

CVOC PILOT STUDY FIELD IMPLEMENTATION WORK PLAN

W4 Group - Site Unit 1

Prepared for: West of 4th Group

Project No. 050067 • April 4, 2018 Agency Review Draft





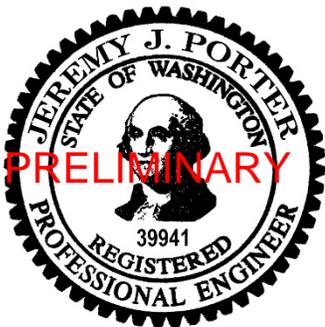
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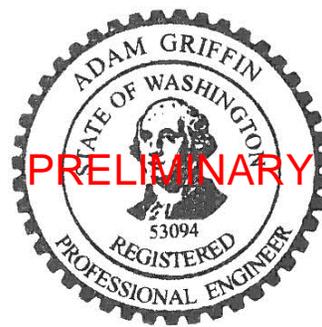
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Acronyms

ABP	Art Brass Plating
AO	Agreed Order
ARI	Analytical Resources Inc.
Aspect	Aspect Consulting, LLC
bgs	below ground surface
BDC	Blaser Die Casting
CI	Capital Industries
CSM	conceptual site model
CVOC	chlorinated volatile organic compounds
DCE	cis-1,2 Dichlorethene
DP	direct push
DR	dose response
EAnb	Enhanced Anaerobic Biodegradation
Ecology	Washington Department of Ecology
EHC Liquid	Peroxychem EHC [®] Liquid Reagent
FIWP	Field Implementation Work Plan
Fe	iron
Fe ²⁺	ferrous iron
Fe ³⁺	ferric iron
FS	Feasibility Study
ft	feet
HASP	Health and Safety Plan
HSA	hollow-stem auger
IDW	investigative-derived waste
IP	injection point
ISCR	<i>In Situ</i> Chemical Reduction
mg/L	milligrams per liter
ug/L	micrograms per liter

MNA	monitored natural attenuation
OUL	Ozark Underground Laboratory
PCE	perchloroethylene
PCULs	preliminary cleanup levels
PGG	Pacific Groundwater Group
PLPs	potentially liable parties (the W4 Group)
PVC	polyvinyl chloride
QAPP	Quality Assurance Project Plan
RAOs	Remedial Action Objectives
redox	reduction/oxidation
ROI	radius of influence
ROW	right-of-way
RWT	Rhodamine WT
SAP	Sampling and Analysis Plan
SDS	safety data sheet
Stericycle	Burlington Environmental, LLC
SU1	W4 Group Site Unit 1
SU2	W4 Site Unit 2
TCE	trichloroethene
TOC	total organic carbon
UIC	Underground Injection Control
W4	west of 4 th
W4 Site	west of 4 th site
WAC	Washington Administrative Code
the Waterway	the Duwamish Waterway
Work Plan	Pilot Study Work Plan

1 Introduction

1.1 Purpose

The W4 Group Site Unit 1 (SU1) chlorinated volatile organic compounds (CVOC) Pilot Study Field Implementation Work Plan (FIWP) 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 ¹ identified by the Washington State Department of Ecology (Ecology) in Agreed Order (AO) No. DE10402 for the West of 4th (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 for the W4 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 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 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 and evaluating the ability of different treatment approaches, including *In-Situ* Chemical Reduction (ISCR) and Enhanced Anaerobic Biodegradation (EAnB), to achieve Remedial Action Objectives (RAOs). Pilot testing will assess the effectiveness and cost of using ISCR and EAnB to treat CVOCs in groundwater west of East Marginal Way. The First Amendment to the AO No. DE 15344, effective on November 20, 2017 (AO Amendment), identifies the pilot study scope of work and schedule of deliverables. After pilot study completion, the AO Amendment requires that the PLPs submit a SU1 Focused FS Report Addendum that selects the preferred cleanup action. The pilot study results will be used to refine the description and evaluation of remedial alternatives presented in the SU1 FS and to define the preferred remedy, to be presented in the SU1 Focused FS Report Addendum.

A Final CVOC Pilot Study Work Plan (Work Plan) was submitted on December 21, 2017, describing pilot study activities proposed to evaluate the *in situ* treatment of the downgradient trichloroethene (TCE) Plume (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 within the Site is shown on Figure 2 and the installed pilot study monitoring well network is presented on Figure 3. This FIWP provides the following:

¹ 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.

- Results of monitoring well installation and baseline groundwater monitoring;
- An updated Conceptual Site Model
- The final pilot study design

1.2 Report Organization

This report is organized as follows:

- **Section 1** describes the purpose and organization of the FIWP.
- **Section 2** describes the activities completed prior to the pilot study: utility clearance, monitoring well installation, and baseline groundwater monitoring.
- **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 CVOC contamination in the pilot study area.
- **Section 4** describes the objectives and approach of the pilot study.
- **Section 5** describes the final pilot study design and is organized by reagent injections and monitoring. The reagent injections subsection includes reagent selection, injection layout, injection methods, injection sequencing, injection point management, reagent dosing and batching, and applied conservative tracer design. The monitoring subsection is organized according to operational and performance monitoring, and also presents the Contingency Plan.
- **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 references 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 boring logs, groundwater monitoring forms, laboratory analytical reports, and data validation reports from the prepilot study activities, a Sampling and Analysis Plan/Quality Assurance Project Plan (SAP/QAPP), Health and Safety Plan (HASP), traffic control plan, and example operational logs for field monitoring.

Based on the baseline monitoring results, some revisions to the scope presented in the Work Plan are proposed in this FIWP. This FIWP presents the final pilot study design and any changes from the Work Plan, but generally does not repeat pilot study elements that have not changed from the Work Plan. This FIWP and the Work Plan are integral components of the planned pilot study and together comprise the final pilot study design.

2 Completed Pilot Study Activities

This section summarizes the results of pre-pilot study activities described in the Work Plan. A key objective of these pre-pilot study activities is to update the CSM for the pilot study area and is presented in Section 3.

2.1 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. The utility locate identified a 6-inch-diameter sewer pipe that runs east-west approximately down the center of South Fidalgo Street (shown on Figure 3). Monitoring well locations were adjusted based on the location of the subsurface sewer pipe and to reduce interference with traffic flow along South Fidalgo Street. The final design, presented in Section 4, takes into consideration the sewer line and the successful traffic control implemented during well installation.

Seven new monitoring wells were installed in South Fidalgo Street for pilot study performance monitoring. The wells were installed January 22 through January 29, 2018. The surveyed well locations are shown on Figure 3, and boring logs with soil classifications and well completion details are provided in Appendix A.

- **Dose-response (DR) monitoring wells.** Two DR monitoring wells (DR-1 and DR-2) were installed approximately 5 feet downgradient of the conceptual injection transect.
- **Downgradient performance monitoring wells.** Four monitoring wells were installed to monitor the reactive zone further downgradient through changes in water quality. Three of these locations (PSW-01, PSW-02, and PSW-03) are located approximately 15 feet downgradient of the conceptual injection transect. The fourth location (PSW-04) was installed approximately 50 feet downgradient of the conceptual injection transect, at a similar distance downgradient as existing locations MW-24-30 and MW-24-50, and will also be utilized as downgradient performance monitoring wells.
- **Upgradient monitoring well.** One well (PSW-05) was installed to evaluate upgradient CVOC and geochemical conditions in groundwater entering the pilot study area. This well is located approximately 20 feet upgradient of the conceptual injection transect.

Monitoring wells were installed by Holt Services, Inc (Holt) using hollow-stem auger (HSA) drilling methods described in the Work Plan. With the exception of DR-1, all new monitoring wells were constructed of 2-inch Schedule 40 polyvinyl chloride (PVC) and 10-slot PVC 10-foot screened sections. DR-1 was constructed using a 4-inch PVC casing and 4-inch stainless-steel wire-wrapped 10-foot screened section to allow potential use as an injection well. All monitoring wells were completed at 30 feet below ground surface, except PSW-04, which was completed at 31 feet below ground surface. Upon

completion, Holt developed all new 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), and the business owner/operators in this busy corridor were notified of planned activities. 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.

2.2 Baseline Groundwater Sampling

Groundwater monitoring data was collected to inform the final pilot study injection design and serve as baseline conditions for performance evaluation. Groundwater samples and water levels were collected at the seven new wells; existing wells MW-24, MW-24-30, and MW-24-50; and existing well PSC-142-40 outside of the CVOC area as a control. Groundwater monitoring was conducted using low-flow sampling methods using a peristaltic pump and flow-through cell in accordance with the SAP (Appendix C). Completed groundwater monitoring field logs and water level measurements are included in Appendix D.

The baseline groundwater analytical results from Analytical Resources Inc. (ARI) are shown in Table 2 and microbiological results from Microbial Insights are shown in Table 3. Water levels and groundwater elevations are presented in Table 4. The complete list of performance monitoring analytes is shown in Table 5, and the specific analyses for each monitoring well are listed in Table 6.

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

3 Updated Conceptual Site Model

A CSM focused on CVOCs in the downgradient TCE area in South Fidalgo Street 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

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 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 was presented in the Work Plan and repeated here as an important reference for pilot testing:

- **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 upper half of the Shallow Interval from 20 to 30 feet bgs. Groundwater at the Site is encountered at a depth of 3 to 10 feet bgs. The depth to groundwater observed at new Shallow Interval monitoring wells ranged from 5.62 to 6.12 feet bgs. Groundwater elevations observed during baseline groundwater monitoring are presented in Table 4. Observed groundwater conditions were consistent with the CSM presented in the Work Plan.

3.2 Groundwater Geochemistry

This section describes updates to the understanding of groundwater geochemistry in the pilot study area. Groundwater geochemical conditions across the Site have been previously reported to be mildly to moderately reducing (Aspect, 2015). The following bullets summarize the new groundwater analytical results from the pilot study area relative to the CSM presented in the Work Plan.

- Under iron-reducing conditions, relatively insoluble and naturally occurring ferric iron (Fe^{3+}) is reduced to more soluble ferrous iron (Fe^{2+}); therefore, greater dissolved iron concentrations in groundwater indicate iron-reducing conditions. The Work Plan presented elevated dissolved iron in groundwater wells MW-26-

40 and MW-26-50 upgradient of East Marginal Way, indicating iron-reducing conditions. However, significantly lower dissolved iron concentrations are observed at MW-24-30 and MW-24-50 in South Fidalgo Street. The new monitoring data, albeit exhibiting a wide range in dissolved iron concentrations, corroborate iron-reducing conditions (Figure 4).

- The presence of sulfate-reducing conditions was uncertain based on the sulfate concentrations presented in the Work Plan that varied widely both in horizontal and vertical extent. The new monitoring results indicate a more consistent range in sulfate concentrations within the pilot study area. Sulfate concentrations in new Shallow Interval monitoring wells ranged from 11.1 to 40.5 milligrams per liter (mg/L); (Figure 4), which do not indicate sulfate-reducing conditions.
- Total organic carbon (TOC), which represents the electron donor for electron acceptors (iron, sulfate, etc.) in redox reactions, was detected at concentrations below 10 mg/L with the exception of DR-01 at 18.2 mg/L (Figure 4). These levels of TOC are generally regarded as indicating that organic carbon is being metabolized and that more reducing conditions are limited by the availability of organic carbon (Wiedemeier et al., 1998).
- The most direct indication of redox conditions (relative to attenuation of CVOCs in groundwater) is the presence of dechlorination end products ethene and ethane. The detection of ethane at all Shallow Interval monitoring locations except DR-01 and PSW-05 (Figure 5) confirm the presence of a native microbial community capable of completely dechlorinating TCE to nontoxic end products.
- The Microbiological results confirm there is *Dehalococcoides* (DHC) present, a species known to be capable of complete reductive dechlorination of PCE and TCE to nontoxic products ethene and ethane (Table 3). Additional microbiological monitoring is proposed to evaluate population and diversity changes to the microbial community during pilot testing discussed in Section 5.2.2.

3.3 Nature and Extent of CVOC Contamination

The Work Plan determined that the pilot study will be conducted in the vicinity of temporary groundwater sample locations PSC-Q32 and PSC-Q32-D in part based on the high historical concentrations of CVOCs detected those locations. However, because temporary groundwater sampling methods can result in biased-high concentrations (primarily due to turbid samples) and the age of these data (12 and 15 years old) well installation and baseline groundwater monitoring was conducted before the final pilot study design to provide a more current and detailed analysis of CVOC concentrations in the pilot study area. Results indicated the following:

- TCE was detected in all new monitoring well locations, at concentrations up to 382 micrograms per liter (ug/L). The higher TCE concentrations appear to be in the southern half of the pilot study area (Figure 6).
- cis-1,2-dichloroethene (DCE) and vinyl chloride were also detected in all new monitoring well locations at concentrations as high as 277 and 27.4 ug/L,

respectively. The maximum concentration of vinyl chloride was observed at MW-24-30 (Figure 6).

Overall, these data confirm the Work Plan CSM that was based on the old temporary groundwater data. The pilot study area contains elevated concentrations of TCE and daughter products; and, is an ideal target for pilot testing. Further, the well network contains a relatively consistent molar concentration of total CVOCs with different amounts of degradation products (Figure 7).

4 Pilot Study Overview

4.1 Approach

A field-scale pilot study will be conducted in the Downgradient TCE Plume Area in South Fidalgo Street. The Final FS (Aspect, 2016) conceptualized active treatment along the entire length of South Fidalgo Street, which is oriented more parallel to groundwater flow than orthogonal. The pilot study injection transect is oriented orthogonal to groundwater flow. This orientation maximizes the treatment downgradient of the injection transect (i.e., advection-controlled, physical flushing via a clean-water front generated within the reactive zone).

The injection reagent will be delivered through an array of injection points to create a continuous reactive zone, targeting 20 to 30 feet bgs in the Shallow Interval and spanning the width of access within the right-of-way (ROW), as shown on Figure 8. Two injection lines of staggered direct-push (DP) points spaced 6 feet apart will be installed to maximize distribution across the target treatment zone, allow thorough evaluation of the technology, and not be limited by reagent distribution.

The Work Plan included a detailed discussion of the EAnB and ISCR technologies, and a comparative evaluation of the two. Both technologies were considered effective for the Downgradient TCE Plume Area. Based on this comparative evaluation, the primary differences are the reagent chemistry relative to groundwater chemistry and the delivery method. Further, the Work Plan indicated that reagent with an ISCR component would be selected if the baseline groundwater results indicated concentrations of total CVOCs (specifically TCE) greater than observed at MW-24-30. All baseline TCE concentrations at new monitoring wells were significantly higher than MW-24-30, with concentrations as high as 382 ug/L observed at DR-02.

Therefore, a reagent with an ISCR component will be used in pilot testing. Further, as presented in the previous section, the baseline groundwater data confirms that native microbial communities are capable of complete reductive dechlorination and the persistent cis-1,2 DCE and vinyl chloride concentrations are likely sourced from natural degradation of the elevated TCE concentrations observed in new monitoring wells. Thus, a reagent with an EAnB component will enhance ongoing reductive dechlorination of cis-1,2 DCE and vinyl chloride concentrations, already present in groundwater, through the addition of an organic carbon to Shallow Interval groundwater. The likely combined approach of ISCR and EAnB presented in the Work Plan will be the approach implemented during pilot testing.

4.2 Objectives

The Final FS (Aspect, 2016) discussed the need for pilot testing of technologies to select and design the final cleanup action. The pilot study is designed to assess the effectiveness and cost of using *in situ* ISCR and EAnB to treat CVOCs in groundwater west of East Marginal Way, to refine remedial alternatives presented in the SU1 FS, and select a preferred remedy. This pilot study is designed based on the following objectives, which have been updated based on the completed pilot study activities:

- 1) **Evaluate the ability to deliver and distribute reagent in Shallow Interval groundwater.** This objective will be evaluated based on the ability to achieve targeted injection volumes and reagent dosing, observe reagent breakthrough, and establish a continuous transect reactive zone through an array of DP injection points. This objective also includes logistical considerations of access, a safe work space in high-traffic areas, and utility locations.
- 2) **Reduce CVOC concentrations at rates greater than observed monitored natural attenuation (MNA) processes.** MNA processes are occurring at the Site and to evaluate effectiveness, post injection CVOC trends at wells influenced by injections will be compared to trends in wells not influenced by injections.
- 3) **Estimate design parameters for implementing the technology.** This includes the longevity of the desired biogeochemical change and associated injection frequency required to maintain the reactive barrier. Other design parameters include radius of influence (ROI)/injection-volume relationship, injection-specific capacity (relationship of injection rate and water level increase), and injection-pressure thresholds.
- 4) **Evaluate performance downgradient of the reactive zone.** Downgradient of the reactive zone in the direction of the Waterway, CVOC concentrations will be reduced through physical flushing of pore spaces via a clean-water front. This will be evaluated using downgradient analytical monitoring and directly measuring groundwater flow rates using an applied, conservative tracer.
- 5) **Evaluate ability to manage secondary effects.** With both the EAnB and ISCR technologies, there are secondary effects inherent to the desired change in CVOC concentrations that should be expected and managed. These include the reductive dissolution of redox-sensitive metals, the generation and potential accumulation of methane, and potential short circuiting of injection solution. The final design includes management elements of a redox recovery zone, a buffer between buildings and injection points, and monitoring of these secondary effects.

These objectives will serve as the basis for performance evaluation during the pilot study. The following sections described the final pilot study design.

5 Pilot Study Design

5.1 Reagent Injections

5.1.1 Reagent Selection

The Work Plan presented a detailed evaluation of the ISCR and EAnB technologies based on the CSM. Based on the results of baseline groundwater monitoring and the pilot study objectives, the pilot study will use Peroxychem EHC[®] Liquid Reagent (EHC Liquid), a reagent that was identified as one of the three most likely to be applied in the Work Plan. The EHC Liquid includes a soluble iron compound and ELS[™] microemulsion that are mixed and diluted on Site for injection. The reagent vendor will supply the EHC Liquid in powder form in 24.5-pound bags and the ELS[™] microemulsion (diluted to 25 percent) in 55-gallon drums.

This reagent is demonstrated effective at degradation through abiotic (ISCR) and biologically mediated (EAnB) degradation. Further, the selection of this reagent was based on the higher solubility relative to other ISCR reagents and, thus, associated ease of delivery, and more repeatable and predictable distribution through lower pressure, nonfracturing injections.

The product sheets and the vendor's mixing guidelines are included in Appendix C and the Safety Data Sheets (SDSs) included in the HASP in Appendix F.

5.1.2 Injection Layout

A reactive zone will be created through an array of injection points (IP) targeting a continuous reactive zone in the Shallow Interval (targeting 20 to 30 feet bgs) and spanning the width of ROW access, as shown on Figure 8. Injection tooling deployed with DP technology will be used to implement the injections. The DP technology is proven able to achieve the target maximum depths of 30 feet. The IP configuration depicted on Figure 8 is based on the following design.

- **Target Vertical Interval.** A target injection interval of 15 feet (17.5 to 32.5 feet bgs) was used in design calculations (Table 7). Treatment will be evaluated based on performance monitoring of wells screened from 20 to 30 feet bgs—the injection targets an additional 5 feet of aquifer thickness as a robust approach to ensure sufficient aquifer volume is influenced to evaluate the technology. Specifically, this additional thickness would help offset any effects of vertical hydraulic or injection solution density gradients, and high reagent dilution/dispersion rates.
- **Radius of Influence (ROI).** A target ROI of 3 feet per IP. This is calculated based on an assumed mobile porosity of 15 percent (Payne et al, 2008). Based on this target ROI, a mobile pore volume of each ROI is calculated as 476 gallons.
- **IP Transects.** Two transects of nine IPs spaced 6 feet apart will be used to create a reactive zone oriented orthogonal to groundwater flow (Figure 8). The two transects will achieve the most continuous distribution as DP injections will allow

as the points within each transect will be offset. The IP spacing along each transect will be 6 feet, according to the target ROI.

- **Physical Limitations.** There are two features that influence injection layout: a 6-inch sanitary sewer line and a fenced storage area adjacent to the southern building, both depicted on Figure 8. A 6-foot buffer will be marked along the sanitary sewer line during the DP injections.

This configuration will be modified in the field, as necessary, based on pedestrian and vehicle traffic. The methods of injection are described in the following section.

5.1.3 Injection Methods

The selected reagent is water soluble; therefore, lower pressure injections and porous distribution are targeted to minimize any fracturing of the aquifer formation. If necessary to achieve target injection volumes and reagent delivery, pressures will be increased and monitored for any indications of fracturing or short circuiting.

The DP injection contractor will utilize conventional screen points. This method uses standard DP tooling for groundwater sampling. A concealed screen and an expendable point are fixed to the bottom of the drill rods. The rods are driven to the desired depth and then retracted, exposing a stainless-steel screen. This screen allows the borehole to stay open across the injection interval, providing increased surface area for reagent delivery. Standard drive points are available in either 4- or 5-foot screen lengths. The screen point will be advanced to approximately three depths for discrete injections:

- 27.5 – 32.5 feet bgs
- 22.5 – 27.5 feet bgs
- 17.5 – 22.5 feet bgs

The estimated ROI pore volume is targeted with an injection volume of 500 gallons per IP (Table 7). One-third of that target injection volume, or approximately 165 gallons will be targeted at each interval.

5.1.4 Injection Point Abandonment and Permitting

Each injection point will be abandoned with bentonite or neat cement to ground surface after the injections are completed and in accordance with WAC 173-160-451.

The proposed injection points are considered Class V underground injection wells that are subject to the Underground Injection Control (UIC) Program, WAC 173-218. The Site is being managed pursuant to Agreed Order 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 agreed order. However, the injection points will be registered with Ecology's UIC program using their online registration tool.

5.1.5 Injection Sequencing

The DP injection vendor will utilize a header system to inject multiple points simultaneously. No two adjacent points will be injected at the same time to reduce

potential of short circuiting and hydraulic interference. The header system will be instrumented to allow monitoring of flow and pressure, discussed further in Section 6.2.

Further, because of the high vehicular traffic, the injections will be performed in two phases to allow traffic control of one lane of traffic on South Fidalgo Street:

- IPs north of PSW-2 with dose-response monitoring at DR-1, and downgradient monitoring of PSW-01, and PSW-02. Traffic will be routed to the south during this phase around the injection equipment, see Appendix B.
- IPs south of PSW-2 with dose-response monitoring at DR-2, and downgradient monitoring of PSW-03. Traffic will be routed to the north during this phase around the injection equipment, see Appendix B.

Each phase will begin with the IP closest to the DR monitoring location to evaluate the ROI/injection-volume relationship for this injection method. Breakthrough monitoring is discussed in Section 5.2.2.

5.1.6 Reagent Dosing and Batching

The reagent dosing calculations are presented in Table 7. The reagent formulation will be prepared in 500-gallon batches consisting of 450 gallons of makeup water, 50 gallons of ELS microemulsion, and one 24.5-pound bag of EHC Liquid powder. The vendor mixing procedures are included in Appendix C. The ELS microemulsion is preemulsified and the EHC Liquid soluble; therefore, both reagents will readily dissolve. Each batch will be mixed for a minimum of 10 minutes before injections are commenced.

Aspect, or their DP injection contractor, will apply for water hydrant use permit issued by Seattle Public Utilities. Once issued, this permit will allow the use of SPU hydrant for makeup water. A hydrant on the west side at South Fidalgo Street is planned to avoid crossing Highway 99 repeatedly with a water truck. If available, the DP injection contractor may use a larger capacity tank (e.g., 1,000 gallons) to minimize trips to the hydrant.

Reagent batches will be injected completely before demobilizing for the day and no batch solutions will be stored overnight or for any extended period of time.

A total of 18 500-gallon batches will be necessary to achieve the targeted injection volume and delivery of total reagent quantities.

5.1.7 Applied Conservative Tracer

An applied tracer will be added to the injection solution to support evaluation of pilot study objectives identified in Section 5.2. The fluorescent tracer, Rhodamine WT (RWT), has been selected for use in pilot testing due to the availability of RWT in dissolved form. Ozark Underground Laboratory (OUL) in Protom, Missouri, will be used as the supplier of tracer and tracer analytical testing. The RWT SDS is included in the HASP (Appendix F).

The applied tracer dosing is designed to prevent discharge of fluorescent water to the Waterway. This is discussed in detail in the Work Plan, which identified a maximum

injection concentration of 10 mg/L based on literature and protection of potential Waterway aquatic receptors. Protection of any potential Waterway aquatic receptors will be further ensured through the contingency plan described in Section 5.2.3.

Based on the final injection design presented herein, an applied tracer concentration of 10 mg/L will be targeted in the injection solution. This requires the addition of 18 grams of RWT per 500-gallon batch of injection reagent (Table 7). Aspect will coordinate premeasurement, and predilution of this dosing with OUL to ease application during pilot testing.

5.2 Monitoring

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. The operational monitoring elements and objectives consist of:

- **Injection rate, volume, and pressure.** The injection rate and pressure at each IP will be monitored continuously and recorded at least hourly throughout the injections. Injection rate will be measured individually at each IP, and pressure measured at the IP wellhead. Injection pressures will be managed to achieve reasonable injection rates and avoid formation fracturing, if possible. Formation fracturing would be indicated by either a loss in pressure and associated increase in injection rate. The total injection volume per point (and per depth interval) will also be recorded.
- **Reagent dosing.** A minimum of two samples will be collected from the batch injection solution and analyzed for TOC and total iron (Table 5) by ARI Laboratories, and for RWT by OUL. If the batch quantities are modified during the injections, a sample of the revised reagent solution will be submitted for the same analysis.
- **Water level monitoring.** Manual water level monitoring of monitoring wells and any injection points not being actively injected will be performed. Manual water levels will be measured at DR-01, DR-02, PSW-01, PSW-02, PSW-03, PSW-04, MW-24-30, and MW-24-50 at least twice daily while injections are occurring.

Additionally, pressure transducers will be deployed in DR-01 and PSW-04 to record water levels every 10 minutes to assess response to the injections. This is a change from the Work Plan, which indicated both DR wells would be instrumented with pressure transducers. The change is recommended to have a greater difference in groundwater elevations and to have one location not hydraulically influenced by injections. These pressure transducers will remain

deployed after the injection event for longer-term monitoring of water levels and tidal influences in the pilot study area.

- **Breakthrough monitoring.** Breakthrough monitoring at the DR monitoring wells will consist of a one-well-volume purge and a grab sample. Breakthrough monitoring samples will be collected every hour or every 50 gallons injected, whichever is more frequent. The grab sample will be field screened against visual standards (to estimate tracer strength). Based on field screening, samples will be submitted to OUL for laboratory analysis of tracer to develop breakthrough curves. Additionally, after reagent breakthrough as indicated by visual tracer, at least one sample will be collected for analysis of TOC and dissolved iron.

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

5.2.2 Performance Monitoring

Performance monitoring will be initiated at the end of the pilot study injections to evaluate the objectives described in Section 4.2. The analytes to be evaluated are listed in Table 5, and the locations and frequency presented in Table 6. The monitoring frequency is based on the average groundwater and TCE transport velocities calculated in the Work Plan. Changes to the monitoring program presented in the approved Work Plan are as follows:

- The addition of microbiological analysis during the 6-month sampling event. These data will be useful in confirming an enhanced microbial community associated with the EAnB approach.
- Nitrate/Nitrite will not be analyzed as a redox couple and indicator of changes in redox conditions based on groundwater monitoring results in which these compounds were not detected in the pilot study area. The evaluation of enhanced reducing conditions will rely on iron, sulfate, and methane concentrations trends.
- The addition of monitoring of MW-24-30 during the Week 4 event based on the final Contingency Plan, presented in Section 5.2.3.
- Additional short-term monitoring will be conducted at PSW-01, PSW-02, and PSW-03 as discussed below, based on the final injection design and closer proximity of these well locations to the injection ROI.

The performance monitoring schedule may be modified if observations warrant a change. Any modifications to the schedule in Table 6 will be discussed with Ecology. The performance monitoring program consists of:

- **Short-term monitoring.** Samples will be collected from DR monitoring wells immediately following injection completion (0 days elapsed), Week 1, Week 2, Week 4, Month 2, and Month 3 (Table 6). Additionally, samples will be collected from PSW-01, -02, and -03 at 0 days and Week 1 for visual screening for tracer (and laboratory analysis if observed). At Weeks 2 and 4, in addition to the DR wells, the three new performance monitoring wells will also be sampled. At Month 2, the fourth new performance monitoring well and wells MW-24-30 and

MW-24-50 will be sampled. This progression of monitoring locations downgradient during the first quarter of monitoring is based on the expected progression of changes in geochemical and CVOC concentrations resulting from injections.

- **Longer-term monitoring.** Following the first quarter, the monitoring frequency will be reduced to quarterly (Months 6, 9, and 12) at all monitoring locations (Table 6). Continued monitoring beyond 1 year may be necessary for complete evaluation of pilot study objectives. This need will be determined during the planned longer-term monitoring and discussed with Ecology.

Monitoring methods will be performed in accordance with the SAP/QAPP (Appendix C) project standard operating procedures (PGG, 2017; Aspect, 2008).

5.2.3 Contingency Plan

The application of *in situ* remediation technologies requires the careful management of nontarget, secondary reactions and effects that require monitoring and contingency actions, if conditions warrant. The pilot study is designed at a scale to minimize the secondary effect footprint and to provide information necessary for full-scale design (see Pilot Study Objectives in Section 4.2). This pilot study carefully considers design parameters, such as planned injection transect length, dosing, and distance from Waterway to prevent any exposure risk to aquatic receptors. However, a Contingency Plan is developed to outline actions to take during the field pilot study if monitoring results indicate a potential exposure risk. A draft Contingency Plan was presented in the Work Plan. The Contingency Plan presented in this FIWP is final and incorporates the baseline monitoring results.

An element added to this final Contingency Plan is the recognition and monitoring of pH change associated with organic carbon fermentation and generation of volatile fatty acids, which can reduce groundwater pH to levels toxic (<5 s.u.) to biological processes (Lutes et al, 2004). This secondary effect is balanced with the reagent dosing in this pilot test design. No engineered pH buffering is planned with the initial injection event; however, it would be considered if the monitoring indicates a groundwater pH that would affect the ability to achieve pilot test objectives.

The performance monitoring well, MW-24-30, the most downgradient performance monitoring well in the Shallow Interval targeted with injections, is proposed to trigger contingency actions (Figure 3). Monitoring well MW-24-30 is located approximately 32 to 67 days of groundwater travel time downgradient of the injection transect, based on the estimated average groundwater seepage velocity presented in the Work Plan. The Waterway, the exposure point this Contingency Plan is designed to protect, is 160 to 335 days of groundwater travel time downgradient of the injection transect. These travel time estimates show that monitoring conditions at well MW-24-30 provides adequate time for contingency response actions protective of the Waterway.

The planned monitoring of MW-24-30 is outlined in Table 8. The monitoring results will be compared to the following triggers for contingency actions:

- **Redox-sensitive metals:** Arsenic and manganese have preliminary cleanup levels (PCULs) protective of surface water of 5 and 100 ug/L, respectively (Table 7). The baseline concentrations of arsenic and manganese at MW-24-30 are 0.142 and 368 ug/L, respectively.

