an emergency arise. Phone numbers for Aspect site personnel are listed in Section 3: Personnel Organization and Chain of Command.

#### 4.5 Nearest Medical Assistance

**FIRST CALL 911.** The route from the site to the nearest hospital is shown in the attached figure.

## 5 SITE WORK PLAN

<b>Proposed Work Activities On-Site:</b>	<ul style="list-style-type: none"> <li>• Drilling and development of injection wells.</li> <li>• Injection of <i>in situ</i> treatment</li> <li>• Routine groundwater monitoring</li> </ul>
<b>Objectives of Site Activities:</b>	Evaluate the <i>in situ</i> pH adjustment to immobilize plating metals in ABP source area groundwater
<b>Proposed Work Dates:</b>	<i>January 2018 – September 2019</i>
<b>Will On-site Personnel Potentially be Exposed to Hazardous Substances?</b>	<p>If yes, describe:</p> <p>The property historically included a metal plating facility with associated support facilities. Based on previous investigations, potential chemical hazards include:</p> <ul style="list-style-type: none"> <li>• VOCs, including dry cleaner solvents: Trichloroethene (TCE), cis-1,2-DCE, vinyl chloride</li> <li>• Heavy Metals (arsenic, barium, iron, manganese, nickel, etc.)</li> <li>• Injection reagent (sodium bicarbonate)</li> </ul>
<b>Do Personnel Conducting Site Activities have Training in Accordance with WAC 296-843-200?</b>	Yes

## 6 DECONTAMINATION

Goals	Procedures
<p>To prevent the distribution of contaminants outside the exclusion zone or cross-contamination of samples, the following procedures will be used to decontaminate sample equipment.</p>	<ul style="list-style-type: none"> <li>• Decontamination process, involving Alconox wash, tap water rinse, and deionized water rinse (with air dry).</li> <li>• Dedicated tubing used for groundwater sampling will be disposed of or retained (bagged) for future use, but not decontaminated.</li> </ul>
<p>To prevent the distribution of contaminants outside the exclusion zone, unnecessary vehicles will not be allowed inside the exclusion zone. For vehicles required in the exclusion zone (e.g., drill rig, excavator), the following decontamination procedures will be used to prevent contamination from leaving the exclusion zone:</p>	<ul style="list-style-type: none"> <li>• Steam clean drilling equipment and excavator bucket that advances below ground surface.</li> </ul>
<p>To minimize or prevent worker exposure to hazardous substances, all personnel working in the exclusion zone and contamination reduction zones will comply with the following decontamination procedures:</p>	<ul style="list-style-type: none"> <li>• Wash boots and rain gear that have come into contact with soil or groundwater with Alconox/tap water and air dry.</li> <li>• Dispose of disposable personal protective equipment (PPE such as gloves, Tyvek) into Department of Transportation (DOT)-approved and appropriately labeled 55-gallon drums.</li> <li>• To prevent distribution of contaminants outside the exclusion zone, do not allow unnecessary vehicles inside the exclusion zone.</li> </ul>
<p>Soil cuttings, monitoring well purge water, and decontamination wastewater will be managed in the following manner:</p>	<ul style="list-style-type: none"> <li>• Appropriate disposition of the cuttings will be based on soil quality data collected for each location. If soil cuttings are grossly contaminated (e.g., free product), that soil will be stored in DOT-approved 55-gallon drums (appropriately labeled) at the sample location for future disposal by owner.</li> <li>• Combine decontamination wastewater and monitoring well purge water from locations with evidence of contamination in DOT-approved 55-gallon drums at the property for future disposal by the owner.</li> </ul>

## 7 HAZARD ANALYSIS

The potential hazards and corresponding control measures for planned site work activities are as follows:

<b>Work Activity</b>	<b>Primary Potential Hazards</b>	<b>Control Measures</b>
Drilling injection wells/injection oversight	<ul style="list-style-type: none"> <li>• Getting hit by drill rig equipment, especially from overhead.</li> </ul>	<ul style="list-style-type: none"> <li>• Stay back from rig whenever possible and stay alert.</li> <li>• Modified Level D PPE (with hard hat, traffic vest, steel-toe boots).</li> </ul>
	<ul style="list-style-type: none"> <li>• Excessive noise.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear hearing protection.</li> </ul>
	<ul style="list-style-type: none"> <li>• Chemical exposure (skin contact, ingestion, inhalation).</li> </ul>	<ul style="list-style-type: none"> <li>• Modified Level D PPE.</li> <li>• Air monitoring.</li> </ul>
Well development and groundwater sampling	<ul style="list-style-type: none"> <li>• Chemical exposure (skin or eye contact, ingestion).</li> </ul>	<ul style="list-style-type: none"> <li>• Modified Level D PPE.</li> <li>• Securely join pump tubing and other connectors.</li> </ul>
All	<ul style="list-style-type: none"> <li>• Getting hit by other trucks working on the property.</li> </ul>	<ul style="list-style-type: none"> <li>• Wear traffic vest.</li> <li>• Stay back from roads and stay alert.</li> </ul>
	<ul style="list-style-type: none"> <li>• Railroad traffic on road entering site.</li> </ul>	<ul style="list-style-type: none"> <li>• Stay alert to railroad traffic.</li> <li>• Obey railroad alerts at road crossings.</li> </ul>
	<ul style="list-style-type: none"> <li>• Heat stress</li> </ul>	<ul style="list-style-type: none"> <li>• Take breaks, seek shade, and increase fluid intake.</li> </ul>

Potentially Hazardous Chemicals Known or Suspected at the Property and Permissible Exposure Limits (air)					
Substance	Medium	OHSA PEL	OSHA STEL	IDLH	Carcinogen or Other Hazard
Trichloroethylene (TCE)	Soil, GW	>/=50 ppm	100 ppm	1000 ppm	C
Cis-1,2-dichloroethylene (DCE)	Soil, GW	200 ppm	100 ppm	1000 ppm	--
Vinyl chloride	Soil, GW	1ppm	N/A	N/A	C
Heavy Metals (arsenic, barium, iron, manganese, etc.)	Soil, GW	As: 0.01 mg/m <sup>3</sup> Ba: 0.5 mg/m <sup>3</sup> Cd: 0.005 mg/m <sup>3</sup> Cu: 1 mg/m <sup>3</sup> Fe: -- Mn: 5 mg/m <sup>3</sup> Ni: 1 mg/m <sup>3</sup>	As: -- Ba: -- Cd:-- Cu: -- Fe: -- Mn: -- Ni: --	As: 0.01 mg/m <sup>3</sup> Ba: 50 mg/m <sup>3</sup> Cd: 9 mg/m <sup>3</sup> Cu: 100 mg/m <sup>3</sup> Fe: -- Mn: 500 mg/m <sup>3</sup> Ni: 10 mg/m <sup>3</sup>	As: C Ba: T Cd: -- Cu: -- Fe: -- Mn: -- Ni: --
Sodium bicarbonate	Injection reagent	--	--	--	--

## Notes:

-- = none established

C = carcinogen

cPAH = carcinogenic polycyclic aromatic hydrocarbon

GW = groundwater

IDLH = immediately dangerous to life or health

N/A = not applicable/not available

OHSA = Occupational Safety and Health Administration

T = toxic

PCB = polychlorinated biphenyl

PEL = permissible exposure level (8-hour time-weighted average)

STEL = short-term exposure level

Chemicals Known or Suspected On-site (check box)			
Chemical Class	Known	Possible	Unlikely
Corrosive (if expected, specify)			x
Ignitable (if expected, specify)			x
Reactive			x
Volatile	x		
Radioactive			x
Explosive			x
Biological Agent			x
Particulate or Fibers			x
If known or likely, describe:			

## 8 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above, the following personal protective equipment (PPE) will be required for the following field activities. This section specifies both an initial level of protection and a more protective (contingency) level or protection, in the event conditions should change. The contingency defines the PPE that will be available on site.

Work Activity	Level of Protection	
	Initial	Contingency
Drilling/injection oversight	D	Mod. D or C
Well development/groundwater sampling	D	Mod. D or C
Sample handling	D	Mod. D or C

Each level of protection will incorporate the following equipment (specify type of protective clothing, boots, gloves, respiratory cartridges or other protection, safety glasses, hardhat, and hearing protection):

Level of Protection	Specific PPE
Level D	Work clothing, traffic vest, rubber (nitrile) gloves, steel toe and shank boots, safety glasses, hearing protection, and hard hat.
Modified D	Level D plus Tyvek coveralls or rain gear, and neoprene outer gloves.
Level C	Level D plus air-purifying respirator with combination organic vapor/HEPA dust cartridges.