Additionally, as mild to moderate reducing conditions already exist, baseline results indicate manganese concentrations above PCULs. Further, dissolved manganese concentrations as high as 573 ug/L are observed in the pilot study network. Thus, the contingency trigger for dissolved manganese is updated to be 2x the maximum baseline concentration observed, or 1,146 ug/L.

The trigger concentration for dissolved arsenic concentration is the PCUL of 5 ug/L.

- **Fluorescent tracer:** Triggered by a measured tracer concentration of greater than the 1 mg/L aquatic toxicity threshold discussed the Work Plan.
- **Methane:** The generation of methane is a desired condition for enhanced reductive dechlorination. There are no relevant aquatic toxicity data for methane. However, the potential to accumulate in the vadose zone in the vicinity of structures is an explosive hazard that warrants a contingency trigger. The methane trigger is a measured methane concentration of 10x greater the baseline concentration. Given this trigger is to protect structures and not the Waterway, this condition will be triggered based on a result from any PSW monitoring location (Table 6).

If any of these conditions are observed, the following sequence of contingency actions would be implemented:

- 1) If the next monitoring event is not within 1 month, per Table 4, an additional monitoring event will be conducted within 1 month to verify the condition. If the condition is verified, proceed to next action.
- 2) a) Establish appropriate sampling to continue monitoring the observed condition. This contingency monitoring would be proposed to and approved by Ecology, and would include more frequent monitoring of the observed condition, at a minimum.
b) Evaluate the aquatic exposure risk of the observed condition at the Waterway. This evaluation would include an estimate of the attenuation observed in the pilot study area and applying this estimate to the groundwater pathway from the pilot study area to the Waterway. If this evaluation indicates there is a potential risk, proceed to the next action.
- 3) Given the estimated groundwater travel time to the Waterway and the next downgradient Shallow Interval monitoring wells are adjacent to the Waterway (PSC-CG-151-25, MW-22-30, MW-23-30), an additional Shallow Interval monitoring well would be installed in the vicinity of MW-24 for contingency monitoring. The contingency monitoring at this new location would be consistent with that approved in Step 2) a) above.

- 4) If the observed contingency condition is observed at the new monitoring well, an appropriate contingency action would be proposed to Ecology in a contingency action plan submitted to Ecology for approval within 10 days of receiving the analytical result. The next contingency action would be designed to address the specific condition, and actions could include pumping to establish hydraulic control, oxidation to offset a condition created by reducing conditions, or passive (or active) vapor relief to address a methane concern.

Any warranted modifications to this Contingency Plan will be communicated to Ecology for approval.

6 Project Organization

6.1 Roles and Responsibilities

The project organization is led by Aspect who will engage the necessary subcontractors to complete the pilot study. All team members are responsible for execution of work in accordance with the Work Plan and the Final FIWP. The 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 the Work Plan and the Final FIWP. The field manager will manage procurement of necessary field supplies, ensure that monitoring equipment is operational and calibrated in accordance with the specifications provided herein, and act as the Site Health and Safety Officer.
- **DP Injection Contractor.** Aspect will contract with a Washington State-licensed driller to implement the reagent injections. The DP Injection Contractor is responsible for providing the necessary injection equipment and implementing the reagent injections according to the Work Plan and the Final FIWP. The DP Injection Contractor will also be responsible for applying for the hydrant use permit and complying with all SPU requirements. Contractor selection and contracting will occur after the Final FIWP is approved by Ecology.
- **Other Subcontractors.** Numerous other subcontractors are necessary to complete the pilot testing activities, including analytical laboratories (ARI Laboratories and OUL), IDW disposal, and the reagent vendor, PeroxyChem. The subcontractors are responsible for conforming to the Work Plan and the agreed-to scope with Aspect.

6.2 Project Plans

A SAP/Supplemental QAPP is included as Appendix C. 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 was effective and appreciated by operating businesses on South Fidalgo Street and the truck traffic. This plan will be revisited and updated for reagent injections. A HASP for the pilot study activities is presented in Appendix F.

6.3 Schedule and Reporting

A detailed estimated schedule of pilot study activities is presented on Figure 9. It is estimated that the FIWP will be final on June 8, 2018. Subcontracting, permitting, and adjacent business coordination will require an estimated 2 months, and it is anticipated that the reagent injections will occur the week of August 13, 2018. The postinjection performance monitoring will be implemented on the dates presented on Figure 9, and the completion of 1 year of performance monitoring would be in July 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, 2017), a Final FIWP, and a Pilot Study Completion Report. Data collected during the pilot study, including injection results and postinjection 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 a draft submitted to Ecology within 45 days of receiving all analytical data. The Pilot Study Completion Report will include conclusions regarding the pilot testing and the potential effectiveness of the technology for the final cleanup action.

7 References

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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	Distance Downgradient of Target ROI (feet)	Installation Date	Coordinates (WA SPN NAD83 US FT)		Ground Surface Elevation (feet)	Top of Casing Elevation (feet)	Casing Diameter (inches)	Screen Material	Screen Length (feet)	Screen Depth (feet bgs)		Groundwater Monitoring Interval
				Easting	Northing								
DR-01	Dose Response	0	1/22/2018	1269059.96	204245.23	12.92	12.59	4	SS	10	20	to 30	Shallow
DR-02	Dose Response	0	1/24/2018	1269062.73	204228.82	12.90	12.68	2	PVC	10	20	to 30	Shallow
PSW-01	Downgradient Performance Well	8	1/23/2018	1269049.44	204250.24	13.24	12.88	2	PVC	10	20	to 30	Shallow
PSW-02	Downgradient Performance Well	8	1/23/2018	1269054.75	204235.42	12.77	12.46	2	PVC	10	20	to 30	Shallow
PSW-03	Downgradient Performance Well	8	1/25/2018	1269057.44	204219.44	13.09	12.86	2	PVC	10	20	to 30	Shallow
PSW-04	Downgradient Performance Well	45	1/25/2018	1269020.08	204205.45	13.11	12.89	2	PVC	10	21	to 31	Shallow
PSW-05	Upgradient Performance Well	NA	1/24/2018	1269086.78	204254.62	13.27	12.95	2	PVC	10	20	to 30	Shallow
PSC-CG-142-40	Existing Control Well	NA	3/13/2002	1269446.93	204977.19	17.16	16.63	2	PVC	10	40	to 50	Intermediate
MW-24	Existing Monitoring Well	161	3/13/2010	1268903.72	204206.13	12.63	12.32	2	PVC	10	5	to 15	Water Table
MW-24-30	Existing Monitoring Well	65	3/13/2010	1268998.87	204216.07	13.01	12.72	2	PVC	10	20	to 30	Shallow
MW-24-50	Existing Monitoring Well	62	3/13/2010	1269002.05	204216.00	13.00	12.56	2	PVC	10	40	to 50	Intermediate

Notes:

Elevation datum is NGVD88

SS - Stainless-steel wire-wrapped

bgs - below ground surface

ROI - radius of influence

Table 2. Baseline Groundwater Analytical Results

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

Chemical Name	Units	Dose Response Wells		Downgradient Performance Wells							Upgradient Performance	Control Well
		DR-01 01/29/2018	DR-02 01/30/2018	PSW-01 01/30/2018	PSW-02 01/30/2018	PSW-03 01/30/2018	PSW-04 01/30/2018	MW-24 01/31/2018	MW-24-30 01/29/2018	MW-24-50 01/30/2018	PSW-05 01/30/2018	PSC-CG-142-40 01/29/2018
		DR-1-012918	DR-2-013018	PSW-1-013018	PSW-2-013018	PSW-3-013018	PSW-4-013018	MW-24-013118	MW-24-30-012918	MW-24-50-013018	PSW-5-013018	PSC-CG-142-40-012918
VOCs												
1,1,1-Trichloroethane	ug/L	< 1 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 1 U	< 0.20 U	< 0.20 U	< 0.2 U
1,1-Dichloroethane	ug/L	1.17	2.03	1.22	1.64	2.19	0.92	< 0.20 U	2	< 0.20 U	0.76	< 0.2 U
1,1-Dichloroethene	ug/L	< 1 U	0.53	1.42	0.55	0.59	0.55	< 0.20 U	3.24	< 0.20 U	0.29	< 0.2 U
1,2-Dichloroethane (EDC)	ug/L	< 1 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 1 U	< 0.20 U	< 0.20 U	< 0.2 U
Chloroethane	ug/L	< 1 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 1 U	< 0.20 U	< 0.20 U	< 0.2 U
Tetrachloroethene (PCE)	ug/L	< 1 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 0.20 U	< 1 U	< 0.20 U	< 0.20 U	< 0.2 U
Trichloroethene (TCE)	ug/L	53.7 J	382	20	45.1	328	124	< 0.20 U	< 1 UJ	< 0.20 U	264	< 0.2 UJ
cis-1,2-Dichloroethene (DCE)	ug/L	201	124	107	277	130	158	0.13 J	256	< 0.20 U	63.3	0.27
trans-1,2-Dichloroethene	ug/L	4.72	7.49	4.36	5.82	5.92	6.15	< 0.20 U	9.85	< 0.20 U	5.05	< 0.2 U
Vinyl Chloride	ug/L	13.5	9.47	16	16.5	12	27.4	< 0.20 U	65.1	< 0.20 U	6.61	< 0.2 U
Dissolved Gases												
Ethane	ug/L	< 1.23 U	10.2	10.9	8.7	7.12	6.93	< 1.23 U	13.6	< 1.23 U	< 1.23 U	< 1.23 U
Ethene	ug/L	< 1.14 U	< 1.14 U	< 1.14 U	< 1.14 U	< 1.14 U	< 1.14 U	< 1.14 U	8.82	< 1.14 U	< 1.14 U	< 1.14 U
Methane	ug/L	7,210	1,480	11,200	5,110	1,640	5,660	11,500	5,700	6,290	1,680	4,810
General Chemistry Parameters												
Chloride	mg/L	18.7	14.6	18.8	16.8	14.8	17		16.5	11.1	14.7	15.3
Nitrate as Nitrogen	mg/L	< 0.1 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U		< 0.1 U	< 0.100 U	< 0.100 U	< 0.1 U
Nitrite as Nitrogen	mg/L	< 0.1 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U	< 0.100 U		< 0.1 U	< 0.100 U	< 0.100 U	< 0.1 U
Sulfate	mg/L	40.5	35.7	11.1	11.4	26.3	31.5		5.4	0.198	16.3	0.578
Total Organic Carbon	mg/L	18.2	5.96	6.51	6.29	5.3	8.31		6.64	4.1	6.76	4.89
Redox-Sensitive Metals												
Arsenic (Dissolved)	ug/L	1.61	1.55	1.23	1.85	0.613	2.29		0.142	0.114 J	1.11	0.372
Barium (Dissolved)	ug/L	18.8	10.6	5.65	15.4	5.82	9.89		1.63		12.4	7.63
Iron (Dissolved)	ug/L	5,130 J	12,300	8,380	1,340	8,720	4,700		4,620 J	1,260	14,000	2,280 J
Manganese (Dissolved)	ug/L	434	573	514	333	352	320		368	121	566	333
Fluorescent Tracer												
Eosine	ppb	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U		< 0 U	< 0 U	< 0 U	
Fluorescein	ppb	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U		< 0 U	< 0 U	< 0 U	
Rhodamine WT	ppb	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U		< 0 U	< 0 U	< 0 U	
Sulforhodamine B	ppb	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U	< 0 U		< 0 U	< 0 U	< 0 U	
Field Parameters												
Temperature	deg C	14.1	13.2	14.7	14	13.9	14.6	11.6	13.9	14.6	13.5	14
Specific Conductance	uS/cm	530	397.1	404	308.8	374.2	424	642	343	101.9	419.1	330
Dissolved Oxygen	mg/L	0.09	0.13	0.09	0.13	0.16	0.1	0.1	0.13	0.1	0.13	0.13
pH	pH units	6.62	6.67	6.62	6.76	6.51	6.76	6.75	6.61	6.21	6.5	6.87
Oxidation Reduction Potential	mV	-53.9	-0.3	-46.5	-3.8	-40.9	-65.3	-51	-69.9	-3.8	-35	-96.8
Turbidity	NTU	20.1	20.2	11	98	13	26	13	9.9	1	12	3.3
Iron, Ferrous, Fe+2	ppm	2.5	6	3	1.5	2	2	1.75	6	1.5	2	3.5

Notes:

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

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

ug/L - micrograms per liter

mg/L - milligrams per liter

ppb - parts per billion

deg C - degrees Celsius

uS/cm - microsiemens per centimeter

mV -millivolts

NTU - nephelometric turbidity units

ppm - parts per million

Aspect Consulting

4/4/2018

V:\050067 Art Brass Plating\Pilot Study\CVOCs\Field Implementation Work Plan\Client Review Draft\Tables\02 Baseline GW Results.xlsx

Table 2

CVOC Pilot Study Field Implementation Work Plan

Table 3. Baseline Microbiological Results

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

Analyte	Units	DR-01 02/28/2018 DR-1-022818	MW-24-30 02/28/2018 MW-24-30-022818	PSC-CG-142-40 02/28/2018 PSC-CG-142-40-022818
CENSUS				
Dehalococcoides (DHC)	cells/bead	32.9	25.0 U	5.20 J
PLFA				
Anaerobic metal reducers (BrMonos)	%	0.0 U	0.0 U	0.0 U
Decreased Permeability	ratio trans/cis	0.213	0.177	0.0 U
Eukaryotes (polyenoics)	%	1.16	1.43	0.7
Firmicutes (TerBrSats)	%	12.8	0.0 U	0.77
Normal Saturated (Nsats)	%	16.5	22.7	26.0
Proteobacteria (Monos)	%	65.3	75.9	72.6
Slowed Growth	ratio cy/cis	0.111	0.226	0.328
SRB/Actinomycetes (MidBrSats)	%	4.24	0.0 U	0.0 U
Total Biomass	cells/bead	3.88E+05	9.25E+04	1.30E+05

Notes:

J - Analyte was positively identified below the reporting limit. 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)
DR-01	1/29/2018	12.59	5.68	6.91
DR-02	1/29/2018	12.68	5.83	6.85
PSW-01	1/29/2018	12.88	6.06	6.82
PSW-02	1/29/2018	12.46	5.62	6.84
PSW-03	1/29/2018	12.86	6.04	6.82
PSW-04	1/29/2018	12.89	6.12	6.77
MW-24	1/31/2018	12.32	4.12	8.20
MW-24-30	1/29/2018	12.72	5.89	6.83
MW-24-50	1/29/2018	12.56	5.72	6.84
PSW-05	1/29/2018	12.95	6.06	6.89
PSC-CG-142-40	1/29/2018	16.63	8.52	8.11

Notes:

Elevation datum is NGVD88.

amsl - above mean sea level

bTOC - below top of casing

ft - feet

Table 5. Monitoring Program - Analyte List

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

Analyte	Analytical Method	Purpose
CVOCs and Degradation Products		
Volatile Organic Compounds (VOCs)	EPA 8260B	
Dissolved gases; ethane, ethene, methane	RSK-175	Degradation end-product (ethene and ethane); redox indicator (methane)
General Chemistry		
Total Organic Carbon (TOC)	EPA 415.1 (or SW-846 Method 9060)	Electron donor
Chloride	EPA 300.0	ERD reaction product
Sulfate	EPA 300.0	Electron acceptor/ Redox Indicator
Iron (Dissolved) ²	EPA 6020 or 6010B	Electron acceptor/redox indicator
Redox-Sensitive Metals		
Arsenic, Barium, and Manganese (Dissolved)	EPA 6020 or 6010B	Redox-sensitive COCs
Microbiological Analysis		
Phospholipids fatty acids	PLFA - Biotrap	Microbiological community indicator
CENSUS- Dehalococcoides	CENSUS - Biotrap	Microbiological community indicator
Field Parameters		
Fe(II)/Fe(III) ¹	Hach ferrous iron kit, in field	Electron acceptor/Redox Indicator
Total Dissolved Solids	Multimeter	Field parameter
Specific conductance	Multimeter	Field parameter
Dissolved oxygen	Multimeter	Field parameter
pH	Multimeter	Field parameter
ORP	Multimeter	Field parameter
Turbidity	Turbidimeter	Field parameter

Notes:

1. Fe(III) is a calculated value from the difference between total iron and ferrous iron.
 2. Dissolved metals analysis will be field-filtered using a 0.45 micron filter. Reagent solution samples will be analyzed for total iron.
- ERD - Enhanced Reductive Dechlorination

Table 6. Groundwater Monitoring Program

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

	Baseline		Performance Monitoring (time elapsed postinjection)								
	(Completed January 2018)	Before Injection	0 days	Week 1	Week 2	Week 4	Month 2	Month 3	Month 6	Month 9	Month 12
DR-1	1,2,3,4,5,6	1,2,3	1,2,3,4,5	1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5	1,2,3,4,5,6	1,2,3,4	1,2,3,4,5
DR-2	1,2,3,4,5	1,2,3	1,2,3,4,5	1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5	1,2,3,4,5	1,2,3,4	1,2,3,4,5
PSW-1	1,2,3,4,5	1,2,3	3,4	3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5
PSW-2	1,2,3,4,5	1,2,3	3,4	3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5
PSW-3	1,2,3,4,5	1,2,3	3,4	3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5
PSW-4	1,2,3,4,5	1,2,3					1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5
PSW-5 (upgradient)	1,2,3,4,5	1,2,3				1,2,3		1,2,3	1,2,3	1,2,3	1,2,3
MW-24	1, 3							1, 3	1, 3	1, 3	1, 3
MW-24-30	1,2,3,4,5,6					1,2,3,4	1,2,3,4	1,2,3,4	1,2,3,4,5,6	1,2,3,4	1,2,3,4,5
MW-24-50	1,2,3,4,5						1,2,3,4	1,2,3,4	1,2,3,4,5	1,2,3,4	1,2,3,4,5
PSC-142-40	1,2,3,6								3,6		

Analytes (see Table 6):

- 1 - CVOCs and Dissolved Gases
- 2 - General Chemistry Parameters
- 3 - Field Parameters
- 4 - Applied Tracer
- 5 - Redox Sensitive Metals
- 6 - Microbiological Analysis

Notes:

- DR - dose-response monitoring wells
- PSW - pilot monitoring wells

Table 7. Injection Design

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

Parameter	Value	Units	Notes
Injection Point Layout			
Number of Injection Points	27	points	
Target ROI	3	feet	
Injection Point Spacing	6	feet	
Target Treatment Interval	20-30	feet bgs	
Target Vertical Interval	15	feet	Includes 50 percent safety factor relative to monitoring well intervals. Injections will be applied from 18 to 32 feet.
Injection Point Hydraulics			
Design Mobile Porosity	0.15		Estimated for fine to medium sand (Payne et al, 2008).
Estimated Pore Volume	476	gallons/target ROI	
Target Pore Volume	100%		As percentage of total pore volume.
Target Injection Volume	500	gallons/point	Rounded up to simplify batch quantities.
Total Injection Volume	13,500	gallons	
Reagent Batching			
Selected Reagent	PeroxyChem EHC Liquid		Includes both ELS Microelmsion and EHC Liquid Mix (organo-iron).
ELS Microelmsion TOC Content	25	%	Vendor Formulations
ELS Dilution	11.0%	by volume	
Volume Water	450	gallons/point	
Volume ELS	50	gallons/point	
EHC Liquid Mix	25	lbs/point	
Applied Tracer Design			
Selected Tracer	Rhodamine WT		
Target Injection Concentration	5	mg/L	
Tracer Mass	9	g/Injection Point	
Total Tracer mass	256	g	
Total Quantities			
Total ELS Reagent	1,337	lbs	
Total EHC Liquid Reagent	662	lbs	
Total Water	12,150	gallons	
Total Tracer	256	mg	

Notes:

1 - Includes a 25 percent contingency to allow for 2x injection volume at the six lps located adjacent to the sanitary sewer line.

% - percent

lbs - pounds

g - grams

mg - milligrams

mg/L - milligrams per liter

ROI - radius of influence

Table 8. Contingency Monitoring Matrix

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

Analyte	MW-24-30 Baseline Concentration	Maximum Baseline Concentration (Location)	PCUL	Triggers	Trigger Concentration
Redox-Sensitive Metals					
Arsenic (Dissolved) (ug/L)	0.142	2.29 (PSW-04)	5	> PCUL	5
Manganese (Dissolved) (ug/L)	368	573 (DR-2)	100	> 2x maximum baseline concentration	1,146
Fluorescent Tracer					
Rhodamine WT (mg/L)	ND	ND	--	>1 mg/L (toxicity threshold)	1
Dissolved Gases					
Methane (ug/L)	5,700	11,500 (MW-24)	--	> 10x baseline conc. ¹	57,000

Notes:

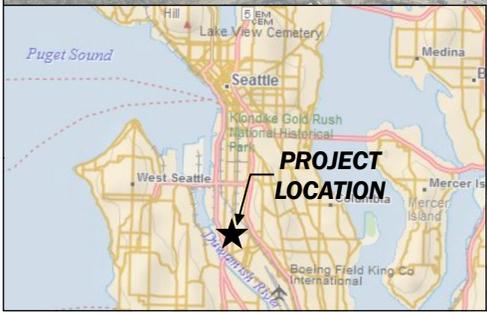
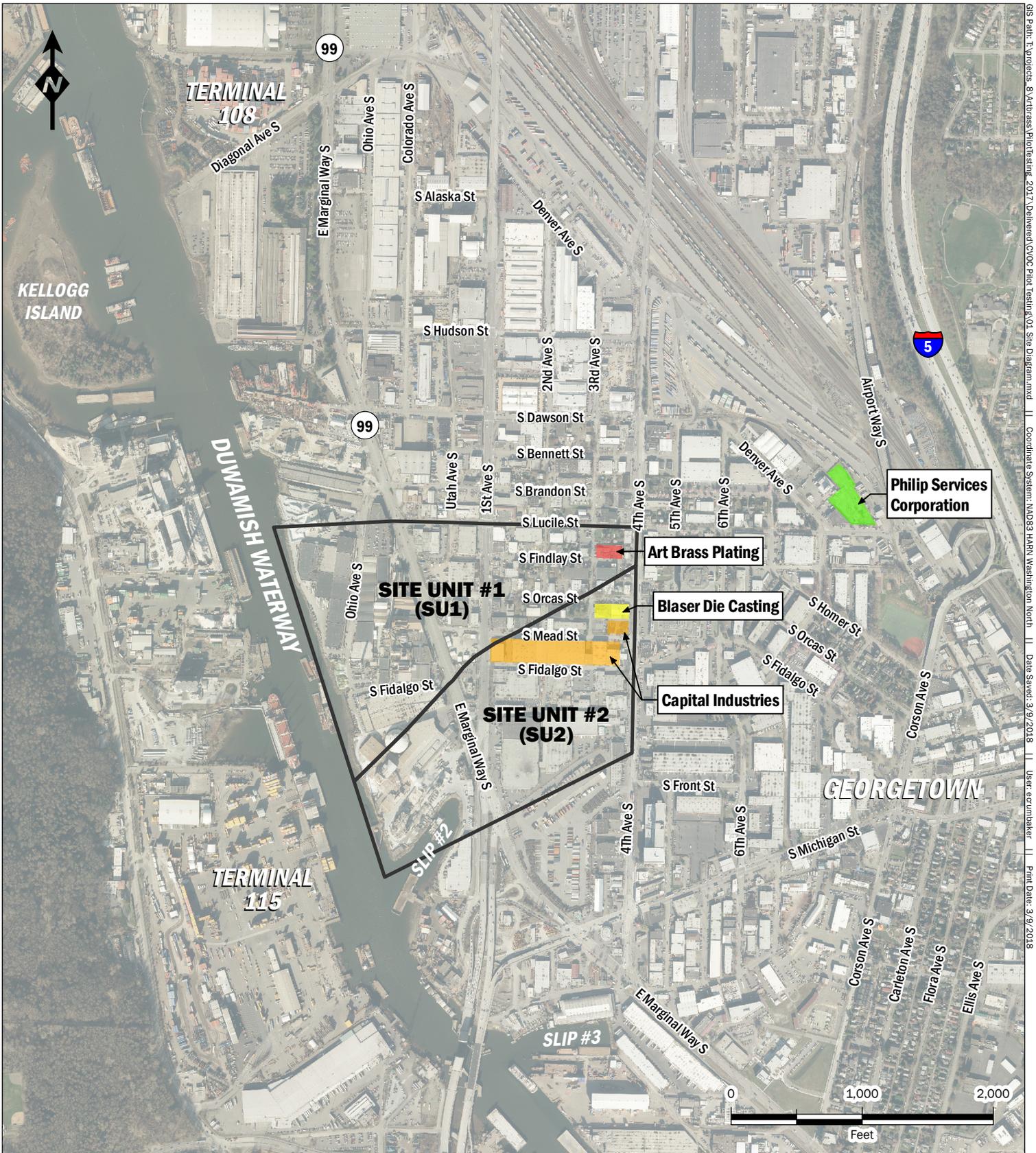
Contingency monitoring will be conducted at MW-24-30.

1 - This is more conservative threshold than 5% LEL for methane.

ug/L - micrograms per liter

mg/L - milligrams per liter

FIGURES



Site Diagram
 CVOC Pilot Study
 Art Brass Plating
 Seattle, Washington

DRAFT

	MAR-2018	BY: PPW	FIGURE: 1
	PROJECT NO. 050067	REVISED BY: DIM / RAP	

GIS Path: I:\Projects_8\Addressing_Plotting_2017\Delivered\CVOC_Pilot_Study\Site Diagram.mxd | Coordinate System: NAD83 HARN Washington North | Date Saved: 3/9/2018 | User: acrum/baker | Print Date: 3/9/2018

Exploration Locations

Symbol (Exploration Type)

- Monitoring Well
- Soil Boring/Probe
- △ Porewater

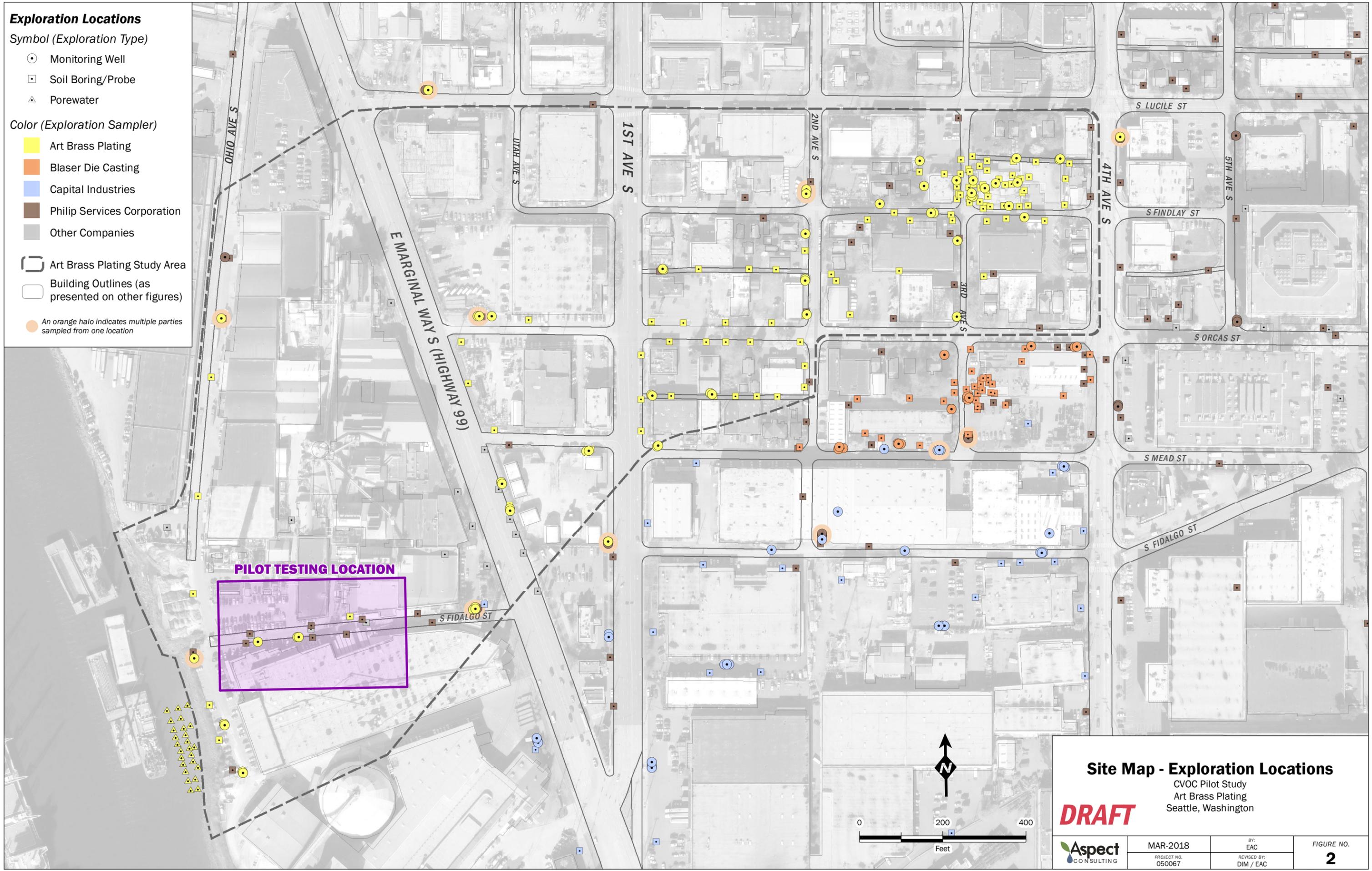
Color (Exploration Sampler)

- 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

CVOC Pilot Study
Art Brass Plating
Seattle, Washington

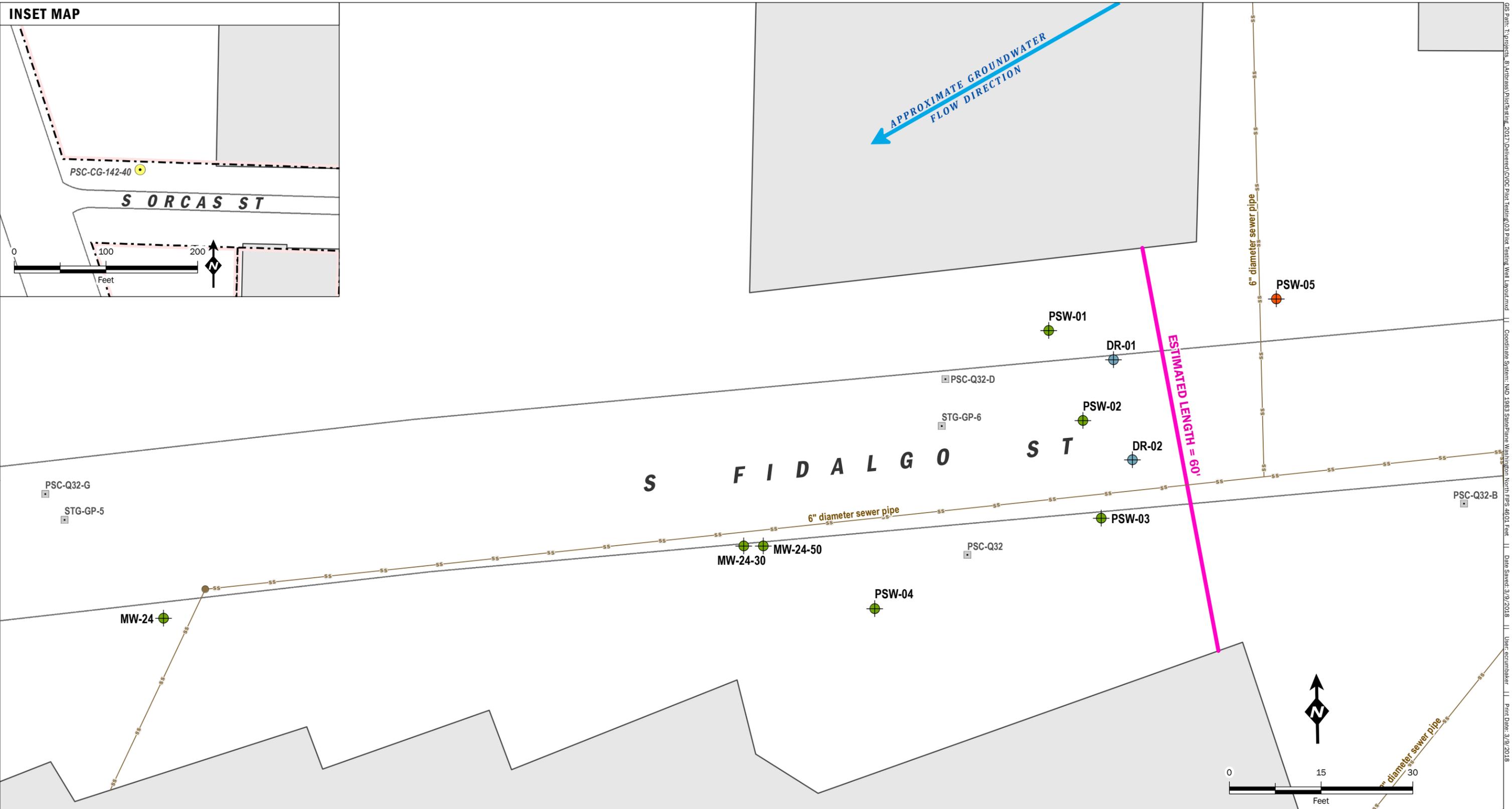
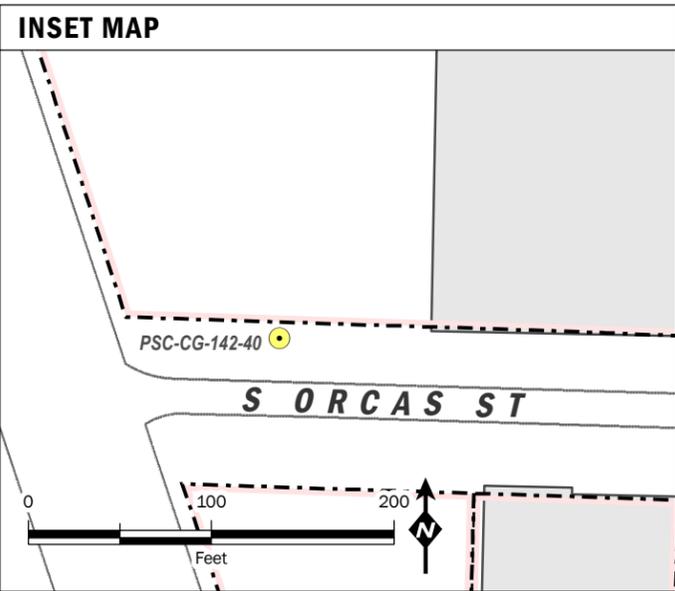
DRAFT



MAR-2018
PROJECT NO.
050067

BY:
EAC
REVISED BY:
DIM / EAC

FIGURE NO.
2



- Pilot Test Monitoring Locations**
- Dose-response Monitoring Well
 - Downgradient Performance Monitoring Well
 - Upgradient Monitoring Well
 - Temporary Soil Boring/Probe
 - Control Monitoring Well
 - Conceptual Injection Transect
 - Building
 - Road Edge



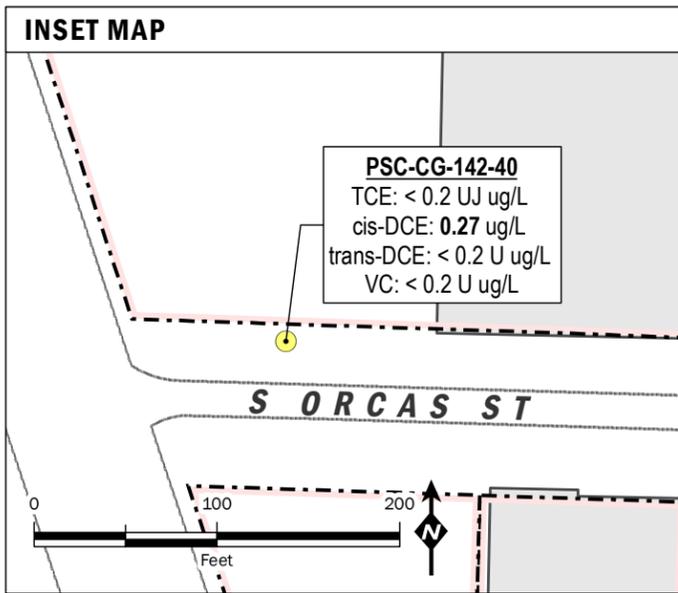
Pilot Testing Well Layout

CVOC Pilot Study
Art Brass Plating
Seattle, Washington

DRAFT

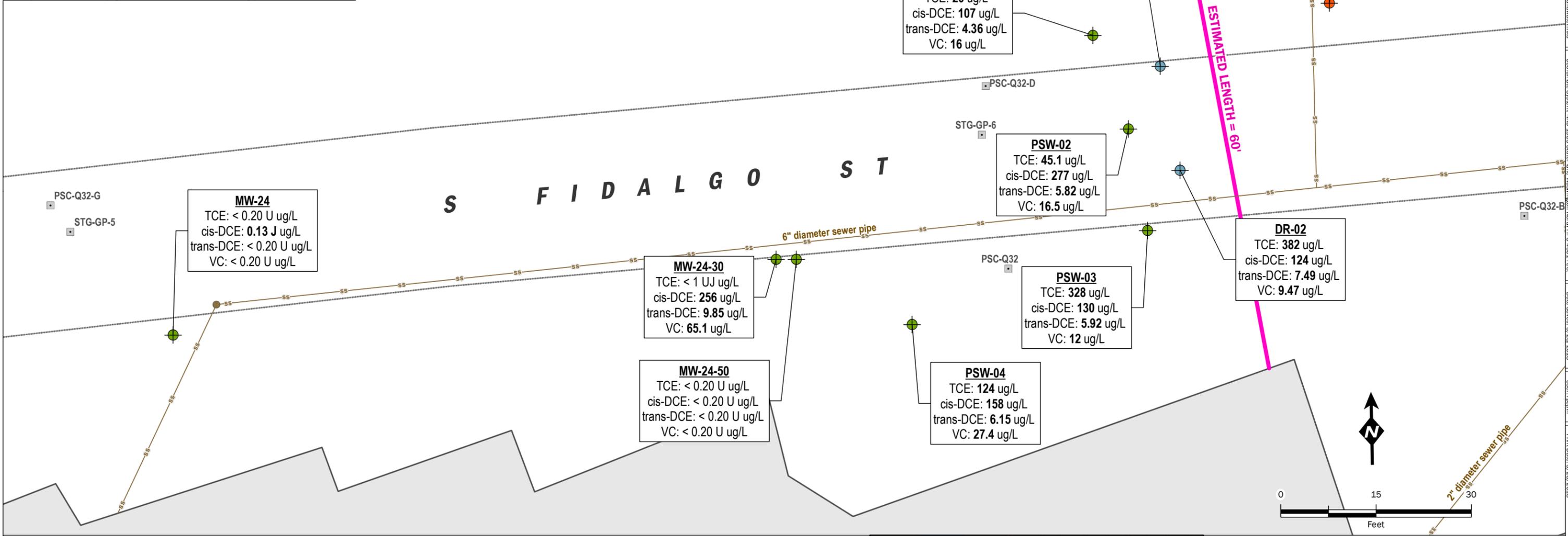
	MAR-2018	BY: EAC	FIGURE NO. 3
	PROJECT NO. 050067	REVISED BY: EAC	

GIS Path: T:\Projects_8\Art Brass Plating_2017\Delivered\CVOC Pilot Testing\03 Pilot Testing Well Layout.mxd | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet | Date Saved: 3/9/2018 | User: ecumbarber | Print Date: 3/9/2018



PSC-CG-142-40
 TCE: < 0.2 UJ ug/L
 cis-DCE: **0.27** ug/L
 trans-DCE: < 0.2 U ug/L
 VC: < 0.2 U ug/L

APPROXIMATE GROUNDWATER
 FLOW DIRECTION



MW-24
 TCE: < 0.20 U ug/L
 cis-DCE: **0.13** J ug/L
 trans-DCE: < 0.20 U ug/L
 VC: < 0.20 U ug/L

MW-24-30
 TCE: < 1 UJ ug/L
 cis-DCE: **256** ug/L
 trans-DCE: **9.85** ug/L
 VC: **65.1** ug/L

MW-24-50
 TCE: < 0.20 U ug/L
 cis-DCE: < 0.20 U ug/L
 trans-DCE: < 0.20 U ug/L
 VC: < 0.20 U ug/L

PSW-01
 TCE: **20** ug/L
 cis-DCE: **107** ug/L
 trans-DCE: **4.36** ug/L
 VC: **16** ug/L

DR-01
 TCE: **53.7** J ug/L
 cis-DCE: **201** ug/L
 trans-DCE: **4.72** ug/L
 VC: **13.5** ug/L

PSW-02
 TCE: **45.1** ug/L
 cis-DCE: **277** ug/L
 trans-DCE: **5.82** ug/L
 VC: **16.5** ug/L

PSW-03
 TCE: **328** ug/L
 cis-DCE: **130** ug/L
 trans-DCE: **5.92** ug/L
 VC: **12** ug/L

PSW-04
 TCE: **124** ug/L
 cis-DCE: **158** ug/L
 trans-DCE: **6.15** ug/L
 VC: **27.4** ug/L

DR-02
 TCE: **382** ug/L
 cis-DCE: **124** ug/L
 trans-DCE: **7.49** ug/L
 VC: **9.47** ug/L

PSW-05
 TCE: **264** ug/L
 cis-DCE: **63.3** ug/L
 trans-DCE: **5.05** ug/L
 VC: **6.61** ug/L

- Pilot Test Monitoring Locations**
- Dose-response Monitoring Well
 - Downgradient Performance Monitoring Well
 - Upgradient Monitoring Well
 - Temporary Soil Boring/Probe
 - Control Monitoring Well
 - Conceptual Injection Transect
 - Building
 - Road Edge

Notes:
 TCE = Trichloroethene
 cis-DCE = cis-1,2-Dichloroethene
 trans-DCE = trans-1,2-Dichloroethene
 VC = Vinyl Chloride
 All results are in ug/L
Bold results indicate analyte was detected.

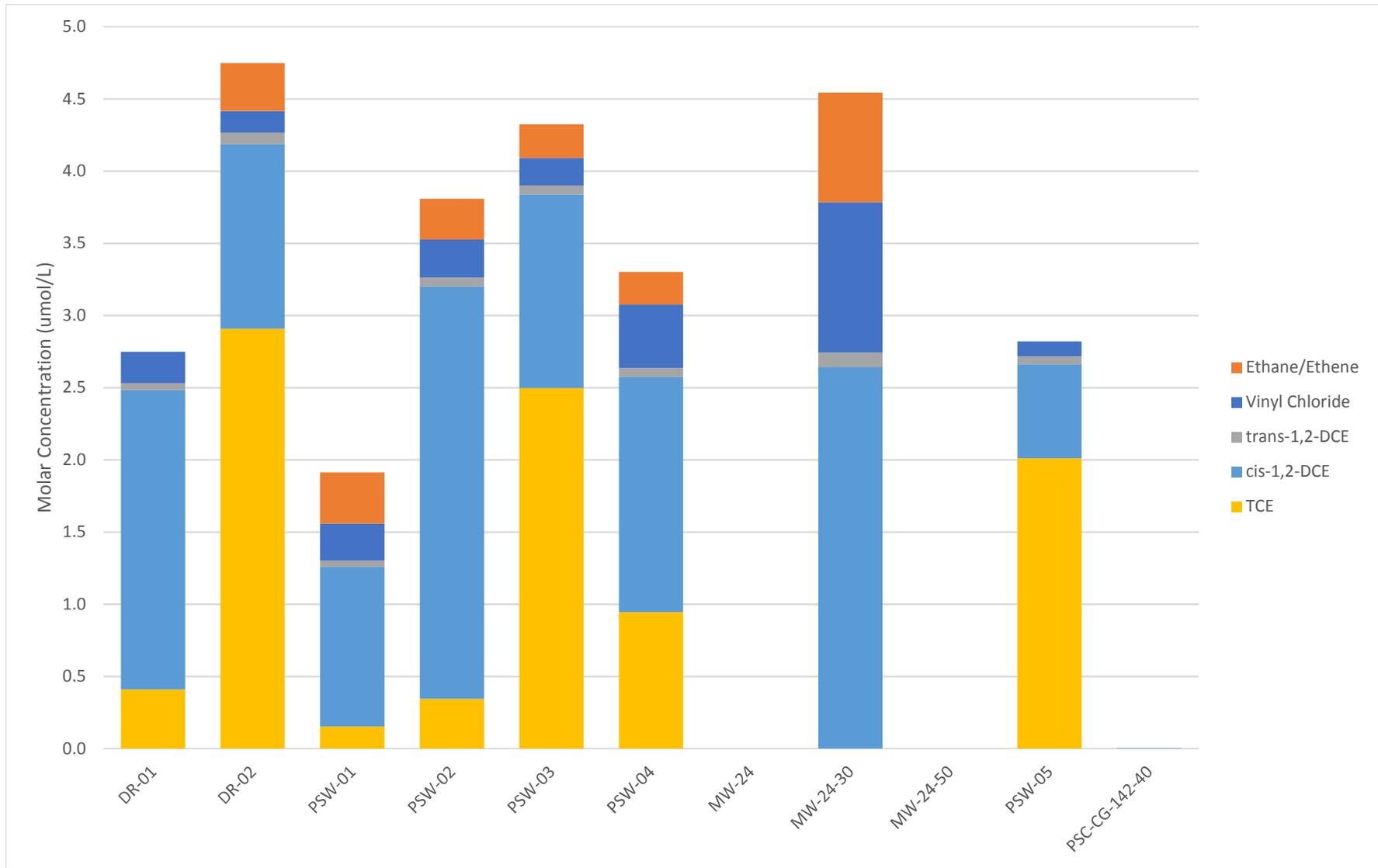


Chlorinated VOCs in Groundwater
 CVOC Pilot Study
 Art Brass Plating
 Seattle, Washington

DRAFT

	MAR-2018	BY: EAC	FIGURE NO. 6
	PROJECT NO. 050067	REVISED BY: RAP	

GIS Path: T:\Projects_8\Artbrass_Plating_2017\Delivered\COC Pilot Testing\06 Chlorinated VOCs in Groundwater.mxd | Coordinate System: NAD 83 StatePlane Washington North FIPS 4801 Feet | Date Saved: 3/28/2018 | User: rreppin | Print Date: 3/28/2018



Aspect Consulting

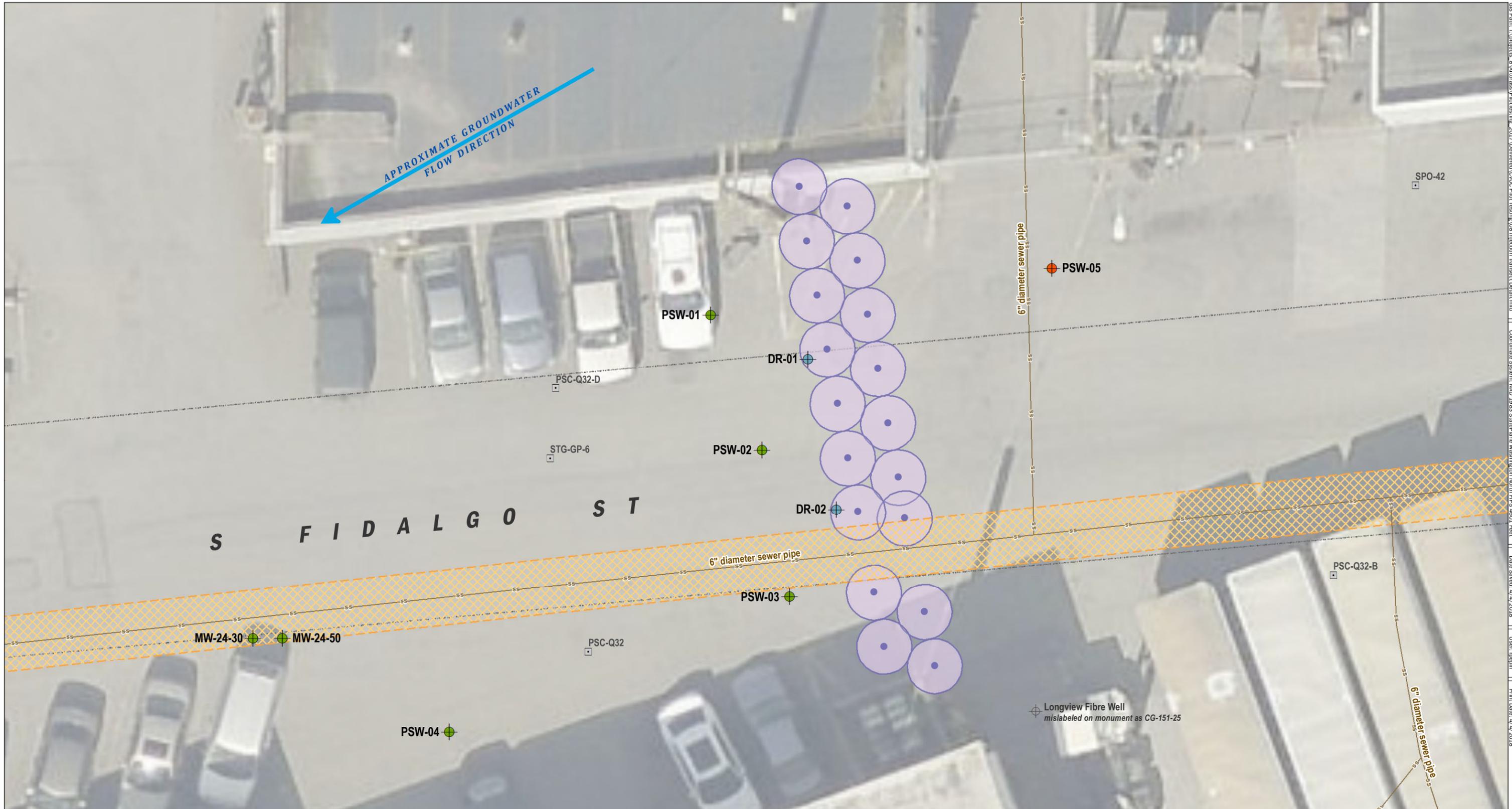
3/7/18

V:\050067 Art Brass Plating\Pilot Study\CVOCS\Field Implementation Work Plan\Client Review Draft\Figures\07 Total CVOC Molar Mass.xlsx

Figure 7

Total CVOC Molar Mass

CVOC Pilot Study Field Implementation Work Plan
Art Brass Plating, Seattle, WA



GIS Path: T:\Projects_8\Art Brass Plating_2017\Delivered\CVOC Pilot Testing\08 Injection Transect Detail.mxd | Coordinate System: NAD 1983 StatePlane Washington North FIPS 4601 Feet | Date Saved: 4/4/2018 | User: rpepin | Print Date: 4/4/2018

Pilot Test Monitoring Locations

- Dose-response Monitoring Well
- Downgradient Performance Monitoring Well
- Upgradient Monitoring Well
- Direct Push Injection Point
- Target Radius of Influence
- Sewer Pipe Buffer
- Temporary Soil Boring/Probe
- Longview Fibre Well
- Road Edge

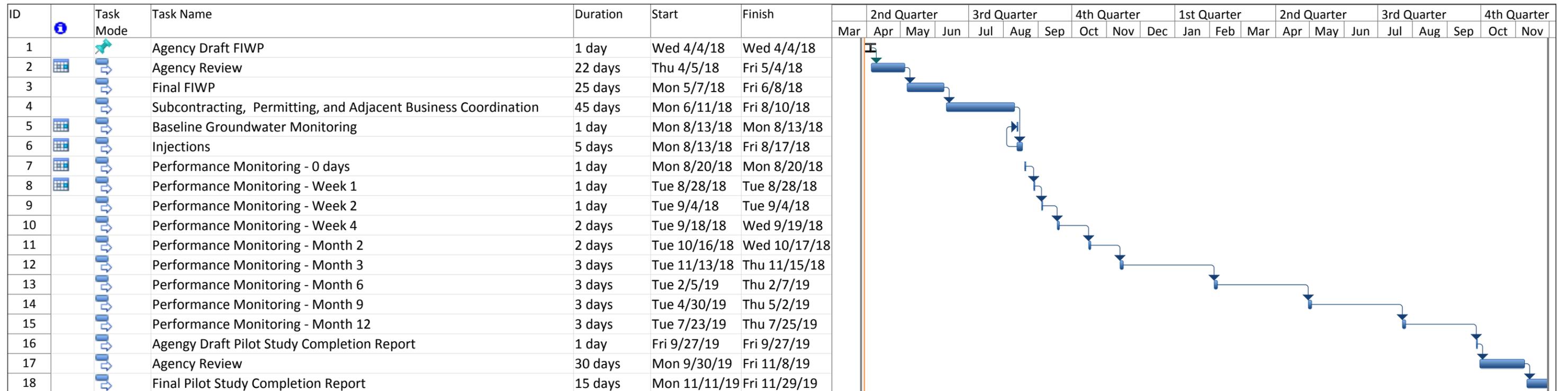
0 10 20
Feet

Injection Transect Detail

CVOC Pilot Study
Art Brass Plating
Seattle, Washington

DRAFT

	APR-2018	BY: EAC	FIGURE NO. 8
	PROJECT NO. 050067	REVISED BY: DIM / RAP	



Project: Implementation Schedule Date: Fri 3/30/18	Task		Project Summary		Inactive Milestone		Manual Summary Rollup		Deadline	
	Split		External Tasks		Inactive Summary		Manual Summary		Progress	
	Milestone		External Milestone		Manual Task		Start-only			
	Summary		Inactive Task		Duration-only		Finish-only			

Figure 9
Pilot Study Implementation Schedule
 CVOC Pilot Study
 Art Brass Plating, Seattle, WA

APPENDIX A

Boring and Well Construction Logs



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

Exploration Number

E:1269060 N:204245

DR-1

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
12.92'

Ecology Well Tag No.
BKL-436

Operator
Rayon

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

Work Start/Completion Dates
1/22/2018

Top of Casing Elev. (NAVD88)
12.59'

Depth to Water (Below GS)
5.55' (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)
0	12.59'	12-inch steel flush monument Compression Plug					4-inch thick Asphalt with gravel base layer.	
0		Concrete surface seal					FILL Medium dense, moist, gray-brown, gravelly silty SAND (SM); fine to medium sand, fine subrounded gravel, no odor, no sheen.	
5		3/8-inch bentonite chips					POST-GLACIAL ALLUVIAL DEPOSITS Loose, wet, black SAND (SP); fine to medium sand with red grains, no odor, no sheen (Duwamish Sand).	5
5		▼ 1/25/2018	S1		SPT= 4,3,4			
5		4-inch SCH40 threaded PVC						
10		▽ 1/22/2018	S2		SPT= 4,4,6		Medium stiff, wet, gray brown, sandy SILT (ML); fine sand, trace roots and fiber organics, no odor.	10
10							Loose, wet, black SAND (SP); fine to medium sand with red grains, no odor, no sheen (Duwamish Sand).	
15			S3		SPT= 5,6,6		Medium stiff, wet, brown, slightly sandy SILT (ML); fine sand, trace roots and fiber organics, no odor.	15
15							Medium stiff, gray brown, sandy SILT (ML); fine sand, no odor, no sheen.	
15							Loose, wet, black SAND (SP); fine to medium sand with red grains, no odor, no sheen (Duwamish Sand).	
15		#10/20 colorado silica sand						

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- ☐ No Soil Sample Recovery
- ▣ 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 DR-1



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

Exploration Number

E:1269060 N:204245

DR-1

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
12.92'

Ecology Well Tag No.
BKL-436

Operator
Rayon

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

Work Start/Completion Dates
1/22/2018

Top of Casing Elev. (NAVD88)
12.59'

Depth to Water (Below GS)
5.55' (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)
		4-inch stainless steel 10-slot wire wrapped screen	S4		SPT= 3,4,6		Loose, wet, black SAND (SP); fine to medium sand with red grains, no odor, no sheen (Duwamish Sand). (continued) Trace fine rounded gravel. Lens of fine sand (2-inch thick).	
-10								
25			S5		SPT= 4,6,8		Becomes medium dense. Lens of cemented gravels (3/4-inch thick).	25
-15								
30		Threaded PVC endcap	S6		SPT= 5,6,8		Thickly laminated silty sand. Bottom of exploration at 31.5 ft. bgs.	30
-20								
35								35
-25								

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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 DR-1



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)
E:1269063 N:204229

Exploration Number

DR-2

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
12.9'

Ecology Well Tag No.
BKL-440

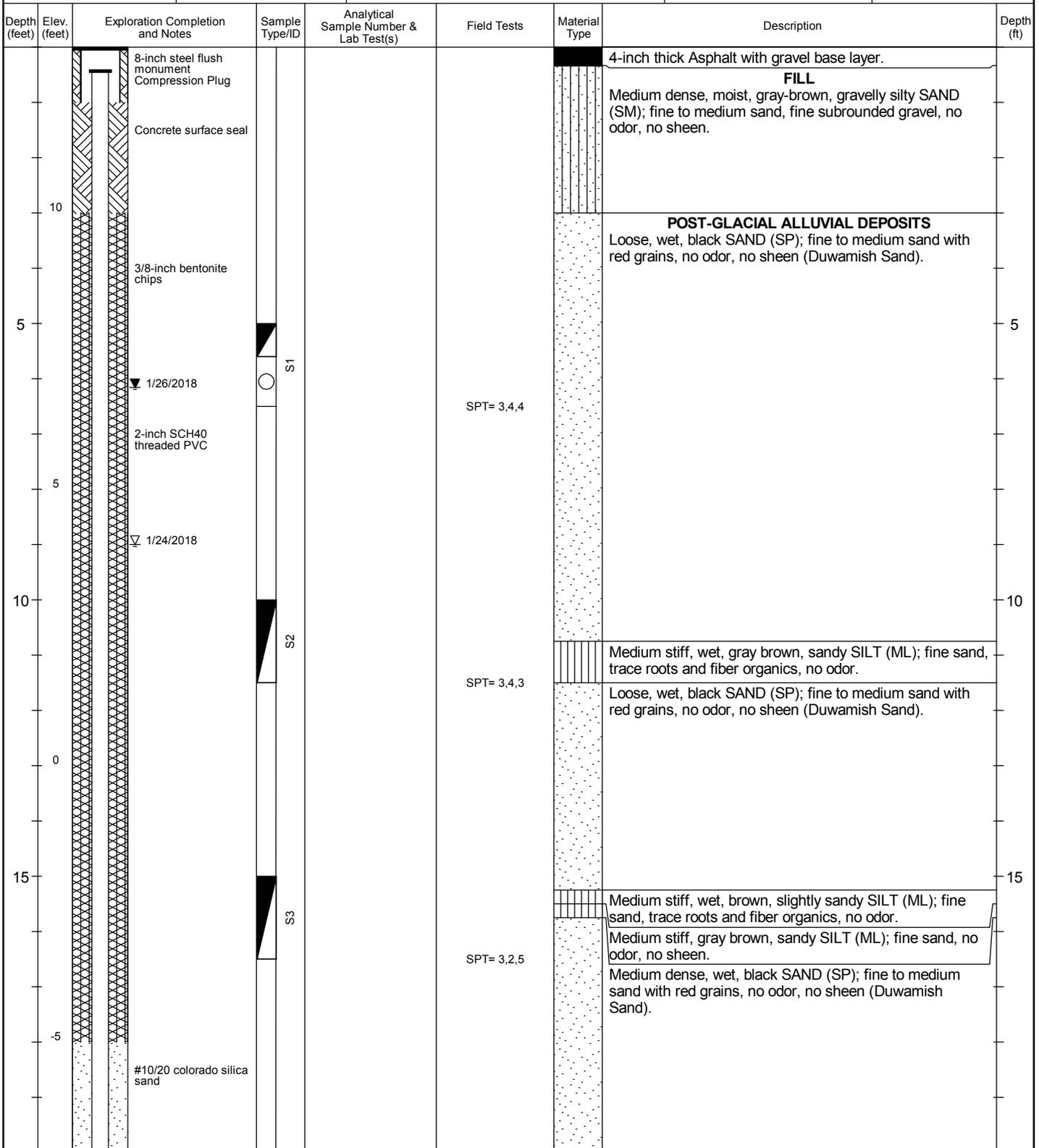
Operator
Rayon

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

Work Start/Completion Dates
1/24/2018

Top of Casing Elev. (NAVD88)
12.68'

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



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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 DR-2



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

Exploration Number

E:1269063 N:204229

DR-2

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
12.9'

Ecology Well Tag No.
BKL-440

Operator
Rayon

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

Work Start/Completion Dates
1/24/2018

Top of Casing Elev. (NAVD88)
12.68'

Depth to Water (Below GS)
6.16' (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)
		2-inch SCH40 PVC 10-slot screen	S4		SPT= 5,7,11		Medium dense, wet, black SAND (SP); fine to medium sand with red grains, no odor, no sheen (Duwamish Sand). (continued)	
-10								
25			S5		SPT= 3,5,10			25
-15								
30		Threaded PVC endcap	S6		SPT= 5,7,12		Becomes fine sand with scattered laminated silty sand.	30
-20							Bottom of exploration at 31.5 ft. bgs.	
35								35
-25								

Legend

- No Soil Sample Recovery
- 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 DR-2

Sheet 2 of 2

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BISERVER1\ASPECT\LOCAL\PROJECTS\GINT\PROJECTS\ART BRASS 050067.GPJ March 27, 2018



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)
E:1269049 N:204250

Exploration Number

PSW-1

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
13.24'

Ecology Well Tag No.
BKL-437

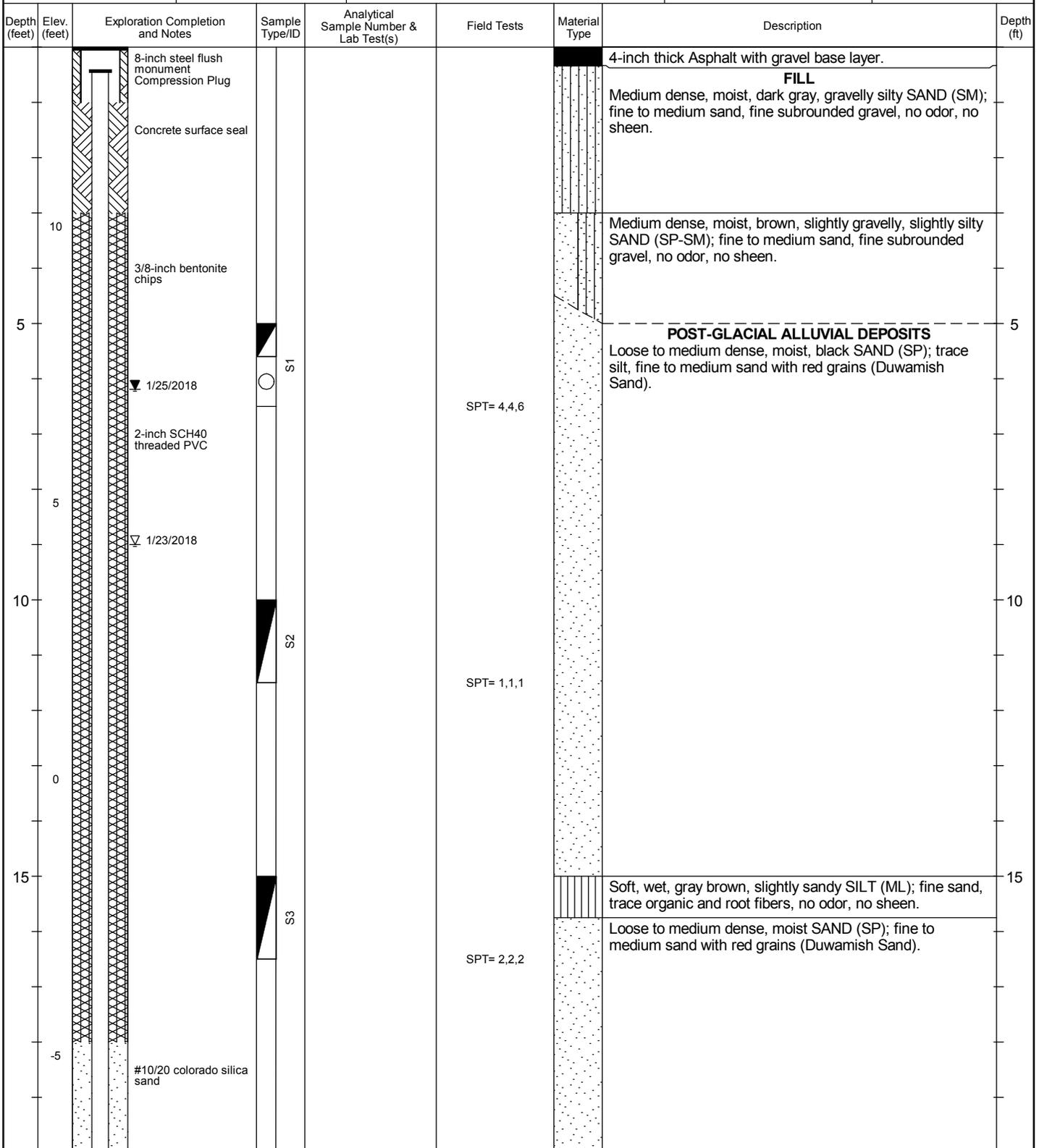
Operator
Rayon

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

Work Start/Completion Dates
1/23/2018

Top of Casing Elev. (NAVD88)
12.88'

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



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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-1

Sheet 1 of 2



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)
E:1269049 N:204250

Exploration Number

PSW-1

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
13.24'

Ecology Well Tag No.
BKL-437

Operator
Rayon

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

Work Start/Completion Dates
1/23/2018

Top of Casing Elev. (NAVD88)
12.88'

Depth to Water (Below GS)
6.19' (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)
		2-inch SCH40 PVC 10-slot screen	S4		SPT= 5,6,10		Loose to medium dense, moist SAND (SP); fine to medium sand with red grains (Duwamish Sand). (continued) Becomes medium dense.	
-10								
-25			S5		SPT= 4,8,8			
-15								
-30		Threaded PVC endcap	S6		SPT= 6,8,12			
-31.5							Bottom of exploration at 31.5 ft. bgs.	
-20								
-35								
-25								

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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-1



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location

Coordinates (SPN NAD83 ft)

Exploration Number

Seattle, WA, Fidalgo Street

E:1269055 N:204235

PSW-2

Contractor

Equipment

Sampling Method

Ground Surface (GS) Elev. (NAVD88)

Holt Services, Inc.