NOTE: Project personnel are not permitted to deviate from the specified levels of protection without the prior approval of the Site Safety Supervisor. A traffic vest is not needed if work clothes are suitably visible (e.g., orange/yellow rain gear or white/yellow chemical protective clothing).

## 9 SAFETY EQUIPMENT

The following safety equipment will be on site during the proposed field activities:

Other Required Items (check items required)	
First aid kit	x
Eyewash (e.g., bottled water)	x
PID	x
Drinking water	x
Fire extinguisher	x
Brush fan	
Wind sox	
Other:	

## 10 SPILL CONTAINMENT

Will the proposed field work include the handling of bulk chemicals?	Yes x	No
If yes, describe spill containment provisions for the property: Injection reagents will be stored in sealed Baker tanks. Reagent will be dispensed from the tanks using a pump and hose manifold.		

## 11 CONFINED SPACE ENTRY

Will the proposed field work include confined space entry?	Yes	No x
If yes, attach to this plan the confined space entry checklist and permit.		

## 12 ASPECT TRAINING AND MEDICAL MONITORING

Aspect employees who perform site work are responsible for understanding potential health and safety hazards of the site. All Aspect site workers will have health and safety training for hazardous waste operations, in accordance with WAC 296-843-200. In addition, Aspect requires medical monitoring for all employees potentially exposed to chemical hazards in concentrations in excess of the permissible exposure limit (PEL) for more than 30 days per year, as required under WAC 296-843-210. Employees who use respirators for their work will have a respirator medical evaluation as required under Chapter 296-842-WAC.

## 13 DISCLAIMER

Aspect Consulting, LLC does not guarantee the health or safety of any person entering this property. Because of the potentially hazardous nature of this property and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this property. The health and safety guidelines in this plan were prepared specifically for this site and should not be used on any other property without prior evaluation by trained health and safety personnel.



## FIELD SAFETY PLAN CONSENT AGREEMENT

### Aspect Consulting Employees

I have reviewed the project specific health and safety plan, dated (*specify month, date, year*) for the (*give project name and type of*) fieldwork. I understand the purpose of the plan and I consent to adhere to its procedures and guidelines while conducting activities on site that are described in the plan.

Employee Printed Name	Signature	Date

### Site Visitors

I have been briefed on the contents of the project-specific health and safety plan. I am responsible for my own health and safety.

Visitor Printed Name and Organization/Company	Signature	Date





Start **5515 3rd Ave S  
Seattle, WA 98108**  
 End **Harborview Medical Center  
325 9th Ave, Seattle, WA 98104**  
 Travel **4.4 mi – about 10 mins**

Directions:

**A** 5515 3rd Ave S  
Seattle, WA 98108

Drive: 4.4 mi – about 10 mins

- |   |                  |
|---|------------------|
| 1. Head <b>north</b> on <b>3rd Ave S</b> toward <b>S Lucile St</b>                | 36 ft            |
| ➔ 2. Turn <b>right</b> at <b>S Lucile St</b>                                      | 338 ft           |
| ➤ 3. Turn <b>left</b> at <b>4th Ave S</b>   | 1.2 mi<br>3 mins |
| ➔ 4. Turn <b>right</b> at <b>S Spokane St</b>                                     | 0.2 mi<br>1 min  |
| 5. Take the ramp to <b>Columbian Way/I-5 N</b>                                    | 0.1 mi           |
| 6. Merge onto <b>W Seattle Bridge</b>   | 328 ft           |
| 7. Merge onto <b>I-5 N</b> via the ramp to <b>Vancouver BC</b>                    | 1.2 mi<br>2 mins |
| 8. Take exit <b>164A</b> for <b>James St/Dearborn St</b> toward <b>Madison St</b> | 1.0 mi<br>2 mins |
| 9. Follow signs for <b>James St</b>   | 0.3 mi           |
| ➔ 10. Turn <b>right</b> at <b>James St</b>  | 0.1 mi           |
| ➔ 11. Turn <b>right</b> at <b>9th Ave</b>   | 0.2 mi           |

**B** Harborview Medical Center  
325 9th Ave, Seattle, WA 98104

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End



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