Rotary drill rig

Autohammer; 140 lb hammer; 30" drop

12.77'

Ecology Well Tag No. BKL-438

Operator

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

Work Start/Completion Dates

Top of Casing Elev. (NAVD88)

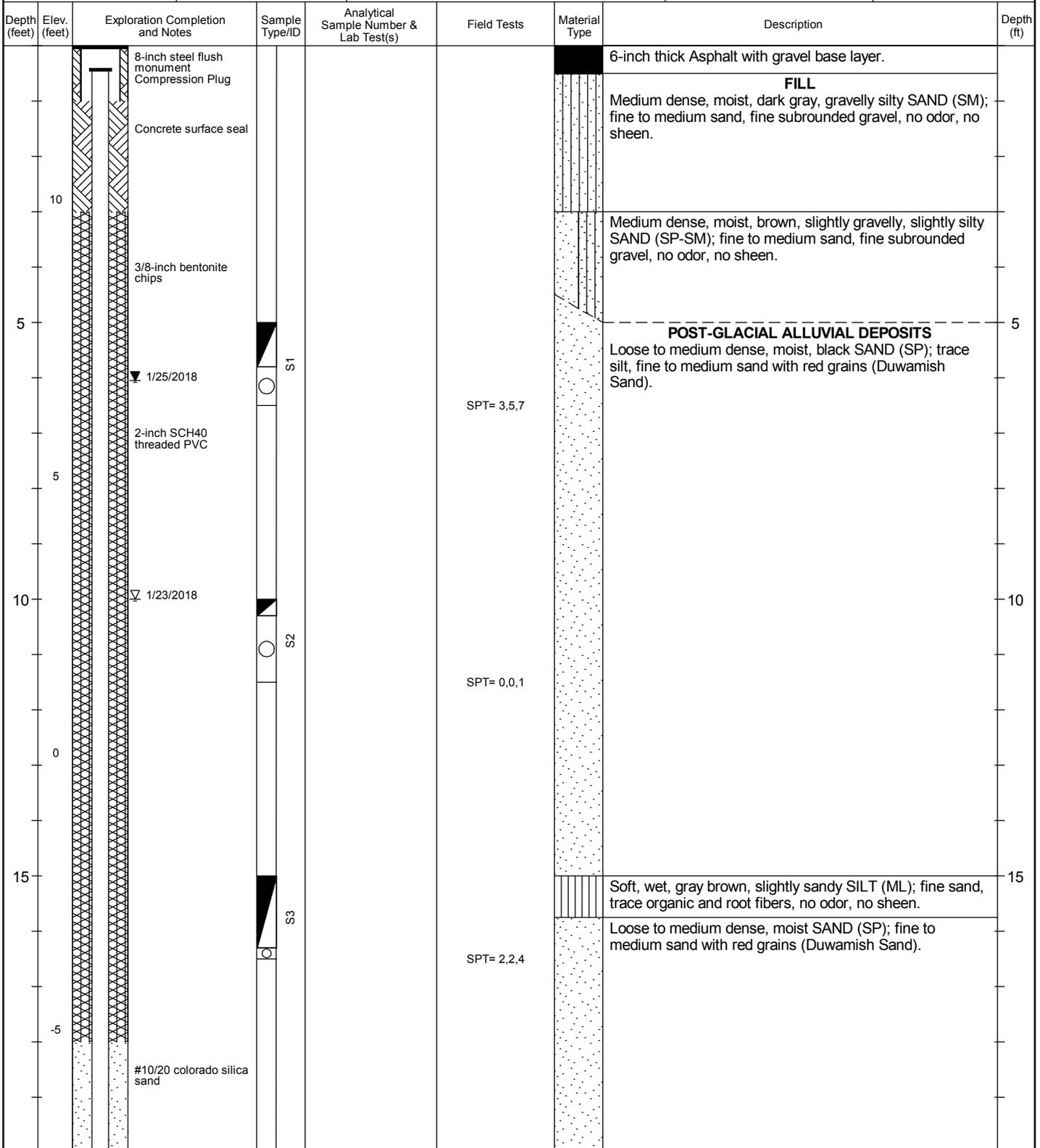
Depth to Water (Below GS)

Rayon

1/29/2018

12.46'

6.05' (Static)



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECT\SMART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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-2

Sheet 1 of 2



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

Exploration Number

E:1269055 N:204235

PSW-2

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)

12.77'

Ecology Well Tag No.
BKL-438

Operator
Rayon

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

Work Start/Completion Dates
1/29/2018

Top of Casing Elev. (NAVD88)

12.46'

Depth to Water (Below GS)
6.05' (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)
		2-inch SCH40 PVC 10-slot screen	S4		SPT= 6,6,8		Loose to medium dense, moist SAND (SP); fine to medium sand with red grains (Duwamish Sand). (continued)	
-10								
25			S5		SPT= 5,5,7		Scattered 1/2-inch pockets of graybrown silt with trace root and fiber organics between 25 and 26 ft bgs.	25
-15								
30		Threaded PVC endcap	S6		SPT= 5,5,6			30
-20							Bottom of exploration at 31.5 ft. bgs.	
35								35
-25								

Legend

- No Soil Sample Recovery
- 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-2

Sheet 2 of 2

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\W\PROJECT\SMART BRASS 050067.GPJ March 27, 2018



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)
E:1269057 N:204219

Exploration Number

PSW-3

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
13.09'

Ecology Well Tag No.
BKL-442

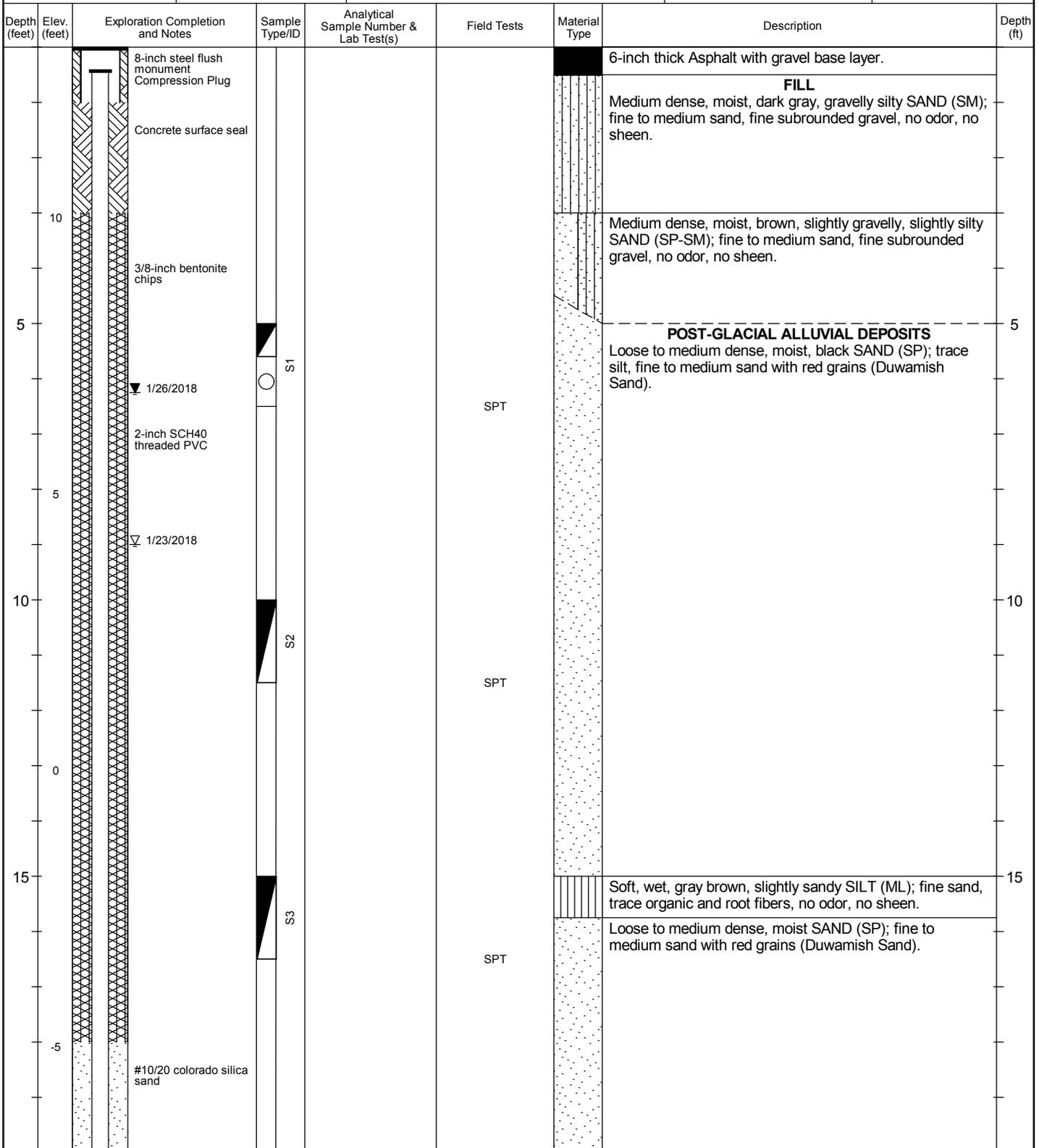
Operator
Rayon

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

Work Start/Completion Dates
1/23/2018

Top of Casing Elev. (NAVD88)
12.86'

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



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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-3

Sheet 1 of 2



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

E:1269057 N:204219

Exploration Number

PSW-3

Ecology Well Tag No.
BKL-442

Contractor

Holt Services, Inc.

Equipment

Rotary drill rig

Sampling Method

Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)

13.09'

Operator

Rayon

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

Work Start/Completion Dates

1/23/2018

Top of Casing Elev. (NAVD88)

12.86'

Depth to Water (Below GS)

6.25' (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)
		2-inch SCH40 PVC 10-slot screen	S4		SPT= 5,7,15		Loose to medium dense, moist SAND (SP); fine to medium sand with red grains (Duwamish Sand). (continued)	
-10								
25			S5		SPT= 5,7,20			
-15								
30		Threaded PVC endcap	S6		SPT= 5,9,12			
-20							Bottom of exploration at 31.5 ft. bgs.	
35								
-25								

Legend

- No Soil Sample Recovery
- 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-3

Sheet 2 of 2

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BISERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ March 27, 2018



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

E:1269020 N:204205

Exploration Number

PSW-4

Ecology Well Tag No.
BKL-441

Contractor

Holt Services, Inc.

Equipment

Rotary drill rig

Sampling Method

Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)

13.11'

Operator

Rayon

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

Work Start/Completion Dates

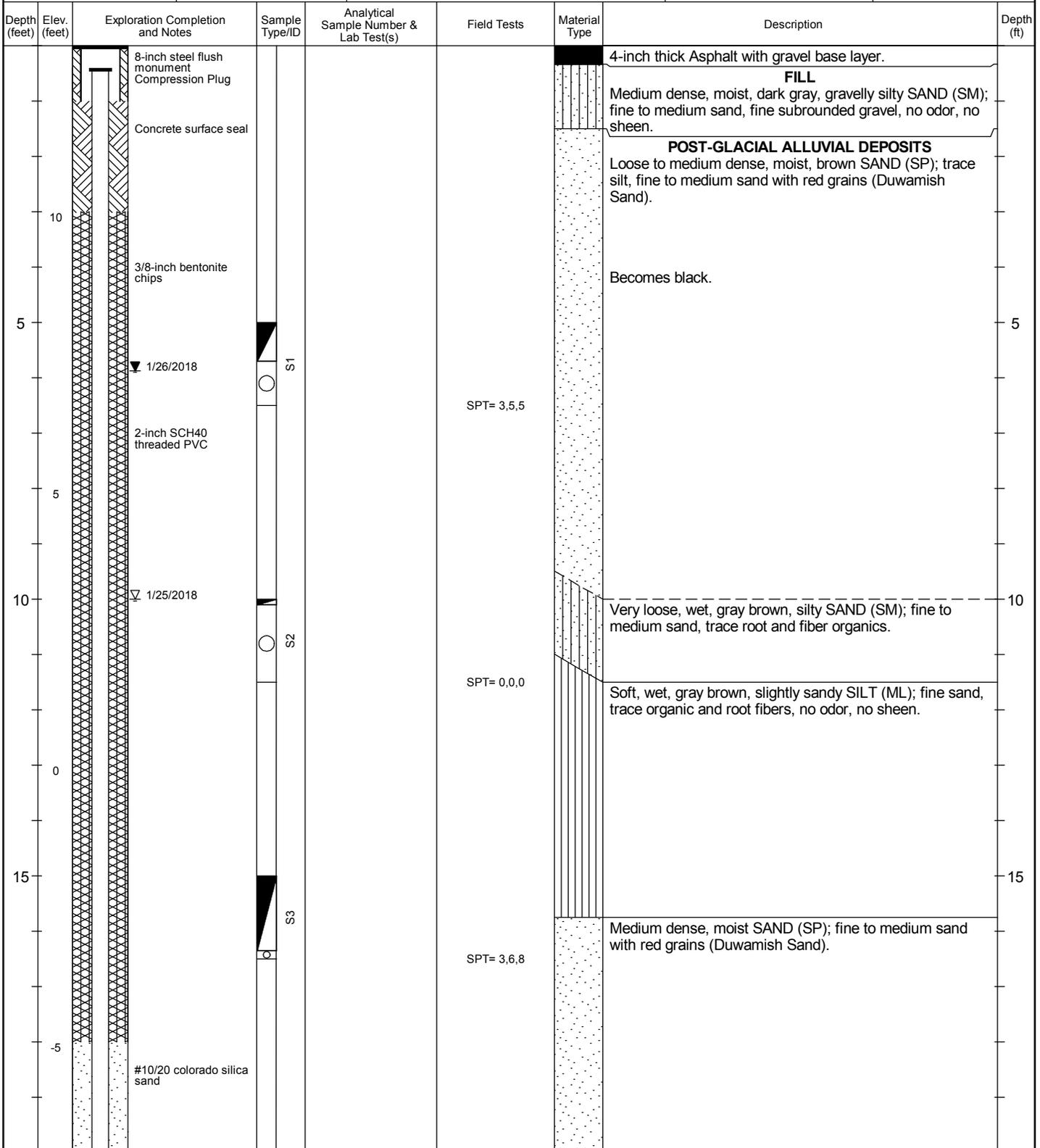
1/25/2018

Top of Casing Elev. (NAVD88)

12.89'

Depth to Water (Below GS)

5.87' (Static)



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECT\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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-4

Sheet 1 of 2



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)

E:1269020 N:204205

Exploration Number

PSW-4

Ecology Well Tag No.
BKL-441

Contractor

Holt Services, Inc.

Equipment

Rotary drill rig

Sampling Method

Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)

13.11'

Operator

Rayon

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

Work Start/Completion Dates

1/25/2018

Top of Casing Elev. (NAVD88)

12.89'

Depth to Water (Below GS)

5.87' (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)
							Medium dense, moist SAND (SP); fine to medium sand with red grains (Duwamish Sand). (continued)	
		2-inch SCH40 PVC 10-slot screen	S4		SPT= 5,7,7			
-10								
25			S5		SPT= 3,5,8			25
-15								
30		Threaded PVC endcap	S6		SPT= 3,5,7			30
-20							Bottom of exploration at 32 ft. bgs.	
35								35
-25								

Legend

- No Soil Sample Recovery
- 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-4

Sheet 2 of 2

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BISERVER1\ASPECT\LOCAL\PROJECTS\GINT\W\PROJECTS\ART BRASS 050067.GPJ March 27, 2018



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)
E:1269087 N:204255

Exploration Number

PSW-5

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
13.27'

Ecology Well Tag No.
BKL-439

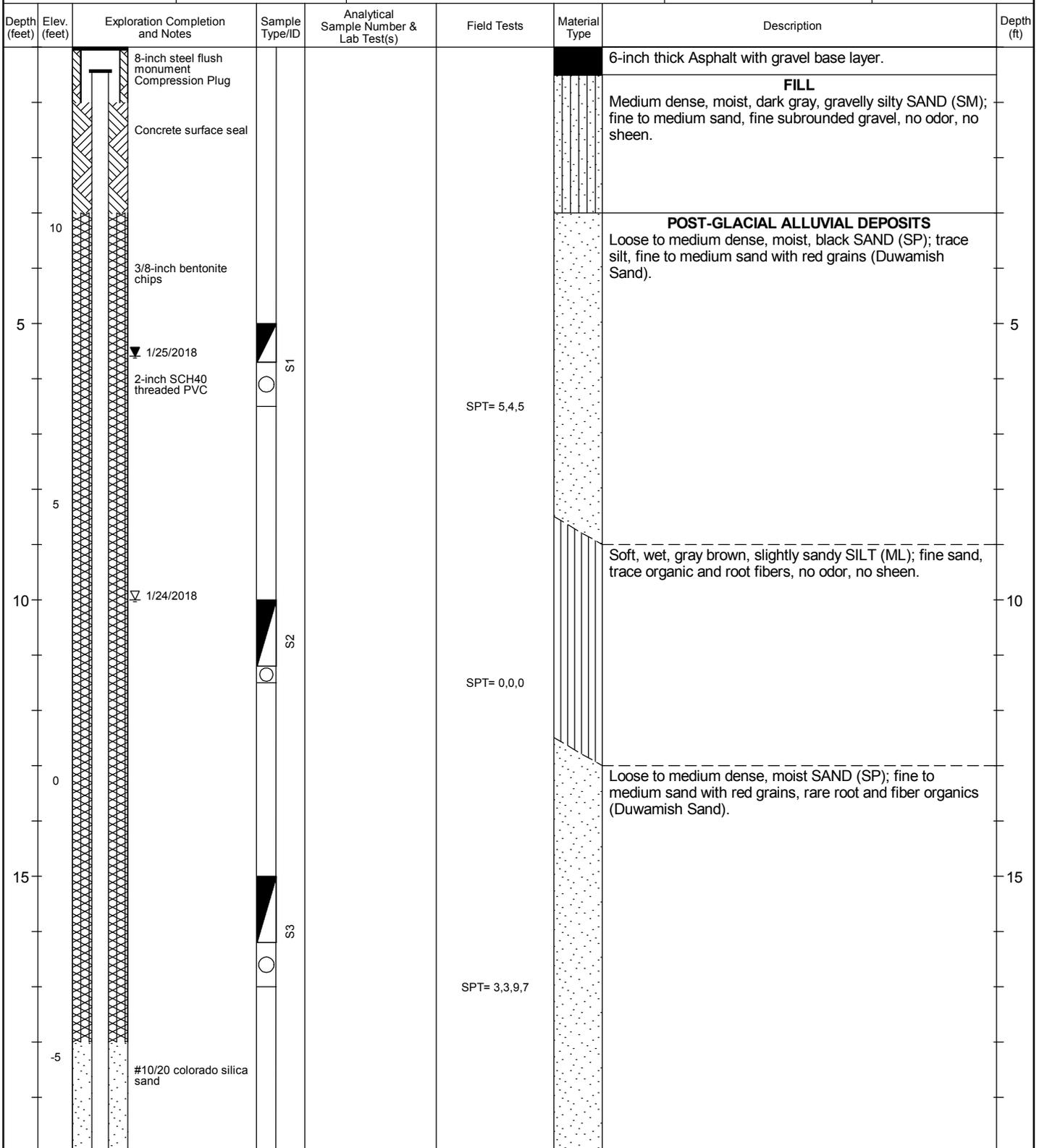
Operator
Rayon

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

Work Start/Completion Dates
1/24/2018

Top of Casing Elev. (NAVD88)
12.95'

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



ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECT\ART BRASS 050067.GPJ March 27, 2018

Legend

- ☐ No Soil Sample Recovery
- ▣ 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-5

Sheet 1 of 2



Art Brass Plating - 050067

Monitoring Well Log

Project Address & Site Specific Location
Seattle, WA, Fidalgo Street

Coordinates (SPN NAD83 ft)
E:1269087 N:204255

Exploration Number

PSW-5

Contractor
Holt Services, Inc.

Equipment
Rotary drill rig

Sampling Method
Autohammer; 140 lb hammer; 30" drop

Ground Surface (GS) Elev. (NAVD88)
13.27'

Ecology Well Tag No.
BKL-439

Operator
Rayon

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

Work Start/Completion Dates
1/24/2018

Top of Casing Elev. (NAVD88)
12.95'

Depth to Water (Below GS)
5.59' (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)
0	12.95							
10		2-inch SCH40 PVC 10-slot screen	S4		SPT= 4,7,8		Loose to medium dense, moist SAND (SP); fine to medium sand with red grains, rare root and fiber organics (Duwamish Sand). (continued)	
25			S5		SPT= 8,30,35		1-inch thick piece of wood.	
30		Threaded PVC endcap	S6		SPT= 8,20,30		Sand becoming finer with depth.	
31.5							Bottom of exploration at 31.5 ft. bgs.	
35								
25								
15								

ASPECT STANDARD EXPLORATION LOG TEMPLATE \\BSERVER1\ASPECT\LOCAL\PROJECTS\GINT\WIP\PROJECTS\ART BRASS 050067.GPJ March 27, 2018

Legend

- No Soil Sample Recovery
- 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-5

Sheet 2 of 2

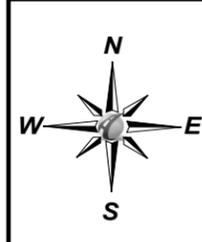
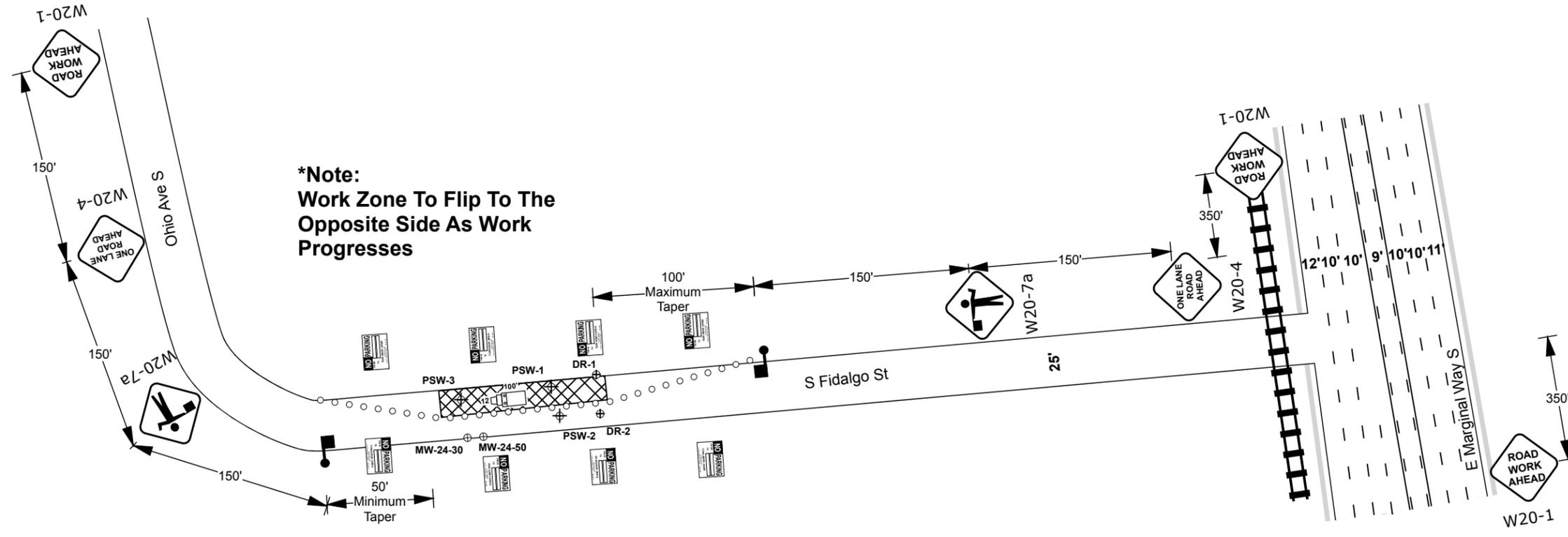
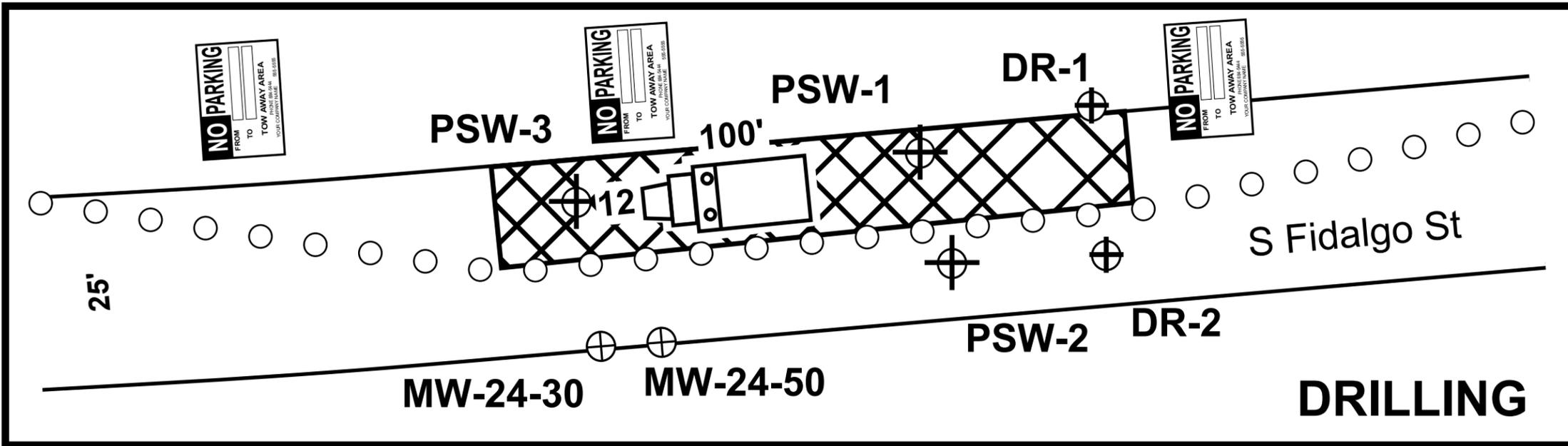
APPENDIX B

Traffic Control Plan and Street Use Permit

REQUESTED DATES: _____
 WORK HOURS: _____

ADDRESS:
 S Fidalgo St & E Marginal Way S, Seattle, WA 98134

PERMIT: _____



ALTUS
 Across America, Altus Traffic is the trusted name for:
 •Traffic management
 •Flagging
 •Traffic control, and
 •Traffic management plans.
 (720) 343-2335

Location: S Fidalgo St & E Marginal Way S
 Seattle, WA 98134
 For: Aspect Consulting, LLC
 Name: Bob Hanford 206-276-9256
 Date: January 5, 2018
 Drawn By: Matt Hitchcock
 ATTSA Cert#: 59042
 Job#: 050067

MHT#1
 NOT DRAWN TO SCALE
 REVIEWED: _____

LEGEND			
	Type 3 Barricade		Channelizing Devices
	Heavy Work Vehicle		Truck Mounted Attenuator
	Trailer Mounted Flashing Arrow Board		Portable Changeable Message Sign (PCMS)
	Sign		Traffic Flow
	No Parking Sign		Uniformed Traffic Officer
	Flagger		Advance Warning Sign

One Lane Road

NOTES:
****NO PARKING SIGNS** ALL DEVICES TO BE SET 24 HOURS CONFORM TO PRIOR TO WORK** CURRENT MUTCD****

Speed (MPH)	Taper Length In Feet			
	LANE WIDTH 10FT	LANE WIDTH 11FT	LANE WIDTH 12FT	LONG BUFFER
25 or less	105'	115'	125'	
30	150'	165'	180'	90'
35	205'	225'	245'	120'
40	270'	295'	320'	155'
45	450'	495'	540'	195'
50	500'	550'	600'	240'
55	550'	605'	660'	295'
60	600'	660'	720'	350'
65	650'	725'	780'	410'
70	700'	770'	840'	475'
75	750'	825'	900'	540'
80	800'	880'	960'	

CHANNELIZATION DEVICE SPACING		
MPH	TAPER	TANGENT
65	40	130
60	40	120
55	40	110
50	40	100
45	40	90
40	40	80
35	35	70
30	30	60
25	25	50

ROAD TYPE	SIGN SPACING		
	A	B	C
Urban Low Speed	150'	150'	150'
Urban High Speed	350'	350'	350'
Rural	500'	500'	500'
Expressway/ Freeway	1000'	1500'	2640'

Summary of Devices

- 8 - No Parking Anytime
- 3 - 48" Road Work Ahead
- 2 - 48" One Lane Road Ahead
- 2 - 48" Flagger Symbol
- 2 - Flaggers
- 30 - Cones

STREET USE PERMIT

Permit No.: **372446**

Job No.: 336822,350884

Inspector Copy

Permittee Copy

File Copy

Project ID:	IMPACT Project ID: ex	Estimated Project Completion Date: 12/15/2017
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LOCATION

Inspector: James Vanater

Inspection District: SOUTH SEATTLE

Address: 5516 3RD AVE S High Impact Area: N Details: S FIDALGO ST, WEST OF EAST MARGINAL WAY S; NO SIDEWALK, STREET PARTIALLY CLOSED; MINIMIZE BUSINESS IMPACTS;	Application Date: 12/29/17 12:59 pm Issue Date: 1/2/18 11:40 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

S FIDALGO ST BETWEEN DEAD END 2 AND EAST MARGINAL WAY S - 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 - No Sidewalk, Street Partially closed; Minimize business impacts; Escort Pedestrians around workzone;

Start Date	Duration	End Date	Sq. Ft	Issue Date	Ext.	Side of Street	Location Type	Closure Type	Peak Work OK	Day or Time Rstrctns
01/15/2018	30	04/15/2018	350	01/02/2018	N	FULL CLOSURE	STREET	PARTIALLY CLOSED		

CONDITIONS OF USE

DESCRIPTION OF WORK :
Additional Notes: Scope: Installation of (4) environmental monitoring wells;
 Impact Mobility: S Fidalgo St, West of East Marginal Way S; No Sidewalk, Street Partially closed; Minimize business impacts;
 Review Notes: Potholes located on S Fidalgo St, 3 Blocks South & 3 Blocks West of Project address 5516 3rd Ave S
 Customer Description: Proposed four new monitoring wells installed in an area approximately 70 feet by 50 feet in Fidalgo Street 500 feet west of East Marginal Way for an environmental pilot study. Individual monitoring wells will be 2-inch in diameter with 12-inch flush traffic rated monuments.

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 :



Project ID:

IMPACT Project ID: ex

Estimated Project Completion Date: 12/15/2017

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.

PED MOBILITY COORDINATION :
PEDESTRIAN MOBILITY COORDINATION: One sidewalk at this location must remain open for safe pedestrian passage at all times. Prior to the beginning of any construction, this permit requires: Contractor will coordinate with existing permit holders to coordinate construction impacts on this street segment. Contractor must ensure that one sidewalk or temporary pedestrian pathway remain open at all times to provide for safe pedestrian passage. SDOT reserves the right to require documentation confirming coordination on future permit requests or extensions when deemed necessary. Permittee is required to notify the district Street Use inspector to ensure all required inspections are scheduled.

RIGHTS - ALREADY APV CONTRACTR :
RIGHTS TO OTHER CONTRACTORS ALREADY APPROVED FOR WORK: The scope of work listed in this permit is approved for the scheduled dates only. SDOT recognizes that construction coordination may be required to allow other contractors with existing approved permits priority in conducting work in the right of way where potential construction conflicts may occur. If, in any given area, the work allowed under this permit conflicts with other area work where contractors demonstrate an existing approved permit, the permittee must move to another location. Permittee is required to notify district Street Use inspector regarding conflicts and any work that is rescheduled due to conflicts. Work that is rescheduled may require an extension or revision to the Street Use permit.

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.

WALKWAY FOR PEDS :
 Maintain a four-foot (4') wide walkway for pedestrians through or around the work areas. Permittee shall contact all businesses and residents who may be affected by the work to be done under this permit at least one week before starting any construction activity in the street rights-of-way. Permittee must coordinate this work with any other contractors working near its construction zone to avoid conflicts. Access to all businesses shall be maintained during construction. All driveways will be cleared and accessible at the end of every work day.

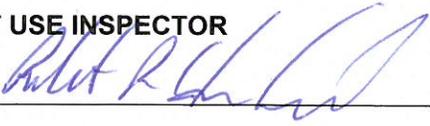
FEES PAID AT THE COUNTER OR ONLINE

Project ID:	IMPACT Project ID: ex	Estimated Project Completion Date: 12/15/2017
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Description	Date	Amount
ISSUANCE FEE - SIGNIFICANT	01/02/2018	\$305.00
Totals:		\$305.00

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.
- 2. Acceptance of terms, conditions, and requirements.** The Permittee accepts the terms, conditions, and requirements of this permit and agrees to 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.
- 6. Compliance with technical requirements and standards.** All work within the public right of way shall be performed and completed according to the current or subsequently-amended requirements in the following technical documents published by the City: Right-of-Way Improvements Manual; Street Tree Manual; Standard Specifications for Road, Bridge and Municipal Construction; Standard Plans for Municipal Construction; Right of Way Opening and Restoration Rule; and Traffic Control Manual for In-Street Work.
- 7. Scope of work.** The Permittee shall stage equipment or materials and construct or install the improvements and infrastructure reflected in and in accordance with this permit and the City-approved construction plans. Any revisions, omissions, or additions to the scope of work shall be reviewed and approved by the City before implementation.
- 8. Street Use notification.** Construction work may be completed in several phases: site preparation (installing traffic control, saw-cutting, etc.); ground breaking; restoration; and staging of equipment and materials. Before beginning any phase of work in the public right of way, the Permittee shall notify Street Use of each start date. The Permittee shall be responsible for notifying Street Use Job Start at (206-684-5270) or SDOTJobStart@seattle.gov a minimum of 2-business days before starting work and shall provide the following information:
 - 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;
 - Brief work description; and
 - Job-site contact name and phone number.
 Failure to notify Street Use Job Start shall result in a \$300 penalty or other amounts according to SMC Section 15.04.074. For Street Improvement Permits and Utility Major Permits, a preconstruction meeting is required before starting construction, and the assigned inspector shall be notified a minimum of 2-business days before required inspections. Construction or utility activity occurring with, but not approved under, a Street Improvement or Utility Major Permit shall be permitted under separate Street Use permits. The Permittee shall apply for and obtain these Street Use permits in advance of work. Failure to do so may subject the Permittee to penalties and additional permit review charges may apply.
- 9. Underground and overhead utility notification.** The Permittee shall notify the following entities, as applicable, 2-business days in advance:
 - Utility Underground Locate Center (811 or 1-800-424-5555) before ground disturbance; and
 - Seattle City Light (206-684-4911) if working within 10 feet of high-voltage lines.
- 10. Olympic Pipe Line Company notification.** When work in the right of way occurs within 100 feet of an Olympic Pipe Line Company ("OPLC") pipeline, the Permittee shall coordinate the work with OPLC, which may include submitting detailed construction plans to OPLC. The Permittee shall notify OPLC's field coordinator 10-business days in advance of the work (425-981-2506) and an OPLC representative may be required to



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be onsite during the work.

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.
 - King County Metro Transit's electric storage battery Trolley Busses can be activated for weekend outage requires with 15 working days notification. Subject to vehicle and staff support capacity restrictions.
 - No two consecutive transit stops may be closed.

If trolley wires are present, call (206) 477-1150 or email trolley.impacts@kingcounty.gov

If trolley wires are not present, call (206) 477-1140 or email construction.coord@kingcounty.gov

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.
 - 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.

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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 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.



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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

From: Schriener, Jake <Jake.Schriener@seattle.gov> on behalf of DOT_UTILPERMITS <SDOTUtilPermits@seattle.gov>
Sent: Friday, December 29, 2017 1:03 PM
To: Robert R. Hanford
Subject: Street use Application # 372446_ 5516 3rd Ave S

Your SDOT **Utility Use** permit has been approved. Total fees due are **\$305.00**. 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: **372446**

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. 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 SDOTUtilPermits@seattle.gov and make sure your **permit number is in the subject line**.

Also, you may visit the Applicant Services Counter at:

700 5th 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

Robert R. Hanford

From: Schriener, Jake <Jake.Schriener@seattle.gov> on behalf of DOT_UTILPERMITS <SDOTUtilPermits@seattle.gov>
Sent: Friday, December 22, 2017 3:33 PM
To: Robert R. Hanford
Subject: Corrections Required Street Use Application # 372446

Bob,

I have a question regarding permit application # **372446** at street address **5516 3rd Ave S**. It appears you had written up this application some months prior and had changed your application date but your start dates remains as 09.11.17. Could you please provide a start date 1-2 weeks out from response.

Thank you,

Please email all correspondence to SDOTPermits@Seattle.Gov and **make sure your permit number is in the subject line**. All Simple Utility and Major Utility Permit inquiries and materials go to: SDOTUtilPermits@seattle.gov.



JAKE SCHRINER

Permit Services – Utility Permit Reviewer, Street Use Division

Sent on behalf of SDOTPermits@Seattle.Gov

APPENDIX C

Sampling and Analysis Plan (SAP)/ Supplemental Quality Assurance Project Plan (QAPP)

Sampling and Analysis Plan

The proposed field program described below outlines the additional investigations necessary to carry out the pilot testing activities in the Field Implementation Work Plan (FIWP).

Unless specified in the following sections, all other field procedures will be completed consistent with the Ecology-approved Remedial Investigation (RI) Work Plan, Standard Field Procedures (Appendix B; Aspect, 2008) and the Supplemental RI Data Gaps Work Plan Sampling and Analysis Plan (Attachment B; Aspect, September 29, 2014).

Groundwater Sampling

Groundwater sampling will be conducted throughout the pilot test before and after the reagent injections to monitor the effectiveness of the pilot test. Analytes for performance monitoring are listed in Table 5. The schedule for performance monitoring is shown in Table 6.

Groundwater Level Monitoring

Depth-to-groundwater measurements will be conducted using an electric well sounder, graduated to 0.01 foot. Water level measurements will be completed before water quality sampling and during reagent injections. For water quality sampling, well caps will be removed for at least 15 minutes before measuring water levels, or until the water level has stabilized. Dedicated pumps will be removed prior to taking a total well depth.

Water level measurements collected during water quality sampling and during reagent injections will be recorded on the Water Level Monitoring Log (see Appendix G).

Groundwater Sampling Procedures

Groundwater samples supporting the pilot study will be collected using a peristaltic pump with low-flow sampling techniques. If a well has an existing dedicated sampling pump, it will remain in place at the bottom of the well while peristaltic sampling conducted. The peristaltic tubing will be set at approximately midscreen. Note that dedicated sample pumps will continue to be used for groundwater sampling outlined in the West of 4th Groundwater Monitoring Program Plan (PGG, 2017). Each well will have dedicated peristaltic tubing that remains in place between sampling events for the duration of the pilot test.

Static water levels will be collected prior to sample collection. The well will then be purged at flow rates less than 0.5 liters per minute, with a target of 250 milliliters per minute (mL/min). The following field parameters will be monitored using a YSI meter and flow-through cell: temperature, pH, electrical conductance, dissolved oxygen (DO), and oxidation-reduction potential (Eh).

The purge criteria are as follows:

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- For performance groundwater monitoring outlined in Table 6, stabilization is defined as three successive readings where the parameter values vary by less than 10 percent (0.5 milligrams per liter [mg/L] DO if the readings are below 1 mg/L). However, no more than three well casing volumes will be purged prior to groundwater sample collection.
- For operational monitoring during reagent injections, stabilization is defined as when one well casing volume has been purged. Parameter stabilization is not necessary. One casing volume for the 4-inch dose-response well would be 15.6 gallons (assuming a depth to water of 6 feet). One casing volume for the 2-inch wells would be 3.8 gallons (assuming a depth to water of 6 feet).

Applied Tracer

Grab groundwater samples will be collected using the low-flow techniques described above for applied fluorescent tracer analysis. Samples will be collected in 50 mL research-grade polypropylene copolymer Perfector Scientific vials (or similar vial provided by the lab). The minimum sample volume to be collected is 30 mL. The sides of the vial will be labeled with the project name, sample ID, sample date, and sample time using a black permanent felt tip pen. The vials will be placed in the dark and chilled immediately after collection and maintained in darkness and under refrigeration until shipment.

Samples will be field screened against visual standards. Visual standards will be prepared prior to injection by the following methods:

- After Rhodamine WT have been mixed, collect approximately 10–20 mL of the solution. Make the following dilution standards using a 500 mL graduated cylinder:
- 10X dilution: Add 10 mL of injection fluid to the 500-mL graduated cylinder. Fill up the cylinder to the 100-mL mark with potable or DI water (10X dilution). Fill up two 40-mL unpreserved VOAs with cylinder contents and label 10X. One 40-mL VOA will be used as a standard. The second will be used for the next serial dilution. Discard the remaining fluid within the graduated cylinder to the tank for injection.
- 100X dilution: Add 10 mL of solution from one of the 10X dilution standards to the 500-mL graduated cylinder. Fill up the cylinder to the 100-mL mark with potable or DI water (100X dilution). Fill up two 40-mL unpreserved VOAs with cylinder contents and label 100X. One 40-mL VOA will be used as a standard. The second will be used for the next serial dilution. Discard the remaining fluid.
- 1,000X dilution: Add 10 mL of solution from one of the 100X dilution standards to the 500-mL graduated cylinder. Fill up the cylinder to the 100-mL mark with potable or DI water (1,000X dilution). Fill up one 40-mL unpreserved VOA with cylinder contents and label 1,000X. Discard the remaining fluid.

Samples will be shipped via overnight express (UPS or FedEx) in a cooler with frozen reusable ice packs to Ozark Underground Labs (OUL) in Protem, Missouri. Shipping will happen as promptly as possible after sample collection. The lab will be notified of the shipment and provided with tracking information. Each water sample shipment will be accompanied by a chain-of-custody (COC) record filled out according to the RI Work Plan Standard Field Procedures (Aspect, 2008).

Samples at OUL will be logged in and refrigerated upon receipt. Samples will be assigned a laboratory identification number. If needed, water samples will be pH adjusted following the OUL Procedures and Criteria (OUL, March 2015). Analysis will be conducted using a Shimadzu spectrofluorophotometer model RF-5301.

Injection reagent

Grab samples of the prepared injection reagent will be collected using the appropriate sample containers and submitted to Analytical Resources, Incorporated (ARI) for analysis of total organic carbon (SW-846 Method 9060A) and dissolved iron (EPA 6020A). Samples will be stored on ice until analysis, and sample documentation, handling, and custody will be completed as described in the RI Data Gaps Work Plan Standard Field Procedures (Appendix B; Aspect, 2008).

Bio-traps

Microbiological samples will be collected using bio-trap samplers from Microbial Insights. Bio-trap samplers are deployed midsaturated screen on a nylon string and left to incubate in the well for 30 days. The samplers are collected after the incubation time, placed in labeled zippered bags, and shipped overnight on blue ice to Microbial Insights with a COC. Complete instructions for bio-trap sampling are attached (Bio-Trap – DNA Sampling Protocol). The microbiological sampling will occur during the initial baseline groundwater monitoring event and 6 months after the injections (Table 6).

Supplemental Quality Assurance Project Plan

This Supplemental Quality Assurance Project Plan (QAPP) is to augment the existing QAPP in the Remedial Investigation (RI) Work Plan (Appendix C; Aspect, September 25, 2008) and the Supplemental RI Data Gaps Work Plan (Attachment D; Aspect, September 29, 2014). This appendix provides the quality assurance (QA) and quality control (QC) objectives, organization, and functional activities associated with the sampling and analyses outlined in this report not covered in the existing QAPPs. The tasks are outlined in the main text of this report.

Data Quality Goal

The data-quality goal for this task is to provide data for evaluating the *in situ* treatment of the downgradient TCE plume. The performance groundwater sampling outlined in the main text is intended to provide data of sufficient technical quality to meet this goal.

Quality Control Procedures

Field and laboratory QC procedures are outlined below.

Field Procedures

Standard field protocols (e.g., sampling procedures and documentation, sample handling, sample custody) are defined in the Standard Field Procedures located in Appendix B of the RI Work Plan (Aspect, 2008). The SAP provides additional standard field protocols that deviate from the RI Work Plan associated with groundwater sampling and injection oversight. Adherence to these methods will ensure the quality of data generated. Furthermore, a Washington State-licensed hydrogeologist will review field activities and generated data.

Laboratory Procedures

Table C-1 summarizes the analytical methods for the applied tracer and microbiological analyses. Testing for the applied tracer that will be performed by Ozark Underground Labs (OUL) of Protem, Missouri. Microbiological testing will be completed by Microbial Insights of Knoxville, Tennessee. The analytical testing for all other analyses, including the injection reagent analysis, will be conducted by Analytical Resources, Incorporated (ARI) of Tukwila, Washington, and is already summarized in the RI Work Plan (Aspect, 2008). The QAPP in the RI Work Plan outlines how the laboratory implements all routine internal QA and QC procedures.

QA/QC procedures for fluorescent tracer analysis will follow procedures as outlined in OUL's Procedures and Criteria Analysis of Fluorescent Dyes in Water (Aley, 2015).

QA/QC procedures for microbiological analysis will follow procedures as outlined in the Microbial Insights Quality Assurance Manual (Microbial Insights, 2013).

Analytical Methods and Reporting Limits

Laboratory analytical methods for applied tracer and microbiological analyses to be performed during this pilot study are provided in Table C-1. The laboratory typically achieves the method detection limits (MDLs) presented for the methods defined in the table. The MDL is the minimum concentration of a compound that can be measured and reported with a 99 percent confidence that the analyte concentration is greater than zero. MDLs are established by the laboratory using prepared samples, not samples of environmental media.

Data Quality Assessment and Management

Data quality assessment and management will be completed in accordance with the existing QAPP in the RI Work Plan (Aspect 2008). Data validation will be conducted at Aspect Consulting, LLC (Aspect) by Lea Beard, Senior Staff Data Scientist. The sample collection and processing will be audited relative to the procedures outlined in the Sampling and Analysis Plan and the Standard Field Procedures from the RI Work Plan (Appendix B; Aspect, September 25, 2008). Deviations from the referenced SOPs will be identified in the data validation process. Information will be qualified accordingly.

References

- Aley, T. and S.L. Beeman, 2015, Procedures and Criteria Analysis of Fluorescent Dyes in Water and Charcoal Samplers: Fluorescein, Eosine, Rhodamine WT, and Sulforhodamine B Dyes, Ozark Underground Lab, March 3, 2015.
- Aspect Consulting, LLC (Aspect), 2008, Remedial Investigation Work Plan, Art Brass Plating, September 25, 2008.
- Aspect Consulting, LLC (Aspect), 2014, Revised Remedial Investigation Data Gaps and Supplemental Work Plan for Site Unit 1, September 29, 2014.
- Microbial Insights, Bio-Trap – DNA Sampling Protocol. 2018.
- Microbial Insights, 2013, Quality Assurance Manual, September 19, 2013.
- Pacific Groundwater Group (PGG), 2017, FINAL West of 4th Groundwater Monitoring Program Plan 2017 through Draft Cleanup Action Plan, W4 Joint Deliverable. March 21, 2017.

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Thomas, G.W., 1996, Soil pH and soil acidity, In Sparks D.L., ed., Methods of Soil Analysis. Part 3. Chemical Methods, pp. 475-90, Madison WI: Soil Science Society of America.

Sobek, A.A., W.A. Schuller, J.R. Freeman, and R.M. Smith, 1978, Field and Laboratory Methods Applicable to Overburden and Minesoils, U.S. Environmental Protection Agency (EPA) 600/2-78-054, 203pp.

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Table C-1. Summary of Chemical Analyses

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

DRAFT

Chemical Group and Analyte	Analytical Methods	MDL	Units
Fluorescein	RF5000U Shimadzu Spectrofluorophotometer	0.0005	ppb
Eosine		0.008	ppb
Rhodamine WT		0.05	ppb
Sulforhodamine B		0.04	ppb
Pyranine		0.03	ppb
Dehalococcoides (DHC)	CENSUS	--	cells/bead
Phospholipid Fatty Acids	PLFA	--	
Anaerobic metal reducers (BrMonos)		--	%
Decreased Permeability		--	ratio trans/cis
Eukaryotes (polyenoics)		--	%
Firmicutes (TerBrSats)		--	%
Normal Saturated (Nsats)		--	%
Proteobacteria (Monos)		--	%
Slowed Growth		--	ratio cy/cis
SRB/Actinomycetes (MidBrSats)		--	%
Total Biomass		--	cells/bead

Notes:

MDL = method detection limit

ppb = parts per billion

CENSUS - enumeration of dehalococcoides by DNA analysis through quantitative polymerase chain reaction

PLFA - phospholipid fatty acids; quantifies total biomass and assesses the entire microbial population

SAMPLING INSTRUCTIONS

Storage:

It is important to minimize the amount of time that the Bio-Trap Samplers are stored prior to being installed in the field. The physical properties of the Bio-Trap Samplers that make them an ideal medium for collecting microbes also increase the chances of microbial or chemical contamination. The Bio-Trap Samplers need to remain sealed and refrigerated (not frozen) until they can be installed in the field.

Note: Clean latex gloves (or similar) should be used at all times when handling the Bio-Trap Samplers.

Installation:

- Prior to installing the Bio-Trap Sampler, the monitoring well may need to be purged if it has not been sampled in a while. If purging is necessary, MI recommends that three well volumes be removed to ensure contact with formation water and reduce well bore effect.
- Attach the Bio-Trap Sampler's nylon loop (provided) to a nylon line (not provided) and suspend the Bio-Trap Sampler at a depth where significant contaminant concentrations exist. If no data is available on the vertical distribution of contaminants, then suspend the Bio-Trap Sampler in the middle of the saturated screened interval.
- If large fluctuations in the water level are anticipated during the period of incubation, the Bio-Trap Sampler should be suspended from a float (contact MI for further details). Be sure not to suspend the Bio-Trap in the NAPL zone.
- Once installed, incubation times can vary depending upon the scope of the project (routine monitoring and stable isotope probing (SIP) - 30 days and "baited" - 60 days).

Retrieval:

- Open the monitoring well and pull up the Bio-Trap Sampler. Cut and remove the braided nylon line used to suspend the Bio-Trap Sampler.
- Transfer the recovered Bio-Trap Sampler to labeled (well number and date) zippered bags, seal and then double bag in a larger (one-gallon) zippered bag, immediately place on blue ice in a cooler.
- Repeat the above for all Bio-Trap Samplers from the site. Individual zippered bags containing the Bio-Trap Samplers can be placed in the same one-gallon zippered bag (if there is enough space).
- A chain of custody (COC) form must be included with each shipment of samples.

Hold time for this analysis is 24-48 hours.

SHIPPING INSTRUCTIONS

Packaging Samples:

1. Samples should be shipped in a cooler with ice or blue ice for next day delivery. If regular ice is used, the ice should be double bagged.
2. A chain of custody form must be included with each shipment of samples. Access our chain of custody at www.microbe.com.

Shipment for Weekday Delivery:

Samples for weekday delivery should be shipped to: Sample Custodian
Microbial Insights, Inc.
10515 Research Drive
Knoxville, TN 37932
(865) 573-8188

Shipment for Saturday Delivery:

Coolers to be delivered on Saturday must be sent to our **FedEx Drop Location**. To ensure proper handling the following steps must be taken:

1. FedEx shipping label should be marked under (6) Special Handling, check Hold Saturday.
2. The cooler must be taped with FedEx SATURDAY tape.
3. The shipping label must be filled out with the Drop Location address below. Our laboratory name must be on the address label.
4. You **MUST notify by email** customerservice@microbe.com with the **tracking number** of the package on Friday (prior to 4pm Eastern Time) to arrange for Saturday pickup. Please make sure you write "Saturday Delivery" in the subject line of the message. **Without proper labeling and the tracking number, there is no guarantee that the samples will be collected.**

Samples for **Saturday delivery** should be shipped to: Microbial Insights, Inc.
FedEx Drop Location
10601 Murdock Drive
Knoxville, TN 37932
(865) 300-8053

APPENDIX D

Groundwater Sampling Logs

Sample number DR-1-012918

GROUNDWATER SAMPLING RECORD

WELL NUMBER: DR-1 Page: 1 of 1

Project Name: Art Brass Planting
Date: 1/24/18
Sampled by: nce
Measuring Point of Well: N TOC
Screened Interval (ft. TOC):
Filter Pack Interval (ft. TOC):

Project Number: 0500067
Starting Water Level (ft TOC): 5.65
Casing Stickup (ft):
Total Depth (ft TOC): 29.60
Casing Diameter (inches): 4"

Casing Volume 22.95 (ft Water) x 0.65 (Lpfv)(gpf) = 14.92 (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" = 2.45 Lpf 6" = 5.56 Lpf

Sample Intake Depth (ft TOC): Mid-screen

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
1100		0.3 Lpm	5.65		ms/cm	0.21				Started purge
1105	0.25		5.66	14.4	0.63	2.18	6.49	31.5	19.3	
1110	0.50		5.64	14.5	0.64	0.26	6.71	-20.1	21.3	clear
1115	0.75		5.63	14.5	0.64	0.17	6.71	-33.4	19.0	
1120	1.0		5.61	14.3	0.536	0.10	6.65	-41.7	19.9	clear
1125	1.25		5.61	14.3	0.534	0.09	6.64	-46.7	16.6	
1130	1.50		5.60	13.9	0.530	0.09	6.61	-47.4	15.7	minor bubbles
1135	1.75		5.59	14.2	0.529	0.09	6.58	-50.0	17.2	
1140	2.0		5.58	14.1	0.530	0.09	6.62	-53.9	20.1	
										Ferrous Iron: 5.5 mg/L 2.5 mg/L

Total Gallons Purged: 3.25 Total Casing Volumes Removed: ~0.25
Ending Water Level (ft TOC): 5.59' Ending Total Depth (ft TOC): 29.91'

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1145	40mL	VOA	12	—	HCl			DR-1-012918-10
1145	40mL	VOA	2	—	—			MS/MSD (DR-1-012918-D)
1145	250	Amber	1	—	H ₂ O ₂			Dissolved Gas
1145	500	OJ type	1	—	—			TOC
1145	500	HDPE	1	Yes	HNO ₃			Anions EPA 3000
1145	50	Cent. tube	1	—	—			Metals Applied Tracer

Set Biotraps!
[Set]
Installed at ~24.5' below TOC on 1/24/18 @ 1230

METHODS

Parameters measured with (instrument model & serial number): YSI (Gotech 5836) + HACH 2100P Turbidity meter + Hach Fe²⁺ Kit
Purging Equipment: Peristaltic Pump Decon Equipment: Alconox + H₂O
Disposal of Discharged Water: Drums on Site
Observations/Comments: Bubbly

GROUNDWATER SAMPLING RECORD WELL NUMBER: PSW-1 Page: 1 of 1

Project Name: ABP Project Number: 050067
 Date: 11/30/18 Starting Water Level (ft TOC): 6.06'
 Sampled by: mcg Casing Stickup (ft): _____
 Measuring Point of Well: N TOC Total Depth (ft TOC): 30.20
 Screened Interval (ft. TOC): _____ Casing Diameter (inches): 2"
 Filter Pack Interval (ft. TOC): _____

Casing Volume 24.14 (ft Water) x 0.16 (Lpfv)(gpf) = 3.86 (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
0945	0.0	0.4	6.06							Started purging
0950	0.5		6.08	14.0	434.5	1.82	6.62	-13.6	244	
0955	0.75		6.11	14.5	443.5	0.17	6.68	-33.5	141	
1000	1.0		6.12	14.5	442.0	0.13	6.66	-39.2	85	
1005	1.25		6.14	14.7	427.8	0.11	6.64	-43.9	42	
1010	1.50		6.14	14.7	419.9	0.09	6.63	-44.8	23	
1015	1.75		6.16	14.7	404.0	0.09	6.62	-46.5	11	
										Ferrous Iron: 3.0 mg/L

Total Gallons Purged: 2.25 Total Casing Volumes Removed: ~0.6
 Ending Water Level (ft TOC): 6.17' Ending Total Depth (ft TOC): 29.90'

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1020	40	VDA	3	-	HCl	clear	10	} Send to ARI lab } Ship to OZARK
1020	40	VDA	2	-	-			
1020	250	Amber	1	-	H ₂ SO ₄			
1020	500	0.5	1	-	-			
1020	500	HDPE	1	Y	HNO ₃			
1020	50	Centrifuge	1	-	-			

METHODS

Parameters measured with (instrument model & serial number): YSI Pro Plus (Geotech) + 2100P Turbiditymeter + Fe²⁺ Kit
 Purging Equipment: Peristaltic Pump Decon Equipment: Alconox + H₂O
 Disposal of Discharged Water: Drain on site
 Observations/Comments: _____



Sample number PSW-3-013018

GROUNDWATER SAMPLING RECORD WELL NUMBER: PSW-3 Page: 1 of 1

Project Name: Art Brass Plating Project Number: 0500067
 Date: 1/30/18 Starting Water Level (ft TOC): 5.99'
 Sampled by: ACO Casing Stickup (ft):
 Measuring Point of Well: N TOC Total Depth (ft TOC): 30.45'
 Screened Interval (ft. TOC): Casing Diameter (inches): 2"
 Filter Pack Interval (ft. TOC):

Casing Volume 24.46 (ft Water) x 0.16 (Lpfv)(gpf) = 3.9 (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
1330	0.0	0.3	5.85							Start Purge
1335	0.25		5.85	12.5	359.0	0.95	6.03	62.7	27	clear
1340	0.50		5.82	13.9	374.1	0.18	6.59	-26.7	22	
1345	0.75		5.80	14.0	373.8	0.15	6.59	-32.3	19	
1350	1.00		5.79	13.9	374.4	0.13	6.57	-36.6	17	
1355	1.25		5.75	14.0	372.9	0.11	6.53	-39.1	18	
1400	1.50		5.72	13.9	374.2	0.16	6.51	-40.9	13	clear
										Ferrous Iron
										2.0 mg/L

Total Gallons Purged: 1.75 Total Casing Volumes Removed: 0.45
 Ending Water Level (ft TOC): 5.63' Ending Total Depth (ft TOC): 31.10'

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1405	40	VOA	3	-	HCl	Clear	NA	CVOGs
1405	40	VOA	2	-	-			Diss. Gases
1405	250	Amber	1	-	H2SO4			TOC
1405	500	OS	1	-	-			Anions
1405	500	HDPE	1	Y	HNO3			Diss. metals
1405	50	Centric	1	-	-			Applied Tracer

METHODS

Parameters measured with (instrument model & serial number): YSI Pro Plus (geotech), 2100P Turbiditymeter, Fe²⁺ Kit
 Purging Equipment: Peri. Pump Decon Equipment: Alconox + H2O
 Disposal of Discharged Water: Drain on Site
 Observations/Comments:



Sample number

PSW-4-013028

GROUNDWATER SAMPLING RECORD

WELL NUMBER: PSW-4

Page: 1 of 1

Project Name: Art Brass Plating
 Date: 1/30/18
 Sampled by: aco
 Measuring Point of Well: N 10C
 Screened Interval (ft. TOC):
 Filter Pack Interval (ft. TOC):

Project Number: 050067
 Starting Water Level (ft TOC): 5.54'
 Casing Stickup (ft):
 Total Depth (ft TOC): 31.45'
 Casing Diameter (inches): 2"

Casing Volume 25.91 (ft Water) x 0.16 (Lpfv(gpf)) = 4.15 (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
1450	0.0	0.4	5.54							Started purge
1455	0.25		5.53	14.0	444.2	1.01	6.48	-28.3	210	slightly silty bubbles
1500	0.50		5.50	14.4	443.9	0.28	6.78	-51.0	142	
1505	0.75		5.49	14.5	443.6	0.13	6.78	-59.7	73	
1510	1.00		5.46	14.6	443.2	0.12	6.77	-61.2	109	
1515	1.25		5.46	14.6	431.9	0.11	6.76	-64.7	25	
1520	1.50		5.43	14.6	424.0	0.10	6.76	-65.3	26	

Ferrous Iron:
2.0 mg/L

Total Gallons Purged: 2.0 gals.

Total Casing Volumes Removed: ~0.5

Ending Water Level (ft TOC): 5.35

Ending Total Depth (ft TOC): 31.80'

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1525	40	VOA	3	-	HCl	Clear	7.0	CVOCs
1525	40	VOA	2	-	HCl			Dis Gas
1525	250	Amber	1	-	H2SO4			TOC
1525	500	OJ	1	-				anions
1525	500	HDPE	1	Y	HNO3			
1525	50	Centri	1	-				Applied Tracer

METHODS

Parameters measured with (instrument model & serial number):
 Purging Equipment: _____ Decon Equipment: _____
 Disposal of Discharged Water: _____
 Observations/Comments: _____



Sample number PSW-5-013018

GROUNDWATER SAMPLING RECORD

WELL NUMBER: PSW-5 Page: 1 of 1

Project Name: Art Brass Plating
 Date: 1/30/18
 Sampled by: aco
 Measuring Point of Well: N TOC
 Screened Interval (ft. TOC): _____
 Filter Pack Interval (ft. TOC): _____

Project Number: 050067
 Starting Water Level (ft TOC): 6.15'
 Casing Stickup (ft): _____
 Total Depth (ft TOC): 30.11
 Casing Diameter (inches): 2"

Casing Volume 23.96 (ft Water) x 0.6 (Lpfv)(gpf) = 3.84 (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
1200	0.0	0.4	6.15							Started purging clear
1205	0.25		6.15	13.5	417.1	1.72	6.53	6.6	66	
1210	0.50		6.15	14.0	424.7	0.20	6.63	-32.1	24	
1215	0.75		6.10	14.1	424.4	0.14	6.61	-36.4	18	clear
1220	1.00		6.12	13.7	421.0	0.14	6.55	-35.8	13	
1225	1.25		6.09	13.5	419.1	0.13	6.50	-35.0	12	
										Ferrous Iron: 2.0 mg/L

Total Gallons Purged: 2.75 Total Casing Volumes Removed: ~0.45
 Ending Water Level (ft TOC): 6.08' Ending Total Depth (ft TOC): ~~30.30~~ 30.30

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1235	40	VDA	3	-	HCl	clear	7	CVOCs
1235	40	VDA	2	-	-			Diss. Gases
1235	250	Amber	1	-	H2SO4			TOC
1235	500	OJ	1	-	-			Anions
1235	500	HDE	1	Y	HNO3			Diss. Metals
1235	50	CAH	1	-	-			Applied Tracer

METHODS

Parameters measured with (instrument model & serial number): YSI Pro Plus (Hach), 2100P Turbidimeter, Fe²⁺ Kit
 Purging Equipment: Peristaltic Pump Decon Equipment: Alconox + H2O
 Disposal of Discharged Water: Drain on site
 Observations/Comments: _____



Sample number MW-24-30-012918

GROUNDWATER SAMPLING RECORD

WELL NUMBER: MW-24-30 Page: 1 of 1

Project Name: 0 KFA Brass Plating
 Date: 1/24/18
 Sampled by: DOA
 Measuring Point of Well: N TOC
 Screened Interval (ft. TOC): _____
 Filter Pack Interval (ft. TOC): _____

Project Number: 050067
 Starting Water Level (ft TOC): 5.28'
 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): mid-screen
 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
1315		0.2 Lpm	5.28	13	0.332	0.58	6.53	-3.0	26.0	Start purging
1320	0.25		5.25	13.0	0.341	0.19	6.70	-51.7	7.7	
1325	0.50		5.24	14.1	0.341	0.19	6.70	-51.7	7.7	
1330	0.75		5.22	14.2	0.343	0.16	6.68	-60.1	4.1	Bubbles
1335	1.0		5.19	14.0	0.343	0.15	6.67	-66.7	4.2	
1340	1.25		5.17	13.9	0.343	0.13	6.61	-69.9	4.9	small white + red flakes floating in H ₂ O
										Ferrous Iron: 6.0 mg/L

Install Biotracer
 (check again after 30 day incubation @ 1415 at depth of ~22' below TOC)

Total Gallons Purged: 1.75 gall Total Casing Volumes Removed: _____
 Ending Water Level (ft TOC): 5.06' Ending Total Depth (ft TOC): N/A

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1340	40	VDA	3	-	HCl	clear	8.6	MW-24-30-012918 CVOCS
1340	40	VDA	2	-	-	minor		Diss. Gases
1340	250	Amber	1	-	H ₂ SO ₄	bubbles		TOC
1340	500	HDPE	1	yes	HNO ₃			Metals
1340	50	Cent-tube	1	-	-			Applied Tracer
1340	500	OJ-type	1	-	-			Anions

METHODS

Parameters measured with (instrument model & serial number): XSE (Pro. Plus) from Grottech + HACH Turbidimeter (Red) +
 Purging Equipment: Peristaltic Pump Decon Equipment: Alumax + H₂O
 Disposal of Discharged Water: Drums on site
 Observations/Comments: _____

HACH Ferrous Iron Kit



Sample number MW-24-50-013018

GROUNDWATER SAMPLING RECORD WELL NUMBER: MW-24-50 Page: 1 of 1

Project Name: Art Brass Plating Project Number: 050067
 Date: 1/30/18 Starting Water Level (ft TOC): 5.01'
 Sampled by: acd Casing Stickup (ft): _____
 Measuring Point of Well: N TOC Total Depth (ft TOC): _____
 Screened Interval (ft. TOC): _____ Casing Diameter (inches): 2"
 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

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
1600	0.0	0.5	5.01							Started purge
1605	0.25		4.97	14.7	80.1	2.30	6.53	0.9	7	
1610	0.50		4.98	14.7	77.1	0.89	6.50	12.3	3	clear
1615	0.75		4.97	14.7	80.5	0.49	6.39	7.6	2	
1620	1.00		4.96	14.5	86.8	0.18	6.24	0.0	1	
1625	1.25		4.95	14.6	90.8	0.13	6.21	-2.2	2	
1630	1.50		4.97	14.5	93.1	0.11	6.20	-2.7	1	
1635	1.75		4.96	14.6	101.9	0.10	6.21	-3.8	1	
										Ferrous Iron: 1.5 mg/l

Total Gallons Purged: 2.25' Total Casing Volumes Removed: -
 Ending Water Level (ft TOC): 4.95' Ending Total Depth (ft TOC): N/A

SAMPLE INVENTORY

Time	Volume (mL)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1635	40	VOA	3	-	HCl	Clear	1	CVOCs
1635	40	VOA	2	-	-			Diss. Gas
1635	250	Amber	1	-	H2SO4			TOC
1635	500	OJ	1	-	-			Anions
1635	500	HDPE	1	Y	HNO3			Diss. Metals
1635	50	Centrifuge	1	-	-			Applied Tracer

METHODS

Parameters measured with (instrument model & serial number): YSI Pro Plus (Geotech), Hach 2100P Turbidimeter,
 Purging Equipment: Peri. Pump Decon Equipment: Alconox + H2O Fe2+ kit
 Disposal of Discharged Water: Drum on Site
 Observations/Comments: _____



Sample number PSC-CG-MZ-40-012918

GROUNDWATER SAMPLING RECORD

WELL NUMBER: PSC-CG-MZ-40 Page: 1 of 1

Project Name: Art Brass Planting
 Date: 12/18
 Sampled by: ACP
 Measuring Point of Well: N TOC
 Screened Interval (ft. TOC):
 Filter Pack Interval (ft. TOC):

Project Number: 050067
 Starting Water Level (ft TOC): 8.52'
 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
1510	0.25	0.3	8.53		ms/cm					Started purging clear
1515	0.25		8.52	14.1	0.280	1.02	6.73	56.7	4.8	
1520	0.50		8.52	14.1	0.299	0.42	6.84	4.2	2.5	
1525	0.75		8.52	14.0	0.311	0.17	6.90	-49.5	4.4	
1530	1.0		8.53	13.9	0.325	0.16	6.88	-72.7	9.7	
1535	1.25		8.53	13.9	0.334	0.13	6.87	-86.4	7.9	
1540	1.50		8.52	13.8	0.332	0.15	6.87	-90.0	6.8	
1545	1.75		8.52	13.8	0.331	0.13	6.88	-90.5	6.8	
1550	2.00		8.53	14.0	0.330	0.13	6.87	-96.8	3.3	

Ferrous Iron: 3.5 mg/L

Biotrap install: @ 1615 @ ~20' bgs

Total Gallons Purged: 2.50 Total Casing Volumes Removed: —
 Ending Water Level (ft TOC): 8.52 Ending Total Depth (ft TOC): —

SAMPLE INVENTORY

Time	Volume (ML)	Bottle Type	Quantity	Filtration	Preservation	Appearance		Remarks
						Color	Turbidity & Sediment	
1555	40	VOA	3	—	HCl	clear	6.9	NOCLs
1555	40	VOA	2	—	—	—	—	Diss. Gases
1555	250	Amber	1	—	H ₂ SO ₄	—	—	TOC
1555	500	OJ-type	1	—	—	—	—	Anions
1555	500	HDPE	1	Yes	HNO ₃	—	—	Metals
1555	50	Centra	1	—	—	—	—	Applied Tracer

METHODS

Parameters measured with (instrument model & serial number): YSI (Pro Plus) - rented from Geotech, Hoch
 Purging Equipment: Peristaltic Pump Decon Equipment: Alconox + H₂O
 Disposal of Discharged Water: Drums on Site
 Observations/Comments:

Hoch Turbidity meter, Hoch Ferrrous Iron Kit

APPENDIX E

Laboratory Analytical and Data Validation Reports

DATA VALIDATION REPORT
Art Brass Plating
Pilot Testing
January 2018
SDG 18A0442, 18A0457, 18B0021

Prepared by:
Aspect Consulting, LLC
401 Second Ave South, Suite 201
Seattle, WA 98104

Project No. 050067 • February 2018

S:\Art Brass Plating 050067\Progress Reports\2017 Q3\AppA Lab Data and DV\DV Report -October2017GW.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 - 31, 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). The analytical methods are summarized below:

Analysis	Method	Laboratory
Anions	EPA 300.0	ARI
Dissolved Gasses	RSK-175	ARI
Metals	SW 6020A	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 18A0442

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				
			EPA300.0	RSK-175	SW6020A	SW8260C	SW9060
DR-1-012918	1/29/2018	N	X	X	X	X	X
DR-1-012918-D	1/29/2018	FD				X	
MW-24-30-012918	1/29/2018	N	X	X	X	X	X
PSC-CG-142-40-012918	1/29/2018	N	X	X	X	X	X

2.1 Receiving

Samples were received in good condition. No action or qualification was needed.

Some bubbles were observed in the VOC vials. This was deemed to not be a significant impairment to accurate analysis. 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 Dissolved Gases (RSK-175)

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 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.

2.3.4 Matrix Spikes/Matrix Spike Duplicates (MS/MSD)

All MS and MSD %R and RPD were within the control limits. No qualification or action was needed.

2.3.5 Surrogates

All surrogate %R values were within laboratory specified control limit. No qualification or action was needed.

2.3.6 Overall Assessment

Accuracy was acceptable based on the LCS/LCSD and MS/MSD recoveries. Precision was acceptable based on the LCS/LCSD and MS/MSD RPD values. The data are acceptable for use as qualified.

2.4 Metals (SW 6020A)

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/Laboratory Control Sample Duplicates (LCS/LCSD)

All LCS and LCSD %R and RPD were within the control limits. No qualification or action was needed.

2.4.4 Matrix Spike (MS)

All MS %R were within control limits, with the exception of Iron, which was low. Associated Iron 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 LCS/LCSD and DUP RPD values. The data are acceptable for use as qualified.

2.5 VOCs (SW 8260C)

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.

No further qualification or action was needed.

2.5.3 Trip Blank

Target analytes were not detected at or above the reporting levels in the trip blank. No qualification or action was needed.

2.5.4 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.

2.5.5 Matrix Spike (MS)

All MS %R were within control limits, with the exception of Trichloroethene (TCE), which was low. Associated Trichloroethene results have been qualified as estimated (J/UJ).

No further action was needed.

2.5.6 Surrogates

All surrogate %R values were within laboratory specified control limit. No qualification or action was needed.

2.5.7 Calibration and Checks

The lab indicated that an instrument calibration check standard had recovery outside the control limits for Chloroethene. None of the impacted results were in samples reported in this set. No action or qualification was needed.

2.5.8 Field Duplicate (FD)

A field duplicate was collected of sample DR01-012918. The RPD between the parent and duplicated were within control limits. No action needed.

2.5.9 Overall Assessment

Accuracy was acceptable based on the LCS/LCSD and MS. Precision was acceptable based on the LCS/LCSD and Field Duplicate RPD values. The data are acceptable for use as qualified.

2.6 Total Organic Carbon (SW 9060)

2.6.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

2.6.2 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.

2.6.3 Laboratory Control Samples (LCS)

All LCS %R were within the control limits. No qualification or action was needed.

2.6.4 Overall Assessment

Accuracy was acceptable based on the LCS and MRL. The data are acceptable for use as qualified.

3 Data Validation Findings for SDG 18A0457

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				
			EPA300.0	RSK-175	SW6020A	SW8260C	SW9060
DR-2-013018	1/30/2018	N	X	X	X	X	X
MW-24-50-013018	1/30/2018	N	X	X	X	X	X
PSW-1-013018	1/30/2018	N	X	X	X	X	X
PSW-2-013018	1/30/2018	N	X	X	X	X	X
PSW-3-013018	1/30/2018	N	X	X	X	X	X
PSW-4-013018	1/30/2018	N	X	X	X	X	X
PSW-5-013018	1/30/2018	N	X	X	X	X	X

3.1 Receiving

Samples were received in good condition. Temperature upon receipt was measured at 7.3 degrees C, which is slightly above ideal. This was not significant to results. No action or qualification was needed.

Some bubbles were observed in the VOC vials. This was deemed to not be a significant impairment to accurate analysis. No action or qualification was needed.

3.2 Anions (EPA 300.0)

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.

An MRL check standard was reported with the analysis, and met control criteria.

No further qualification or action was needed.

3.2.3 Laboratory Control Samples (LCS)

All LCS %R were within the control limits. No qualification or action was needed.

3.2.4 Matrix Spike (MS)

All MS %R were within control limits. No qualification or action was needed.

3.2.5 Lab Duplicate (DUP)

All DUP RPDs were within control limits. No qualification or action was needed.

3.2.6 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.

3.3 Dissolved Gases (RSK-175)

3.3.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

3.3.2 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.

3.3.3 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.

3.3.4 Surrogates

All surrogate %R values were within laboratory specified control limit. No qualification or action was needed.

3.3.5 Overall Assessment

Accuracy was acceptable based on the LCS/LCSD recoveries. Precision was acceptable based on the LCS/LCSD RPD values. The data are acceptable for use as qualified.

3.4 Metals (SW 6020A)

3.4.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

3.4.2 Method Blanks/Detection Levels

Target analytes were not detected at or above the reporting levels in the method blank.

One result for Arsenic was detected below the reporting limit but above the detection limit. The result has been qualified as estimated (J).

No further qualification or action was needed.

3.4.3 Laboratory Control Samples (LCS)

All LCS %R were within the control limits. No qualification or action was needed.

3.4.4 Matrix Spike (MS)

All MS %R were within control limits. No further action was needed.

3.4.5 Lab Duplicate (DUP)

All DUP RPDs were within control limits. No qualification or action was needed.

3.4.6 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.

3.5 VOCs (SW 8260C)

3.5.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

3.5.2 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.

3.5.3 Dilutions and Reanalyses

Some results exceeded the calibration range for the analysis and had to be reanalyzed at dilution. The results that exceeded the linear range were flagged as rejected (R). Results for all other analytes in the dilutions were flagged do-not-report in favor of the lower dilution results.

3.5.4 Trip Blank

Target analytes were not detected at or above the reporting levels in the trip blank. No qualification or action was needed.

3.5.5 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.

3.5.6 Surrogates

All surrogate %R values were within laboratory specified control limit. No qualification or action was needed.

3.5.7 Overall Assessment

Accuracy was acceptable based on the LCS/LCSD. Precision was acceptable based on the LCS/LCSD RPD values. The data are acceptable for use as qualified.

3.6 Total Organic Carbon (SW 9060)

3.6.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

3.6.2 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.

3.6.3 Laboratory Control Samples (LCS)

All LCS %R were within the control limits. No qualification or action was needed.

3.6.4 Overall Assessment

Accuracy was acceptable based on the LCS and MRL. The data are acceptable for use as qualified.

4 Data Validation Findings for SDG 18B0021

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	
			RSK-175	SW8260C
MW-24-013118	1/31/2018	N	X	X

4.1 Receiving

Samples were received in good condition.

No action or qualification was needed.

4.2 Dissolved Gases (RSK-175)

4.2.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

4.2.2 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.

4.2.3 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.

4.2.4 Surrogates

All surrogate %R values were within laboratory specified control limit. No qualification or action was needed.

4.2.5 Overall Assessment

Accuracy was acceptable based on the LCS/LCSD recoveries. Precision was acceptable based on the LCS/LCSD RPD values. The data are acceptable for use as qualified.

4.3 VOCs (SW 8260C)

4.3.1 Holding Times

Samples were analyzed within the requisite holding time limit.

No actions needed.

4.3.2 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.

4.3.3 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.

4.3.4 Surrogates

All surrogate %R values were within laboratory specified control limit. No qualification or action was needed.

4.3.5 Overall Assessment

Accuracy was acceptable based on the LCS/LCSD. Precision was acceptable based on the LCS/LCSD RPD values. The data are acceptable for use as qualified.

5 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
DR-1-012918	18A0442	Iron	J	MS %R Low.
DR-1-012918	18A0442	Trichloroethene (TCE)	J	MSD %R low
DR-1-012918-D	18A0442	Trichloroethene (TCE)	J	MSD %R low
MW-24-30-012918	18A0442	Iron	J	MS %R Low.
MW-24-30-012918	18A0442	Trichloroethene (TCE)	UJ	MSD %R low
PSC-CG-142-40-012918	18A0442	Iron	J	MS %R Low.
PSC-CG-142-40-012918	18A0442	Trichloroethene (TCE)	UJ	MSD %R low
DR-2-013018	18A0457	cis-1,2-Dichloroethene (DCE)	R	Exceeds calibration range
DR-2-013018	18A0457	Trichloroethene (TCE)	R	Exceeds calibration range
MW-24-50-013018	18A0457	Arsenic	J	Detected below RL and above MDL.
PSW-1-013018	18A0457	cis-1,2-Dichloroethene (DCE)	R	Exceeds calibration range
PSW-2-013018	18A0457	cis-1,2-Dichloroethene (DCE)	R	Exceeds calibration range
PSW-3-013018	18A0457	cis-1,2-Dichloroethene (DCE)	R	Exceeds calibration range
PSW-3-013018	18A0457	Trichloroethene (TCE)	R	Exceeds calibration range
PSW-4-013018	18A0457	cis-1,2-Dichloroethene (DCE)	R	Exceeds calibration range
PSW-4-013018	18A0457	Trichloroethene (TCE)	R	Exceeds calibration range
PSW-5-013018	18A0457	Trichloroethene (TCE)	R	Exceeds calibration range
MW-24-013118	18B0021	cis-1,2-Dichloroethene (DCE)	J	Result detect 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.

6 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.



12 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>
18A0442	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.





Aspect Consulting, LLC.

401 Second Avenue South, Suite 201
Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

12-Feb-2018 11:26

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
DR-1-012918	18A0442-01	Water	29-Jan-2018 11:45	29-Jan-2018 17:45
DR-1-012918-D	18A0442-02	Water	29-Jan-2018 11:45	29-Jan-2018 17:45
MW-24-30-012918	18A0442-03	Water	29-Jan-2018 13:40	29-Jan-2018 17:45
PSC-CG-142-40-012918	18A0442-04	Water	29-Jan-2018 15:55	29-Jan-2018 17:45
Trip Blanks	18A0442-05	Water	29-Jan-2018 00:00	29-Jan-2018 17:45



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Case Narrative

Sample receipt

Samples as listed on the preceding page were received January 29, 2018 under ARI workorder 18A0442. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Volatiles - EPA Method SW8260C

The samples were run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The initial calibration verification (ICV) is outside of control limits high for Chloroethene. Associated samples and QC have been flagged with a "Q" qualifier.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits.

The LCS/LCSD percent recoveries and RPD were within control limits.

A matrix spike and matrix spike duplicate were prepared in conjunction with sample DR-1-012918. The matrix spike has low spike recovery for cis-1,2-Dichloroethene. The matrix spike duplicate has low spike recovery for cis-1,2-Dichloroethene and Trichloroethene. The results are advisory. All other matrix spike/matrix spike duplicate percent recoveries and RPD were within QC limits. No corrective action was taken.

Volatile Gases - MEE by RSK175

The samples were run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits.

A matrix spike and matrix spike duplicate were prepared in conjunction with sample DR-1-012918. The matrix spike percent recoveries were within QC limits. The matrix spike duplicate has low spike recovery for Methane. The results are advisory. No corrective action was taken.

Dissolved Metals - EPA Method 6020A



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201
Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:

12-Feb-2018 11:26

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 and duplicate were prepared in conjunction with sample DR-1-012918. The duplicate RPD were within QC limits. The matrix spike has low spike recovery for Iron. The results are advisory. All other matrix spike percent recoveries were within QC limits. No corrective action was taken.

Wet Chemistry (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.

An Anions matrix spike and duplicate were prepared in conjunction with sample DR-1-012918. The matrix spike percent recoveries and duplicate RPD were within QC limits.



WORK ORDER

18A0442

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: 050067-014J-02

Preservation Confirmation

Container ID	Container Type	pH
18A0442-01 A	HDPE NM, 500 mL, 1:1 HNO3	LZ pass
18A0442-01 B	Small OJ, 500 mL	
18A0442-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	LZ pass
18A0442-01 D	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 E	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 F	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 G	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 H	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 I	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 J	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 K	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 L	VOA Vial, Clear, 40 mL, HCL	
18A0442-01 M	VOA Vial, Clear, 40 mL	
18A0442-01 N	VOA Vial, Clear, 40 mL	
18A0442-02 A	VOA Vial, Clear, 40 mL, HCL	
18A0442-02 B	VOA Vial, Clear, 40 mL, HCL	
18A0442-02 C	VOA Vial, Clear, 40 mL, HCL	
18A0442-03 A	HDPE NM, 500 mL, 1:1 HNO3	LZ pass
18A0442-03 B	Small OJ, 500 mL	
18A0442-03 C	Glass NM, Amber, 250 mL, 9N H2SO4	LZ pass
18A0442-03 D	VOA Vial, Clear, 40 mL, HCL	
18A0442-03 E	VOA Vial, Clear, 40 mL, HCL	
18A0442-03 F	VOA Vial, Clear, 40 mL, HCL	
18A0442-03 G	VOA Vial, Clear, 40 mL	
18A0442-03 H	VOA Vial, Clear, 40 mL	
18A0442-04 A	HDPE NM, 500 mL, 1:1 HNO3	LZ pass
18A0442-04 B	Small OJ, 500 mL	
18A0442-04 C	Glass NM, Amber, 250 mL, 9N H2SO4	LZ pass
18A0442-04 D	VOA Vial, Clear, 40 mL, HCL	
18A0442-04 E	VOA Vial, Clear, 40 mL, HCL	
18A0442-04 F	VOA Vial, Clear, 40 mL, HCL	



WORK ORDER

18A0442

Client: Aspect Consulting, LLC.	Project Manager: Amanda Volgardsen
Project: Art Brass	Project Number: 050067-014J-02

18A0442-04 G	Sm	VOA Vial, Clear, 40 mL
18A0442-04 H		VOA Vial, Clear, 40 mL
18A0442-05 A	lg	VOA Vial, Clear, 40 mL, HCL
18A0442-05 B	lg	VOA Vial, Clear, 40 mL, HCL
18A0442-05 C	lg	VOA Vial, Clear, 40 mL, HCL
18A0442-05 D	lg	VOA Vial, Clear, 40 mL, HCL

SEF

Preservation Confirmed By _____

1/30/18
Date _____



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/29/2018 11:45

Instrument: NT2

Analyzed: 31-Jan-2018 10:33

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGA0703 Sample Size: 2 mL
Prepared: 31-Jan-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.29	1.00	13.5	ug/L	
Chloroethane	75-00-3	1	0.43	1.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.27	1.00	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.24	1.00	4.72	ug/L	
1,1-Dichloroethane	75-34-3	1	0.27	1.00	1.17	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.21	1.00	201	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.20	1.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.36	1.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.24	1.00	53.7	ug/L	
Tetrachloroethene	127-18-4	1	0.24	1.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	109	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	98.3	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	92.5	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/29/2018 11:45

Instrument: FID6

Analyzed: 31-Jan-2018 10:06

Sample Preparation:

Preparation Method: No Prep - Volatiles
Preparation Batch: BGA0700
Prepared: 31-Jan-2018

Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	7210	ug/L	
Ethane	74-84-0	1	1.23	ND	ug/L	U
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			<i>72-122 %</i>	<i>89.8</i>	<i>%</i>	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/29/2018 11:45

Instrument: ICPMS1

Analyzed: 01-Feb-2018 16:34

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Manganese, Dissolved	7439-96-5	5	0.425	2.50	434	ug/L	D

Instrument: ICPMS2 Analyzed: 31-Jan-2018 16:57

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	18.8	ug/L	
Iron, Dissolved	7439-89-6	1	6.27	20.0	5130	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/29/2018 11:45

Instrument: ICPMS2

Analyzed: 31-Jan-2018 16:57

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.61	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 11:45

Instrument: DX500

Analyzed: 30-Jan-2018 13:44

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/29/2018 11:45

Instrument: TOC-LCSH

Analyzed: 31-Jan-2018 01:00

Sample Preparation:

Preparation Method: No Prep Wet Chem
Preparation Batch: BGA0683
Prepared: 30-Jan-2018

Sample Size: 20 mL
Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	18.2	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918
18A0442-01RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 11:45

Instrument: DX500

Analyzed: 31-Jan-2018 12:46

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	50	5.00	18.7	mg/L	D

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	40.5	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

DR-1-012918-D
18A0442-02 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/29/2018 11:45

Instrument: NT2

Analyzed: 31-Jan-2018 10:57

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGA0703 Sample Size: 2 mL
Prepared: 31-Jan-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.29	1.00	13.0	ug/L	
Chloroethane	75-00-3	1	0.43	1.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.27	1.00	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.24	1.00	4.87	ug/L	
1,1-Dichloroethane	75-34-3	1	0.27	1.00	1.11	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.21	1.00	201	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.20	1.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.36	1.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.24	1.00	54.0	ug/L	
Tetrachloroethene	127-18-4	1	0.24	1.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	109 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	98.0 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	90.7 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	103 %	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

MW-24-30-012918

18A0442-03 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/29/2018 13:40

Instrument: NT2

Analyzed: 31-Jan-2018 11:20

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGA0703 Sample Size: 2 mL
Prepared: 31-Jan-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.29	1.00	65.1	ug/L	
Chloroethane	75-00-3	1	0.43	1.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.27	1.00	3.24	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.24	1.00	9.85	ug/L	
1,1-Dichloroethane	75-34-3	1	0.27	1.00	2.00	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.21	1.00	256	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.20	1.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.36	1.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.24	1.00	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.24	1.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	111	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	98.3	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	87.9	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	103	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
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MW-24-30-012918
18A0442-03 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/29/2018 13:40

Instrument: FID6

Analyzed: 31-Jan-2018 10:20

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BGA0700 Sample Size: 10 mL
Prepared: 31-Jan-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	5700	ug/L	
Ethane	74-84-0	1	1.23	13.6	ug/L	
Ethene	74-85-1	1	1.14	8.82	ug/L	
<i>Surrogate: Propane</i>			<i>72-122 %</i>	<i>95.7</i>	<i>%</i>	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
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MW-24-30-012918
18A0442-03 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/29/2018 13:40

Instrument: ICPMS1

Analyzed: 01-Feb-2018 15:18

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Manganese, Dissolved	7439-96-5	5	0.425	2.50	368	ug/L	D

Instrument: ICPMS2 Analyzed: 31-Jan-2018 17:14

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	1.63	ug/L	
Iron, Dissolved	7439-89-6	1	6.27	20.0	4620	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
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MW-24-30-012918
18A0442-03 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/29/2018 13:40

Instrument: ICPMS2

Analyzed: 31-Jan-2018 17:14

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	0.142	ug/L	J



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

MW-24-30-012918
18A0442-03 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 13:40

Instrument: DX500

Analyzed: 30-Jan-2018 14:34

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U



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Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

MW-24-30-012918

18A0442-03 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/29/2018 13:40

Instrument: TOC-LCSH

Analyzed: 31-Jan-2018 01:21

Sample Preparation:

Preparation Method: No Prep Wet Chem

Preparation Batch: BGA0683

Prepared: 30-Jan-2018

Sample Size: 20 mL

Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	6.64	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

MW-24-30-012918
18A0442-03RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 13:40

Instrument: DX500

Analyzed: 01-Feb-2018 14:59

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	10	1.00	5.40	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

MW-24-30-012918
18A0442-03RE2 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 13:40

Instrument: DX500

Analyzed: 01-Feb-2018 14:59

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	16.5	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

PSC-CG-142-40-012918
18A0442-04 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/29/2018 15:55

Instrument: NT2

Analyzed: 31-Jan-2018 11:40

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGA0703 Sample Size: 10 mL
Prepared: 31-Jan-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	ND	ug/L	U
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.05	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	0.27	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	113	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	99.0	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	90.5	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	103	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

PSC-CG-142-40-012918
18A0442-04 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/29/2018 15:55

Instrument: FID6

Analyzed: 31-Jan-2018 10:33

Sample Preparation:

Preparation Method: No Prep - Volatiles
Preparation Batch: BGA0700
Prepared: 31-Jan-2018

Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	4810	ug/L	
Ethane	74-84-0	1	1.23	ND	ug/L	U
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			<i>72-122 %</i>	<i>94.8</i>	<i>%</i>	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

PSC-CG-142-40-012918
18A0442-04 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/29/2018 15:55

Instrument: ICPMS1

Analyzed: 01-Feb-2018 14:29

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Manganese, Dissolved	7439-96-5	5	0.425	2.50	333	ug/L	D

Instrument: ICPMS2 Analyzed: 31-Jan-2018 17:19

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696 Sample Size: 25 mL
Prepared: 31-Jan-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	7.63	ug/L	
Iron, Dissolved	7439-89-6	1	6.27	20.0	2280	ug/L	



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Project: Art Brass

Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:

12-Feb-2018 11:26

PSC-CG-142-40-012918

18A0442-04 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/29/2018 15:55

Instrument: ICPMS2

Analyzed: 31-Jan-2018 17:19

Sample Preparation:

Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGA0696
Prepared: 31-Jan-2018

Sample Size: 25 mL
Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	0.372	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

PSC-CG-142-40-012918
18A0442-04 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 15:55

Instrument: DX500

Analyzed: 30-Jan-2018 14:51

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	0.100	0.578	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

PSC-CG-142-40-012918
18A0442-04 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/29/2018 15:55

Instrument: TOC-LCSH

Analyzed: 31-Jan-2018 01:41

Sample Preparation: Preparation Method: No Prep Wet Chem
Preparation Batch: BGA0683 Sample Size: 20 mL
Prepared: 30-Jan-2018 Final Volume: 20 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.50	4.89	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

PSC-CG-142-40-012918
18A0442-04RE2 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/29/2018 15:55

Instrument: DX500

Analyzed: 01-Feb-2018 15:16

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0680 Sample Size: 5 mL
Prepared: 30-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	15.3	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Trip Blanks
18A0442-05 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/29/2018 00:00

Instrument: NT2

Analyzed: 31-Jan-2018 09:50

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGA0703 Sample Size: 10 mL
Prepared: 31-Jan-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	ND	ug/L	U
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.05	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	106	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	98.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	94.1	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Volatile Organic Compounds - Quality Control

Batch BGA0703 - EPA 5030 (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGA0703-BLK2)											
						Prepared: 31-Jan-2018	Analyzed: 31-Jan-2018 09:09				
Vinyl Chloride	ND	0.06	0.20	ug/L							U
Chloroethane	ND	0.09	0.20	ug/L							U
1,1-Dichloroethene	ND	0.05	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.05	0.20	ug/L							U
1,1-Dichloroethane	ND	0.05	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.04	0.20	ug/L							U
1,1,1-Trichloroethane	ND	0.04	0.20	ug/L							U
1,2-Dichloroethane	ND	0.07	0.20	ug/L							U
Trichloroethene	ND	0.05	0.20	ug/L							U
Tetrachloroethene	ND	0.05	0.20	ug/L							U
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.08			ug/L	5.00		102	80-129			
<i>Surrogate: Toluene-d8</i>	4.99			ug/L	5.00		99.8	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.57			ug/L	5.00		91.5	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.04			ug/L	5.00		101	80-120			
LCS (BGA0703-BS2)											
						Prepared: 31-Jan-2018	Analyzed: 31-Jan-2018 08:09				
Vinyl Chloride	10.3	0.06	0.20	ug/L	10.0		103	66-133			
Chloroethane	12.6	0.09	0.20	ug/L	10.0		126	60-155			Q
1,1-Dichloroethene	10.6	0.05	0.20	ug/L	10.0		106	69-135			
trans-1,2-Dichloroethene	10.3	0.05	0.20	ug/L	10.0		103	78-128			
1,1-Dichloroethane	10.6	0.05	0.20	ug/L	10.0		106	76-124			
cis-1,2-Dichloroethene	10.5	0.04	0.20	ug/L	10.0		105	80-121			
1,1,1-Trichloroethane	11.3	0.04	0.20	ug/L	10.0		113	79-123			
1,2-Dichloroethane	10.9	0.07	0.20	ug/L	10.0		109	75-123			
Trichloroethene	10.5	0.05	0.20	ug/L	10.0		105	80-120			
Tetrachloroethene	10.6	0.05	0.20	ug/L	10.0		106	80-120			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.92			ug/L	5.00		98.4	80-129			
<i>Surrogate: Toluene-d8</i>	5.01			ug/L	5.00		100	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.78			ug/L	5.00		95.6	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	5.04			ug/L	5.00		101	80-120			
LCS Dup (BGA0703-BSD2)											
						Prepared: 31-Jan-2018	Analyzed: 31-Jan-2018 08:49				
Vinyl Chloride	9.79	0.06	0.20	ug/L	10.0		97.9	66-133	4.65	30	
Chloroethane	11.4	0.09	0.20	ug/L	10.0		114	60-155	9.67	30	Q
1,1-Dichloroethene	9.93	0.05	0.20	ug/L	10.0		99.3	69-135	6.31	30	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Volatile Organic Compounds - Quality Control

Batch BGA0703 - EPA 5030 (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BGA0703-BSD2)					Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 08:49						
trans-1,2-Dichloroethene	9.63	0.05	0.20	ug/L	10.0		96.3	78-128	6.37	30	
1,1-Dichloroethane	10.0	0.05	0.20	ug/L	10.0		100	76-124	5.67	30	
cis-1,2-Dichloroethene	9.85	0.04	0.20	ug/L	10.0		98.5	80-121	6.01	30	
1,1,1-Trichloroethane	10.7	0.04	0.20	ug/L	10.0		107	79-123	5.31	30	
1,2-Dichloroethane	10.4	0.07	0.20	ug/L	10.0		104	75-123	4.26	30	
Trichloroethene	9.96	0.05	0.20	ug/L	10.0		99.6	80-120	5.12	30	
Tetrachloroethene	10.1	0.05	0.20	ug/L	10.0		101	80-120	5.44	30	
Surrogate: 1,2-Dichloroethane-d4	5.12			ug/L	5.00		102	80-129			
Surrogate: Toluene-d8	4.93			ug/L	5.00		98.6	80-120			
Surrogate: 4-Bromofluorobenzene	4.86			ug/L	5.00		97.1	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.93			ug/L	5.00		98.6	80-120			

Matrix Spike (BGA0703-MS1)					Source: 18A0442-01 Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 13:22						
Vinyl Chloride	60.7	0.29	1.00	ug/L	50.0	13.5	94.5	66-133			
Chloroethane	39.0	0.43	1.00	ug/L	50.0	ND	78.1	60-155			Q
1,1-Dichloroethene	50.3	0.27	1.00	ug/L	50.0	ND	101	69-135			
trans-1,2-Dichloroethene	53.5	0.24	1.00	ug/L	50.0	4.72	97.6	78-128			
1,1-Dichloroethane	52.0	0.27	1.00	ug/L	50.0	1.17	102	76-124			
cis-1,2-Dichloroethene	236	0.21	1.00	ug/L	50.0	201	71.0	80-121			*
1,1,1-Trichloroethane	51.0	0.20	1.00	ug/L	50.0	ND	102	79-123			
1,2-Dichloroethane	49.9	0.36	1.00	ug/L	50.0	ND	99.8	75-123			
Trichloroethene	97.9	0.24	1.00	ug/L	50.0	53.7	88.3	80-120			
Tetrachloroethene	50.6	0.24	1.00	ug/L	50.0	ND	101	80-120			
Surrogate: 1,2-Dichloroethane-d4	4.92			ug/L	5.00	5.45	98.3	80-129			
Surrogate: Toluene-d8	4.96			ug/L	5.00	4.91	99.2	80-120			
Surrogate: 4-Bromofluorobenzene	4.81			ug/L	5.00	4.62	96.1	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.00			ug/L	5.00	5.12	100	80-120			

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

Matrix Spike Dup (BGA0703-MSD1)					Source: 18A0442-01 Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 13:42						
Vinyl Chloride	55.7	0.29	1.00	ug/L	50.0	13.5	84.4	66-133	8.67	30	
Chloroethane	39.3	0.43	1.00	ug/L	50.0	ND	78.7	60-155	0.75	30	Q
1,1-Dichloroethene	46.4	0.27	1.00	ug/L	50.0	ND	92.9	69-135	8.01	30	
trans-1,2-Dichloroethene	48.7	0.24	1.00	ug/L	50.0	4.72	87.9	78-128	9.43	30	



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401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

12-Feb-2018 11:26

Volatile Organic Compounds - Quality Control

Batch BGA0703 - EPA 5030 (Purge and Trap)

Instrument: NT2 Analyst: LH

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Matrix Spike Dup (BGA0703-MSD1)											
		Source: 18A0442-01			Prepared: 31-Jan-2018		Analyzed: 31-Jan-2018 13:42				
1,1-Dichloroethane	47.5	0.27	1.00	ug/L	50.0	1.17	92.6	76-124	9.08	30	
cis-1,2-Dichloroethene	228	0.21	1.00	ug/L	50.0	201	55.6	80-121	3.31	30	*
1,1,1-Trichloroethane	47.8	0.20	1.00	ug/L	50.0	ND	95.6	79-123	6.41	30	
1,2-Dichloroethane	45.7	0.36	1.00	ug/L	50.0	ND	91.5	75-123	8.76	30	
Trichloroethene	92.1	0.24	1.00	ug/L	50.0	53.7	76.8	80-120	6.02	30	*
Tetrachloroethene	45.4	0.24	1.00	ug/L	50.0	ND	90.8	80-120	10.90	30	
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.82			ug/L	5.00	5.45	96.4	80-129			
<i>Surrogate: Toluene-d8</i>	5.00			ug/L	5.00	4.91	99.9	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.74			ug/L	5.00	4.62	94.8	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.97			ug/L	5.00	5.12	99.3	80-120			

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



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Dissolved Gases - Quality Control

Batch BGA0700 - No Prep - Volatiles

Instrument: FID6 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGA0700-BLK1)		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 09:13								
Methane	ND	0.65	ug/L							U
Ethane	ND	1.23	ug/L							U
Ethene	ND	1.14	ug/L							U
<i>Surrogate: Propane</i>	1740		ug/L	1800		96.9	72-122			

LCS (BGA0700-BS1)		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 08:46								
Methane	687		ug/L	656		105	80-120			
Ethane	1280		ug/L	1230		104	80-120			
Ethene	1160		ug/L	1150		101	80-120			
<i>Surrogate: Propane</i>	1770		ug/L	1800		98.2	62-122			

LCS Dup (BGA0700-BSD1)		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 08:59								
Methane	701		ug/L	656		107	80-120	2.11	30	
Ethane	1310		ug/L	1230		106	80-120	1.67	30	
Ethene	1190		ug/L	1150		103	80-120	1.85	30	
<i>Surrogate: Propane</i>	1770		ug/L	1800		98.4	62-122			

Matrix Spike (BGA0700-MS1)		Source: 18A0442-01		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 11:01						
Methane	7930		ug/L	656	7210	110	80-120			
Ethane	1160		ug/L	1230	ND	93.9	80-120			
Ethene	1040		ug/L	1150	ND	90.1	80-120			
<i>Surrogate: Propane</i>	1550		ug/L	1800	1620	86.3	62-122			

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

Matrix Spike Dup (BGA0700-MSD1)		Source: 18A0442-01		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 14:42						
Methane	8130		ug/L	656	7210	142	80-120	2.55	30	*
Ethane	1180		ug/L	1230	ND	95.7	80-120	1.86	30	
Ethene	1070		ug/L	1150	ND	92.7	80-120	2.85	30	
<i>Surrogate: Propane</i>	1570		ug/L	1800	1620	87.3	62-122			

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



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Metals and Metallic Compounds (dissolved) - Quality Control

Batch BGA0696 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS1 Analyst: TCH

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Duplicate (BGA0696-DUP2)		Source: 18A0442-01			Prepared: 31-Jan-2018		Analyzed: 01-Feb-2018 16:30					
Manganese, Dissolved	55	442	0.425	2.50	ug/L		434			1.94	20	D
Matrix Spike (BGA0696-MS2)		Source: 18A0442-01			Prepared: 31-Jan-2018		Analyzed: 01-Feb-2018 16:38					
Manganese, Dissolved	55	458	0.425	2.50	ug/L	25.0	434	95.9	75-125			D

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

Instrument: ICPMS2 Analyst: CC

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGA0696-BLK1)					Prepared: 31-Jan-2018		Analyzed: 31-Jan-2018 16:48					
Barium, Dissolved	135	ND	0.0560	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0530	0.500	ug/L							U
Iron, Dissolved	54	ND	6.27	20.0	ug/L							U
Iron, Dissolved	57	ND	1.40	20.0	ug/L							U
Manganese, Dissolved	55	ND	0.0850	0.500	ug/L							U
Arsenic, Dissolved	75a	ND	0.0220	0.200	ug/L							U
LCS (BGA0696-BS1)					Prepared: 31-Jan-2018		Analyzed: 31-Jan-2018 17:08					
Barium, Dissolved	135	24.1	0.0560	0.500	ug/L	25.0		96.5	80-120			
Barium, Dissolved	137	23.9	0.0530	0.500	ug/L	25.0		95.6	80-120			
Iron, Dissolved	54	5130	6.27	20.0	ug/L	5000		103	80-120			
Iron, Dissolved	57	4930	1.40	20.0	ug/L	5000		98.6	80-120			
Manganese, Dissolved	55	25.6	0.0850	0.500	ug/L	25.0		103	80-120			
Arsenic, Dissolved	75a	24.5	0.0220	0.200	ug/L	25.0		98.1	80-120			
Duplicate (BGA0696-DUP1)		Source: 18A0442-01			Prepared: 31-Jan-2018		Analyzed: 31-Jan-2018 16:53					
Barium, Dissolved	135	19.6	0.0560	0.500	ug/L		18.8			4.13	20	
Iron, Dissolved	54	5160	6.27	20.0	ug/L		5130			0.68	20	
Arsenic, Dissolved	75a	1.66	0.0220	0.200	ug/L		1.61			3.05	20	
Matrix Spike (BGA0696-MS1)		Source: 18A0442-01			Prepared: 31-Jan-2018		Analyzed: 31-Jan-2018 17:02					
Barium, Dissolved	135	41.1	0.0560	0.500	ug/L	25.0	18.8	89.0	75-125			
Iron, Dissolved	54	8740	6.27	20.0	ug/L	5000	5130	72.4	75-125			*
Arsenic, Dissolved	75a	25.1	0.0220	0.200	ug/L	25.0	1.61	94.1	75-125			

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



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Reported:
12-Feb-2018 11:26

Wet Chemistry - Quality Control

Batch BGA0680 - SM 5310 A-00, 0.45um filtration

Instrument: DX500 Analyst: CDE

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGA0680-BLK1)		Prepared: 30-Jan-2018 Analyzed: 30-Jan-2018 13:10								
Chloride	ND	0.100	mg/L							U
Nitrate-N	ND	0.100	mg-N/L							U
Nitrite-N	ND	0.100	mg-N/L							U
Sulfate	ND	0.100	mg/L							U
LCS (BGA0680-BS1)		Prepared: 30-Jan-2018 Analyzed: 30-Jan-2018 13:27								
Chloride	1.46	0.100	mg/L	1.50		97.3	90-110			
Nitrate-N	1.53	0.100	mg-N/L	1.50		102	90-110			
Nitrite-N	1.47	0.100	mg-N/L	1.50		97.8	90-110			
Sulfate	1.54	0.100	mg/L	1.50		103	90-110			
Duplicate (BGA0680-DUP1)		Source: 18A0442-01		Prepared: 30-Jan-2018 Analyzed: 30-Jan-2018 14:01						
Nitrate-N	ND	0.100	mg-N/L		ND					U
Nitrite-N	ND	0.100	mg-N/L		ND					U
Duplicate (BGA0680-DUP2)		Source: 18A0442-01RE1		Prepared: 30-Jan-2018 Analyzed: 31-Jan-2018 13:03						
Chloride	18.8	5.00	mg/L		18.7			0.18	20	D
Duplicate (BGA0680-DUP3)		Source: 18A0442-01RE1		Prepared: 30-Jan-2018 Analyzed: 01-Feb-2018 14:25						
Sulfate	40.6	5.00	mg/L		40.5			0.22	20	D
Matrix Spike (BGA0680-MS1)		Source: 18A0442-01		Prepared: 30-Jan-2018 Analyzed: 30-Jan-2018 14:17						
Nitrate-N	2.14	0.100	mg-N/L	2.00	ND	107	75-125			
Nitrite-N	1.98	0.100	mg-N/L	2.00	ND	99.2	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
Matrix Spike (BGA0680-MS2)		Source: 18A0442-01RE1		Prepared: 30-Jan-2018 Analyzed: 31-Jan-2018 13:20						
Chloride	66.1	5.00	mg/L	50.0	18.7	94.7	75-125			D
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
Matrix Spike (BGA0680-MS3)		Source: 18A0442-01RE1		Prepared: 30-Jan-2018 Analyzed: 01-Feb-2018 14:42						
Sulfate	88.8	5.00	mg/L	50.0	40.5	96.6	75-125			D
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										



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Reported:

12-Feb-2018 11:26

Wet Chemistry - Quality Control

Batch BGA0683 - No Prep Wet Chem

Instrument: TOC-LCSH Analyst: GM

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGA0683-BLK1)					Prepared: 30-Jan-2018 Analyzed: 30-Jan-2018 16:28					
Total Organic Carbon	ND	0.50	mg/L							U
LCS (BGA0683-BS1)					Prepared: 30-Jan-2018 Analyzed: 30-Jan-2018 16:54					
Total Organic Carbon	20.9	0.50	mg/L	20.0		104	90-110			



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Reported:
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Certified Analyses included in this Report

Analyte	Certifications
EPA 300.0 in Water	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Nitrate-N	DoD-ELAP,WADOE,WA-DW,NELAP
Nitrite-N	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
EPA 6020A in Water	
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
EPA 6020A UCT-KED in Water	
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC
EPA 8260C in Water	
Chloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrolein	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Iodomethane	DoD-ELAP,NELAP,CALAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,CALAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,CALAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,CALAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Butanone	DoD-ELAP,NELAP,CALAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,CALAP,WADOE



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

Bromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,CALAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Styrene	DoD-ELAP,NELAP,CALAP,WADOE
Bromoform	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,CALAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,CALAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE



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Project Manager: Adam Griffin

Reported:
12-Feb-2018 11:26

4-Isopropyl Toluene	DoD-ELAP,NELAP,CALAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 9060A in Water

Total Organic Carbon DoD-ELAP,WADOE,NELAP

EPA RSK-175 in Water

Methane	NELAP
Ethane	NELAP
Ethene	NELAP
Acetylene	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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401 Second Avenue South, Suite 201

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Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

12-Feb-2018 11:26

Notes and Definitions

- U This analyte is not detected above the applicable reporting or detection limit.
- Q Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
- J Estimated concentration value detected below the reporting limit.
- 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.



14 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>
18A0457	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.





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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-24-50-013018	18A0457-01	Water	30-Jan-2018 16:35	31-Jan-2018 18:15
PSW-4-013018	18A0457-02	Water	30-Jan-2018 15:25	31-Jan-2018 18:15
PSW-3-013018	18A0457-03	Water	30-Jan-2018 14:05	31-Jan-2018 18:15
PSW-5-013018	18A0457-04	Water	30-Jan-2018 12:35	31-Jan-2018 18:15
PSW-2-013018	18A0457-05	Water	30-Jan-2018 11:30	31-Jan-2018 18:15
PSW-1-013018	18A0457-06	Water	30-Jan-2018 10:20	31-Jan-2018 18:15
DR-2-013018	18A0457-07	Water	30-Jan-2018 09:00	31-Jan-2018 18:15



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Seattle WA, 98104

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

Case Narrative

Sample receipt

Samples as listed on the preceding page were received January 31, 2018 under ARI workorder 18A0457. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Volatiles - EPA Method SW8260C

The samples were run within the recommended holding times.

All samples except sample MW-24-50-033018 were reanalyzed at dilutions due to various compounds exceeding the upper calibration range. These compounds have been flagged with an "E" qualifier in the initial runs. No further corrective action was taken.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blanks were clean at the reporting limits.

The LCS/LCSD percent recoveries and RPD were within control limits.

Volatile Gases - MEE by RSK175

The samples were run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits.

The LCS/LCSD percent recoveries and RPD were within control limits.

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 blanks were clean at the reporting limits.

The LCS percent recoveries were within control limits.



Aspect Consulting, LLC.

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Project: Art Brass

Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:

14-Feb-2018 15:40

A matrix spike and duplicate were prepared in conjunction with sample MW-24-50-013018. The matrix spike percent recoveries and duplicate RPD were within QC limits.

Wet Chemistry (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.

An Anions matrix spike and duplicate were prepared in conjunction with sample MW-24-50-013018. The matrix spike percent recoveries and duplicate RPD were within QC limits.



WORK ORDER

18A0457

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: 050067-014J-02

Preservation Confirmation

Container ID	Container Type	pH
18A0457-01 A	VOA Vial, Clear, 40 mL, HCL	
18A0457-01 B	VOA Vial, Clear, 40 mL, HCL	
18A0457-01 C <i>Sm</i>	VOA Vial, Clear, 40 mL, HCL	
18A0457-01 D <i>pb</i>	VOA Vial, Clear, 40 mL	
18A0457-01 E <i>pb Sm</i>	VOA Vial, Clear, 40 mL	
18A0457-01 F	Glass NM, Amber, 250 mL, 9N H2SO4	<i>L2 pass</i>
18A0457-01 G	Small OJ, 500 mL	
18A0457-01 H	HDPE NM, 500 mL, 1:1 HNO3	<i>L2 pass</i>
18A0457-02 A	VOA Vial, Clear, 40 mL, HCL	
18A0457-02 B	VOA Vial, Clear, 40 mL, HCL	
18A0457-02 C <i>Sm</i>	VOA Vial, Clear, 40 mL, HCL	
18A0457-02 D <i>Sm</i>	VOA Vial, Clear, 40 mL	
18A0457-02 E <i>Sm</i>	VOA Vial, Clear, 40 mL	
18A0457-02 F	Glass NM, Amber, 250 mL, 9N H2SO4	<i>L2 pass</i>
18A0457-02 G	Small OJ, 500 mL	
18A0457-02 H	HDPE NM, 500 mL, 1:1 HNO3	<i>L2 pass</i>
18A0457-03 A <i>Sm</i>	VOA Vial, Clear, 40 mL, HCL	
18A0457-03 B	VOA Vial, Clear, 40 mL, HCL	
18A0457-03 C <i>Sm</i>	VOA Vial, Clear, 40 mL, HCL	
18A0457-03 D	VOA Vial, Clear, 40 mL	
18A0457-03 E	VOA Vial, Clear, 40 mL	
18A0457-03 F	Glass NM, Amber, 250 mL, 9N H2SO4	<i>L2 pass</i>
18A0457-03 G	Small OJ, 500 mL	
18A0457-03 H	HDPE NM, 500 mL, 1:1 HNO3	<i>L2 pass</i>
18A0457-04 A	VOA Vial, Clear, 40 mL, HCL	
18A0457-04 B <i>Sm</i>	VOA Vial, Clear, 40 mL, HCL	
18A0457-04 C	VOA Vial, Clear, 40 mL, HCL	
18A0457-04 D	VOA Vial, Clear, 40 mL	
18A0457-04 E	VOA Vial, Clear, 40 mL	
18A0457-04 F	Glass NM, Amber, 250 mL, 9N H2SO4	<i>L2 pass</i>
18A0457-04 G	Small OJ, 500 mL	



WORK ORDER

18A0457

Client: Aspect Consulting, LLC.	Project Manager: Amanda Volgardsen
Project: Art Brass	Project Number: 050067-014J-02

18A0457-04 H	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18A0457-05 A	VOA Vial, Clear, 40 mL, HCL	
18A0457-05 B	VOA Vial, Clear, 40 mL, HCL	
18A0457-05 C	VOA Vial, Clear, 40 mL, HCL	
18A0457-05 D	VOA Vial, Clear, 40 mL	
18A0457-05 E	VOA Vial, Clear, 40 mL	
18A0457-05 F	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18A0457-05 G	Small OJ, 500 mL	
18A0457-05 H	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18A0457-06 A	VOA Vial, Clear, 40 mL, HCL	
18A0457-06 B	VOA Vial, Clear, 40 mL, HCL	
18A0457-06 C	VOA Vial, Clear, 40 mL, HCL	
18A0457-06 D Sm	VOA Vial, Clear, 40 mL	
18A0457-06 E	VOA Vial, Clear, 40 mL	
18A0457-06 F	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18A0457-06 G	Small OJ, 500 mL	
18A0457-06 H	HDPE NM, 500 mL, 1:1 HNO3	L2 pass
18A0457-07 A pb	VOA Vial, Clear, 40 mL, HCL	
18A0457-07 B	VOA Vial, Clear, 40 mL, HCL	
18A0457-07 C Sm	VOA Vial, Clear, 40 mL, HCL	
18A0457-07 D Sm	VOA Vial, Clear, 40 mL	
18A0457-07 E Sm	VOA Vial, Clear, 40 mL	
18A0457-07 F	Glass NM, Amber, 250 mL, 9N H2SO4	L2 pass
18A0457-07 G	Small OJ, 500 mL	
18A0457-07 H	HDPE NM, 500 mL, 1:1 HNO3	L2 pass

SEF
Preservation Confirmed By _____

1/31/18
Date _____



Cooler Receipt Form

ARI Client: Aspect

Project Name: ART Brass

COC No(s): _____ NA

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 18A0457

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 YES NO

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

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 7.3

Time: _____

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

Temp Gun ID#: D002565

Cooler Accepted by: SEF Date: 1/30/18 Time: 1815

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: SEF Date: 1/31/18 Time: 1025

**** 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:

IF bottle label had sample time & date left blank
air bubbles on pres sheet

By: SEF Date: 1/31/18

<p>Small Air Bubbles - 2mm</p>	<p>Peabubbles 2-4 mm</p>	<p>LARGE Air Bubbles > 4 mm</p>	<p>Small → "sm" (< 2 mm)</p> <p>Peabubbles → "pb" (2 to < 4 mm)</p> <p>Large → "lg" (4 to < 6 mm)</p> <p>Headspace → "hs" (> 6 mm)</p>
------------------------------------	------------------------------	--	--



18A0457

Cooler#:		Temperature(°C): 7.3	
Sample ID	Bottle Count	Bottle Type	
Samples received above 6°			

Cooler#:		Temperature(°C):	
Sample ID	Bottle Count	Bottle Type	

Cooler#:		Temperature(°C):	
Sample ID	Bottle Count	Bottle Type	

Cooler#:		Temperature(°C):	
Sample ID	Bottle Count	Bottle Type	

Completed by: SEF Date: 11/30/18 Time: 1815



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 16:35

Instrument: NT2

Analyzed: 01-Feb-2018 14:02

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	ND	ug/L	U
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.05	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	ND	ug/L	U
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	101	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.6	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	94.4	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	



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401 Second Avenue South, Suite 201
Seattle WA, 98104

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 16:35

Instrument: FID6

Analyzed: 08-Feb-2018 10:26

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167 Sample Size: 10 mL
Prepared: 08-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	6290	ug/L	
Ethane	74-84-0	1	1.23	ND	ug/L	U
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			72-122 %	89.2	%	



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 16:35

Instrument: ICPMS2

Analyzed: 05-Feb-2018 17:04

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Iron, Dissolved	7439-89-6	2	12.5	40.0	1260	ug/L	D
Manganese, Dissolved	7439-96-5	2	0.170	1.00	121	ug/L	D



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401 Second Avenue South, Suite 201
Seattle WA, 98104

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 16:35

Instrument: ICPMS2

Analyzed: 02-Feb-2018 17:35

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	0.114	ug/L	J



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 16:35

Instrument: DX500

Analyzed: 31-Jan-2018 17:32

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 16:35

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 17:43

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	4.10	mg/L	



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401 Second Avenue South, Suite 201
Seattle WA, 98104

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

MW-24-50-013018
18A0457-01RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 16:35

Instrument: DX500

Analyzed: 01-Feb-2018 17:47

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	11.1	mg/L	D

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	1	0.100	0.198	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 15:25

Instrument: NT2

Analyzed: 01-Feb-2018 14:22

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	27.4	ug/L	
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	0.55	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	6.15	ug/L	
1,1-Dichloroethane	75-34-3	1	0.05	0.20	0.92	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	164	ug/L	E
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	124	ug/L	E
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	107	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	96.2	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	92.6	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 15:25

Instrument: FID6

Analyzed: 08-Feb-2018 10:55

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167 Sample Size: 10 mL
Prepared: 08-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	5660	ug/L	
Ethane	74-84-0	1	1.23	6.93	ug/L	
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			72-122 %	89.9	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 15:25

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:36

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	9.89	ug/L	
Iron, Dissolved	7439-89-6	5	31.4	100	4700	ug/L	D
Manganese, Dissolved	7439-96-5	5	0.425	2.50	320	ug/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 15:25

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:36

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	2.29	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 15:25

Instrument: DX500

Analyzed: 31-Jan-2018 18:22

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	20	2.00	31.5	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 15:25

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 18:02

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	8.31	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 15:25

Instrument: NT3

Analyzed: 02-Feb-2018 13:05

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 2 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.29	1.00	25.7	ug/L	
Chloroethane	75-00-3	1	0.43	1.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.27	1.00	0.49	ug/L	J
trans-1,2-Dichloroethene	156-60-5	1	0.24	1.00	5.81	ug/L	
1,1-Dichloroethane	75-34-3	1	0.27	1.00	0.86	ug/L	J
cis-1,2-Dichloroethene	156-59-2	1	0.21	1.00	158	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.20	1.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.36	1.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.24	1.00	124	ug/L	
Tetrachloroethene	127-18-4	1	0.24	1.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	101	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	100	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	96.1	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-4-013018
18A0457-02RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 15:25

Instrument: DX500

Analyzed: 01-Feb-2018 18:37

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	17.0	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 14:05

Instrument: NT2

Analyzed: 01-Feb-2018 14:43

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	12.0	ug/L	
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	0.59	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	5.92	ug/L	
1,1-Dichloroethane	75-34-3	1	0.05	0.20	2.19	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	138	ug/L	E
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	278	ug/L	E
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	110 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	95.5 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	89.8 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	98.4 %	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 14:05

Instrument: FID6

Analyzed: 08-Feb-2018 11:22

Sample Preparation:

Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167
Prepared: 08-Feb-2018

Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	1640	ug/L	
Ethane	74-84-0	1	1.23	7.12	ug/L	
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			72-122 %	96.6	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 14:05

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:41

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	5.82	ug/L	
Iron, Dissolved	7439-89-6	5	7.00	100	8720	ug/L	D
Manganese, Dissolved	7439-96-5	5	0.425	2.50	352	ug/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 14:05

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:41

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	0.613	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 14:05

Instrument: DX500

Analyzed: 31-Jan-2018 18:39

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	20	2.00	26.3	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 14:05

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 18:23

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	5.30	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 14:05

Instrument: NT3

Analyzed: 02-Feb-2018 13:34

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 1 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.57	2.00	11.6	ug/L	
Chloroethane	75-00-3	1	0.86	2.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.54	2.00	0.56	ug/L	J
trans-1,2-Dichloroethene	156-60-5	1	0.49	2.00	5.55	ug/L	
1,1-Dichloroethane	75-34-3	1	0.53	2.00	2.01	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.43	2.00	130	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.41	2.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.72	2.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.49	2.00	328	ug/L	
Tetrachloroethene	127-18-4	1	0.47	2.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	93.8 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	97.9 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	102 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	99.0 %	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-3-013018
18A0457-03RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 14:05

Instrument: DX500

Analyzed: 01-Feb-2018 18:54

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	14.8	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-5-013018
18A0457-04 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 12:35

Instrument: NT2

Analyzed: 01-Feb-2018 15:03

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	6.61	ug/L	
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	0.29	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	5.05	ug/L	
1,1-Dichloroethane	75-34-3	1	0.05	0.20	0.76	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	63.3	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	226	ug/L	E
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	110 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	95.8 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	91.5 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	101 %	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-5-013018
18A0457-04 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 12:35

Instrument: FID6

Analyzed: 08-Feb-2018 11:36

Sample Preparation:

Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167
Prepared: 08-Feb-2018

Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	1680	ug/L	
Ethane	74-84-0	1	1.23	ND	ug/L	U
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			72-122 %	97.0	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-5-013018
18A0457-04 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 12:35

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:46

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	12.4	ug/L	
Iron, Dissolved	7439-89-6	5	7.00	100	14000	ug/L	D
Manganese, Dissolved	7439-96-5	5	0.425	2.50	566	ug/L	D



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Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

14-Feb-2018 15:40

PSW-5-013018

18A0457-04 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 12:35

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:46

Sample Preparation:

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

Preparation Batch: BGB0031

Sample Size: 25 mL

Prepared: 02-Feb-2018

Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.11	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-5-013018
18A0457-04 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 12:35

Instrument: DX500

Analyzed: 31-Jan-2018 18:56

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	10	1.00	16.3	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-5-013018
18A0457-04 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 12:35

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 18:43

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	6.76	mg/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-5-013018
18A0457-04RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 12:35

Instrument: NT3

Analyzed: 02-Feb-2018 14:02

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 1 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.57	2.00	5.96	ug/L	
Chloroethane	75-00-3	1	0.86	2.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.54	2.00	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.49	2.00	5.13	ug/L	
1,1-Dichloroethane	75-34-3	1	0.53	2.00	0.84	ug/L	J
cis-1,2-Dichloroethene	156-59-2	1	0.43	2.00	60.9	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.41	2.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.72	2.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.49	2.00	264	ug/L	
Tetrachloroethene	127-18-4	1	0.47	2.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	97.3 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	96.5 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	102 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	98.9 %	



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Project: Art Brass
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Project Manager: Adam Griffin

Reported:
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PSW-5-013018
18A0457-04RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 12:35

Instrument: DX500

Analyzed: 01-Feb-2018 19:11

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	14.7	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-2-013018
18A0457-05 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 11:30

Instrument: NT2

Analyzed: 01-Feb-2018 15:24

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	16.5	ug/L	
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	0.55	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	5.82	ug/L	
1,1-Dichloroethane	75-34-3	1	0.05	0.20	1.64	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	237	ug/L	E
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	45.1	ug/L	
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	112	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	95.7	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	92.8	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	104	%	



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Reported:
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PSW-2-013018
18A0457-05 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 11:30

Instrument: FID6

Analyzed: 08-Feb-2018 11:50

Sample Preparation:

Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167
Prepared: 08-Feb-2018

Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	5110	ug/L	
Ethane	74-84-0	1	1.23	8.70	ug/L	
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			<i>72-122 %</i>	<i>93.9</i>	<i>%</i>	



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Reported:
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PSW-2-013018
18A0457-05 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 11:30

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:51

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	15.4	ug/L	
Iron, Dissolved	7439-89-6	5	31.4	100	1340	ug/L	D
Manganese, Dissolved	7439-96-5	5	0.425	2.50	333	ug/L	D



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Reported:
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PSW-2-013018
18A0457-05 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 11:30

Instrument: ICPMS2

Analyzed: 02-Feb-2018 16:51

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.85	ug/L	



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Project Manager: Adam Griffin

Reported:
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PSW-2-013018
18A0457-05 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 11:30

Instrument: DX500

Analyzed: 31-Jan-2018 19:46

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	10	1.00	11.4	mg/L	D



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Project Manager: Adam Griffin

Reported:
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PSW-2-013018
18A0457-05 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 11:30

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 19:08

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	6.29	mg/L	



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Project Manager: Adam Griffin

Reported:
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PSW-2-013018
18A0457-05RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 11:30

Instrument: NT3

Analyzed: 02-Feb-2018 14:29

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 1 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.57	2.00	16.6	ug/L	
Chloroethane	75-00-3	1	0.86	2.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.54	2.00	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.49	2.00	5.90	ug/L	
1,1-Dichloroethane	75-34-3	1	0.53	2.00	1.76	ug/L	J
cis-1,2-Dichloroethene	156-59-2	1	0.43	2.00	277	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.41	2.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.72	2.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.49	2.00	48.2	ug/L	
Tetrachloroethene	127-18-4	1	0.47	2.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	101 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	99.1 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	103 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	97.1 %	



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Reported:
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PSW-2-013018
18A0457-05RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 11:30

Instrument: DX500

Analyzed: 01-Feb-2018 19:27

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	16.8	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-1-013018
18A0457-06 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 10:20

Instrument: NT2

Analyzed: 01-Feb-2018 15:44

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	16.0	ug/L	
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	1.42	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	4.36	ug/L	
1,1-Dichloroethane	75-34-3	1	0.05	0.20	1.22	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	107	ug/L	E
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	20.0	ug/L	
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	111	%
<i>Surrogate: Toluene-d8</i>					80-120 %	95.3	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	94.2	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	102	%



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Project: Art Brass
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Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-1-013018
18A0457-06 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 10:20

Instrument: FID6

Analyzed: 08-Feb-2018 12:17

Sample Preparation:

Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167
Prepared: 08-Feb-2018

Sample Size: 10 mL
Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	11200	ug/L	
Ethane	74-84-0	1	1.23	10.9	ug/L	
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			72-122 %	94.2	%	



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Project Manager: Adam Griffin

Reported:
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PSW-1-013018
18A0457-06 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 10:20

Instrument: ICPMS2

Analyzed: 02-Feb-2018 17:49

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	5.65	ug/L	
Iron, Dissolved	7439-89-6	5	31.4	100	8380	ug/L	D
Manganese, Dissolved	7439-96-5	5	0.425	2.50	514	ug/L	D



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Reported:
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PSW-1-013018
18A0457-06 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 10:20

Instrument: ICPMS2

Analyzed: 02-Feb-2018 17:49

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.23	ug/L	



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Reported:
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PSW-1-013018
18A0457-06 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 10:20

Instrument: DX500

Analyzed: 31-Jan-2018 20:03

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	20	2.00	11.1	mg/L	D



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Reported:
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PSW-1-013018
18A0457-06 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 10:20

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 19:33

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	6.51	mg/L	



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Reported:
14-Feb-2018 15:40

PSW-1-013018
18A0457-06RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 10:20

Instrument: NT3

Analyzed: 02-Feb-2018 14:57

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 2 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.29	1.00	15.5	ug/L	
Chloroethane	75-00-3	1	0.43	1.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.27	1.00	1.51	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.24	1.00	4.51	ug/L	
1,1-Dichloroethane	75-34-3	1	0.27	1.00	1.27	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.21	1.00	107	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.20	1.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.36	1.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.24	1.00	21.3	ug/L	
Tetrachloroethene	127-18-4	1	0.24	1.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	98.5	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	101	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	104	%	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

PSW-1-013018
18A0457-06RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 10:20

Instrument: DX500

Analyzed: 01-Feb-2018 19:44

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	20	2.00	18.8	mg/L	D



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 09:00

Instrument: NT2

Analyzed: 01-Feb-2018 16:05

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0012 Sample Size: 10 mL
Prepared: 01-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	9.47	ug/L	
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	0.53	ug/L	
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	7.49	ug/L	
1,1-Dichloroethane	75-34-3	1	0.05	0.20	2.03	ug/L	
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	118	ug/L	E
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	297	ug/L	E
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	111 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	97.8 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	90.5 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	105 %	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/30/2018 09:00

Instrument: FID6

Analyzed: 08-Feb-2018 12:31

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167 Sample Size: 10 mL
Prepared: 08-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	1480	ug/L	
Ethane	74-84-0	1	1.23	10.2	ug/L	
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			<i>72-122 %</i>	<i>97.6</i>	<i>%</i>	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A

Sampled: 01/30/2018 09:00

Instrument: ICPMS2

Analyzed: 02-Feb-2018 17:54

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Barium, Dissolved	7440-39-3	1	0.0560	0.500	10.6	ug/L	
Iron, Dissolved	7439-89-6	5	7.00	100	12300	ug/L	D
Manganese, Dissolved	7439-96-5	5	0.425	2.50	573	ug/L	D



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Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07 (Water)

Metals and Metallic Compounds (dissolved)

Method: EPA 6020A UCT-KED

Sampled: 01/30/2018 09:00

Instrument: ICPMS2

Analyzed: 02-Feb-2018 17:54

Sample Preparation: Preparation Method: REN EPA 600/4-79-020 4.1.4 HNO3 matrix
Preparation Batch: BGB0031 Sample Size: 25 mL
Prepared: 02-Feb-2018 Final Volume: 25 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Arsenic, Dissolved	7440-38-2	1	0.0220	0.200	1.55	ug/L	



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 09:00

Instrument: DX500

Analyzed: 31-Jan-2018 20:19

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrate-N	14797-55-8	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Nitrite-N	14797-65-0	1	0.100	ND	mg-N/L	U

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	50	5.00	35.7	mg/L	D



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Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07 (Water)

Wet Chemistry

Method: EPA 9060A

Sampled: 01/30/2018 09:00

Instrument: TOC-LCSH

Analyzed: 07-Feb-2018 20:36

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	5.96	mg/L	



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Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07RE1 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/30/2018 09:00

Instrument: NT3

Analyzed: 02-Feb-2018 15:25

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 1 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.57	2.00	9.09	ug/L	
Chloroethane	75-00-3	1	0.86	2.00	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.54	2.00	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.49	2.00	7.98	ug/L	
1,1-Dichloroethane	75-34-3	1	0.53	2.00	1.83	ug/L	J
cis-1,2-Dichloroethene	156-59-2	1	0.43	2.00	124	ug/L	
1,1,1-Trichloroethane	71-55-6	1	0.41	2.00	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.72	2.00	ND	ug/L	U
Trichloroethene	79-01-6	1	0.49	2.00	382	ug/L	
Tetrachloroethene	127-18-4	1	0.47	2.00	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	99.6 %	
<i>Surrogate: Toluene-d8</i>					80-120 %	98.1 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	99.4 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	99.0 %	



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Project Number: 050067-014J-02
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Reported:
14-Feb-2018 15:40

DR-2-013018
18A0457-07RE1 (Water)

Wet Chemistry

Method: EPA 300.0

Sampled: 01/30/2018 09:00

Instrument: DX500

Analyzed: 01-Feb-2018 20:01

Sample Preparation: Preparation Method: SM 5310 A-00, 0.45um filtration
Preparation Batch: BGA0713 Sample Size: 5 mL
Prepared: 31-Jan-2018 Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Chloride	16887-00-6	10	1.00	14.6	mg/L	D



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Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

Volatile Organic Compounds - Quality Control

Batch BGB0012 - EPA 5030 (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGB0012-BLK1)											
						Prepared: 01-Feb-2018 Analyzed: 01-Feb-2018 13:01					
Vinyl Chloride	ND	0.06	0.20	ug/L							U
Chloroethane	ND	0.09	0.20	ug/L							U
1,1-Dichloroethene	ND	0.05	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.05	0.20	ug/L							U
1,1-Dichloroethane	ND	0.05	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.04	0.20	ug/L							U
1,1,1-Trichloroethane	ND	0.04	0.20	ug/L							U
1,2-Dichloroethane	ND	0.07	0.20	ug/L							U
Trichloroethene	ND	0.05	0.20	ug/L							U
Tetrachloroethene	ND	0.05	0.20	ug/L							U
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.88			ug/L	5.00		97.6	80-129			
<i>Surrogate: Toluene-d8</i>	4.85			ug/L	5.00		97.0	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.71			ug/L	5.00		94.2	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.97			ug/L	5.00		99.4	80-120			
LCS (BGB0012-BS1)											
						Prepared: 01-Feb-2018 Analyzed: 01-Feb-2018 12:18					
Vinyl Chloride	9.51	0.06	0.20	ug/L	10.0		95.1	66-133			
Chloroethane	11.4	0.09	0.20	ug/L	10.0		114	60-155			
1,1-Dichloroethene	10.2	0.05	0.20	ug/L	10.0		102	69-135			
trans-1,2-Dichloroethene	9.93	0.05	0.20	ug/L	10.0		99.3	78-128			
1,1-Dichloroethane	10.2	0.05	0.20	ug/L	10.0		102	76-124			
cis-1,2-Dichloroethene	9.94	0.04	0.20	ug/L	10.0		99.4	80-121			
1,1,1-Trichloroethane	10.6	0.04	0.20	ug/L	10.0		106	79-123			
1,2-Dichloroethane	10.3	0.07	0.20	ug/L	10.0		103	75-123			
Trichloroethene	10.4	0.05	0.20	ug/L	10.0		104	80-120			
Tetrachloroethene	10.6	0.05	0.20	ug/L	10.0		106	80-120			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	5.09			ug/L	5.00		102	80-129			
<i>Surrogate: Toluene-d8</i>	5.01			ug/L	5.00		100	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	4.76			ug/L	5.00		95.3	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.85			ug/L	5.00		97.0	80-120			
LCS Dup (BGB0012-BSD1)											
						Prepared: 01-Feb-2018 Analyzed: 01-Feb-2018 12:38					
Vinyl Chloride	9.64	0.06	0.20	ug/L	10.0		96.4	66-133	1.34	30	
Chloroethane	11.5	0.09	0.20	ug/L	10.0		115	60-155	0.37	30	
1,1-Dichloroethene	10.2	0.05	0.20	ug/L	10.0		102	69-135	0.65	30	



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Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

14-Feb-2018 15:40

Volatile Organic Compounds - Quality Control

Batch BGB0012 - EPA 5030 (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BGB0012-BSD1)						Prepared: 01-Feb-2018 Analyzed: 01-Feb-2018 12:38					
trans-1,2-Dichloroethene	10.1	0.05	0.20	ug/L	10.0	101	78-128	1.90	30		
1,1-Dichloroethane	10.2	0.05	0.20	ug/L	10.0	102	76-124	0.30	30		
cis-1,2-Dichloroethene	10.2	0.04	0.20	ug/L	10.0	102	80-121	2.70	30		
1,1,1-Trichloroethane	10.8	0.04	0.20	ug/L	10.0	108	79-123	2.08	30		
1,2-Dichloroethane	10.5	0.07	0.20	ug/L	10.0	105	75-123	1.98	30		
Trichloroethene	10.5	0.05	0.20	ug/L	10.0	105	80-120	0.66	30		
Tetrachloroethene	10.4	0.05	0.20	ug/L	10.0	104	80-120	1.53	30		
Surrogate: 1,2-Dichloroethane-d4	5.08			ug/L	5.00	102	80-129				
Surrogate: Toluene-d8	4.92			ug/L	5.00	98.4	80-120				
Surrogate: 4-Bromofluorobenzene	4.88			ug/L	5.00	97.6	80-120				
Surrogate: 1,2-Dichlorobenzene-d4	4.87			ug/L	5.00	97.3	80-120				



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Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

Volatile Organic Compounds - Quality Control

Batch BGB0033 - EPA 5030 (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGB0033-BLK1)											
						Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 12:38					
Vinyl Chloride	ND	0.06	0.20	ug/L							U
Chloroethane	ND	0.09	0.20	ug/L							U
1,1-Dichloroethene	ND	0.05	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.05	0.20	ug/L							U
1,1-Dichloroethane	ND	0.05	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.04	0.20	ug/L							U
1,1,1-Trichloroethane	ND	0.04	0.20	ug/L							U
1,2-Dichloroethane	ND	0.07	0.20	ug/L							U
Trichloroethene	ND	0.05	0.20	ug/L							U
Tetrachloroethene	ND	0.05	0.20	ug/L							U
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.88			ug/L	5.00		97.7	80-129			
<i>Surrogate: Toluene-d8</i>	5.00			ug/L	5.00		99.9	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	5.03			ug/L	5.00		101	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.91			ug/L	5.00		98.2	80-120			
LCS (BGB0033-BS1)											
						Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 10:06					
Vinyl Chloride	8.99	0.06	0.20	ug/L	10.0		89.9	66-133			
Chloroethane	8.24	0.09	0.20	ug/L	10.0		82.4	60-155			
1,1-Dichloroethene	9.36	0.05	0.20	ug/L	10.0		93.6	69-135			
trans-1,2-Dichloroethene	9.29	0.05	0.20	ug/L	10.0		92.9	78-128			
1,1-Dichloroethane	9.33	0.05	0.20	ug/L	10.0		93.3	76-124			
cis-1,2-Dichloroethene	9.10	0.04	0.20	ug/L	10.0		91.0	80-121			
1,1,1-Trichloroethane	9.11	0.04	0.20	ug/L	10.0		91.1	79-123			
1,2-Dichloroethane	9.26	0.07	0.20	ug/L	10.0		92.6	75-123			
Trichloroethene	9.68	0.05	0.20	ug/L	10.0		96.8	80-120			
Tetrachloroethene	9.83	0.05	0.20	ug/L	10.0		98.3	80-120			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.59			ug/L	5.00		91.7	80-129			
<i>Surrogate: Toluene-d8</i>	5.02			ug/L	5.00		100	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	5.45			ug/L	5.00		109	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.81			ug/L	5.00		96.3	80-120			
LCS Dup (BGB0033-BSD1)											
						Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 10:31					
Vinyl Chloride	9.45	0.06	0.20	ug/L	10.0		94.5	66-133	4.98	30	
Chloroethane	8.53	0.09	0.20	ug/L	10.0		85.3	60-155	3.38	30	
1,1-Dichloroethene	9.50	0.05	0.20	ug/L	10.0		95.0	69-135	1.55	30	



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Project: Art Brass
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Reported:
14-Feb-2018 15:40

Volatile Organic Compounds - Quality Control

Batch BGB0033 - EPA 5030 (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BGB0033-BSD1)					Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 10:31						
trans-1,2-Dichloroethene	9.54	0.05	0.20	ug/L	10.0		95.4	78-128	2.59	30	
1,1-Dichloroethane	9.65	0.05	0.20	ug/L	10.0		96.5	76-124	3.41	30	
cis-1,2-Dichloroethene	9.35	0.04	0.20	ug/L	10.0		93.5	80-121	2.70	30	
1,1,1-Trichloroethane	9.36	0.04	0.20	ug/L	10.0		93.6	79-123	2.76	30	
1,2-Dichloroethane	9.54	0.07	0.20	ug/L	10.0		95.4	75-123	2.96	30	
Trichloroethene	9.97	0.05	0.20	ug/L	10.0		99.7	80-120	2.95	30	
Tetrachloroethene	9.75	0.05	0.20	ug/L	10.0		97.5	80-120	0.79	30	
Surrogate: 1,2-Dichloroethane-d4	4.66			ug/L	5.00		93.2	80-129			
Surrogate: Toluene-d8	5.07			ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	5.30			ug/L	5.00		106	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.84			ug/L	5.00		96.7	80-120			



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Reported:
14-Feb-2018 15:40

Dissolved Gases - Quality Control

Batch BGB0167 - No Prep - Volatiles

Instrument: FID6 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGB0167-BLK1)		Prepared: 08-Feb-2018 Analyzed: 08-Feb-2018 09:34								
Methane	ND	0.65	ug/L							U
Ethane	ND	1.23	ug/L							U
Ethene	ND	1.14	ug/L							U
<i>Surrogate: Propane</i>	1730		ug/L	1800		96.1	72-122			
LCS (BGB0167-BS1)		Prepared: 08-Feb-2018 Analyzed: 08-Feb-2018 09:06								
Methane	682		ug/L	656		104	80-120			
Ethane	1270		ug/L	1230		103	80-120			
Ethene	1150		ug/L	1150		100	80-120			
<i>Surrogate: Propane</i>	1780		ug/L	1800		99.1	62-122			
LCS Dup (BGB0167-BSD1)		Prepared: 08-Feb-2018 Analyzed: 08-Feb-2018 12:04								
Methane	709		ug/L	656		108	80-120	3.85	30	
Ethane	1300		ug/L	1230		106	80-120	2.39	30	
Ethene	1170		ug/L	1150		102	80-120	1.76	30	
<i>Surrogate: Propane</i>	1810		ug/L	1800		101	62-122			



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Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

Metals and Metallic Compounds (dissolved) - Quality Control

Batch BGB0031 - REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Instrument: ICPMS2 Analyst: CC

QC Sample/Analyte	Isotope	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGB0031-BLK1)						Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 17:23						
Barium, Dissolved	135	ND	0.0560	0.500	ug/L							U
Barium, Dissolved	137	ND	0.0530	0.500	ug/L							U
Arsenic, Dissolved	75a	ND	0.0220	0.200	ug/L							U
Blank (BGB0031-BLK2)						Prepared: 02-Feb-2018 Analyzed: 05-Feb-2018 16:54						
Iron, Dissolved	54	ND	6.27	20.0	ug/L							U
Iron, Dissolved	57	ND	1.40	20.0	ug/L							U
Manganese, Dissolved	55	ND	0.0850	0.500	ug/L							U
LCS (BGB0031-BS1)						Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 17:44						
Arsenic, Dissolved	75a	25.3	0.0220	0.200	ug/L	25.0		101	80-120			
LCS (BGB0031-BS2)						Prepared: 02-Feb-2018 Analyzed: 05-Feb-2018 17:14						
Iron, Dissolved	54	5450	6.27	20.0	ug/L	5000		109	80-120			
Iron, Dissolved	57	5380	1.40	20.0	ug/L	5000		108	80-120			
Manganese, Dissolved	55	27.0	0.0850	0.500	ug/L	25.0		108	80-120			
Duplicate (BGB0031-DUP1)						Source: 18A0457-01 Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 17:28						
Barium, Dissolved	135	31.9	0.0560	0.500	ug/L							
Arsenic, Dissolved	75a	0.112	0.0220	0.200	ug/L		0.114			1.77	20	J
Duplicate (BGB0031-DUP2)						Source: 18A0457-01 Prepared: 02-Feb-2018 Analyzed: 05-Feb-2018 16:59						
Iron, Dissolved	54	1160	12.5	40.0	ug/L		1260			7.61	20	D
Manganese, Dissolved	55	109	0.170	1.00	ug/L		121			10.40	20	D
Matrix Spike (BGB0031-MS1)						Source: 18A0457-01 Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 17:39						
Arsenic, Dissolved	75a	24.6	0.0220	0.200	ug/L	25.0	0.114	98.1	75-125			

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

Matrix Spike (BGB0031-MS2)						Source: 18A0457-01 Prepared: 02-Feb-2018 Analyzed: 05-Feb-2018 17:08						
Iron, Dissolved	54	6340	12.5	40.0	ug/L	5000	1260	102	75-125			D
Manganese, Dissolved	55	141	0.170	1.00	ug/L	25.0	121	78.6	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: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

Wet Chemistry - Quality Control

Batch BGA0713 - SM 5310 A-00, 0.45um filtration

Instrument: DX500 Analyst: CDE

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGA0713-BLK1)		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 16:58								
Chloride	ND	0.100	mg/L							U
Nitrate-N	ND	0.100	mg-N/L							U
Nitrite-N	ND	0.100	mg-N/L							U
Blank (BGA0713-BLK2)		Prepared: 31-Jan-2018 Analyzed: 01-Feb-2018 16:39								
Sulfate	ND	0.100	mg/L							U
LCS (BGA0713-BS1)		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 17:15								
Chloride	1.52	0.100	mg/L	1.50		102	90-110			
Nitrate-N	1.54	0.100	mg-N/L	1.50		103	90-110			
Nitrite-N	1.50	0.100	mg-N/L	1.50		100	90-110			
LCS (BGA0713-BS2)		Prepared: 31-Jan-2018 Analyzed: 01-Feb-2018 17:30								
Sulfate	1.58	0.100	mg/L	1.50		106	90-110			
Duplicate (BGA0713-DUP1)		Source: 18A0457-01		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 17:48						
Nitrate-N	ND	0.100	mg-N/L		ND					U
Nitrite-N	ND	0.100	mg-N/L		ND					U
Duplicate (BGA0713-DUP2)		Source: 18A0457-01RE1		Prepared: 31-Jan-2018 Analyzed: 01-Feb-2018 18:03						
Chloride	11.1	1.00	mg/L		11.1			0.35	20	D
Duplicate (BGA0713-DUP4)		Source: 18A0457-01RE1		Prepared: 31-Jan-2018 Analyzed: 07-Feb-2018 12:46						
Sulfate	ND	0.100	mg/L		0.198					U
Matrix Spike (BGA0713-MS1)		Source: 18A0457-01		Prepared: 31-Jan-2018 Analyzed: 31-Jan-2018 18:05						
Nitrate-N	2.17	0.100	mg-N/L	2.00	ND	109	75-125			
Nitrite-N	1.94	0.100	mg-N/L	2.00	ND	97.2	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
Matrix Spike (BGA0713-MS3)		Source: 18A0457-01		Prepared: 31-Jan-2018 Analyzed: 01-Feb-2018 21:41						
Sulfate	2.24	0.200	mg/L	2.00	0.281	98.0	75-125			D
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
Matrix Spike (BGA0713-MS4)		Source: 18A0457-01RE1		Prepared: 31-Jan-2018 Analyzed: 02-Feb-2018 13:01						
Chloride	20.0	2.00	mg/L	10.0	11.1	89.3	75-125			D



Aspect Consulting, LLC. 401 Second Avenue South, Suite 201 Seattle WA, 98104	Project: Art Brass Project Number: 050067-014J-02 Project Manager: Adam Griffin	Reported: 14-Feb-2018 15:40
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Wet Chemistry - Quality Control

Batch BGA0713 - SM 5310 A-00, 0.45um filtration

Instrument: DX500 Analyst: CDE

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

14-Feb-2018 15:40

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
Blank (BGB0146-BLK1)					Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 17:01					
Total Organic Carbon	ND	0.50	mg/L							U
LCS (BGB0146-BS1)					Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 17:23					
Total Organic Carbon	20.9	0.50	mg/L	20.0		105	90-110			



Aspect Consulting, LLC.
401 Second Avenue South, Suite 201
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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 15:40

Certified Analyses included in this Report

Analyte	Certifications
EPA 300.0 in Water	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Nitrate-N	DoD-ELAP,WADOE,WA-DW,NELAP
Nitrite-N	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
EPA 6020A in Water	
Barium-135	NELAP,WADOE,DoD-ELAP,ADEC
Barium-137	NELAP,WADOE,DoD-ELAP,ADEC
Iron-54	NELAP,WADOE,DoD-ELAP
Iron-57	NELAP,WADOE,DoD-ELAP
Manganese-55	NELAP,WADOE,DoD-ELAP
EPA 6020A UCT-KED in Water	
Arsenic-75a	NELAP,WADOE,DoD-ELAP,ADEC
EPA 8260C in Water	
Chloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrolein	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Iodomethane	DoD-ELAP,NELAP,CALAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,CALAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,CALAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,CALAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Butanone	DoD-ELAP,NELAP,CALAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,CALAP,WADOE



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Project: Art Brass
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Reported:
14-Feb-2018 15:40

Bromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,CALAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Styrene	DoD-ELAP,NELAP,CALAP,WADOE
Bromoform	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,CALAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,CALAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE



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Reported:
14-Feb-2018 15:40

4-Isopropyl Toluene	DoD-ELAP,NELAP,CALAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE

EPA 9060A in Water

Total Organic Carbon	DoD-ELAP,WADOE,NELAP
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EPA RSK-175 in Water

Methane	NELAP
Ethane	NELAP
Ethene	NELAP
Acetylene	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



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

14-Feb-2018 15:40

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.
- 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
- * 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.



14 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>
18B0021	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 enclose 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.





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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 16:22

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
MW-24-013118	18B0021-01	Water	31-Jan-2018 10:35	01-Feb-2018 16:49



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

14-Feb-2018 16:22

Case Narrative

Sample receipt

One sample as listed on the preceding page was received February 1, 2018 under ARI workorder 18B0021. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Volatiles - EPA Method SW8260C

The sample was run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits.

The LCS/LCSD percent recoveries and RPD were within control limits.

Volatile Gases - MEE by RSK175

The sample was run within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank was clean at the reporting limits.

The LCS/LCSD percent recoveries and RPD were within control limits.



WORK ORDER

18B0021

Client: Aspect Consulting, LLC.

Project Manager: Amanda Volgardsen

Project: Art Brass

Project Number: [none]

Report To:

Aspect Consulting, LLC.
Dana Cannon
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 17:17

Samples Received at: 1.8°C	
Intact, properly signed and dated custody seals attached to outside of cooler(s).....	No
Custody papers properly filled out (in, signed, analyses requested, etc).....	Yes
Was sufficient ice used (if appropriate).....	Yes
All bottles arrived in good condition (unbroken).....	Yes
Number of containers listed on COC match number received.....	Yes
Correct bottles used for the requested analyses.....	Yes
Analyses/bottles require preservation (attach preservation sheet excluding VOC).No	No
Sample split at ARI.....	No
Custody papers included with the cooler.....	Yes
Was a temperature blank included in the cooler.....	No
All bottles sealed in individual plastic bags.....	No
All bottle labels complete and legible.....	Yes
Bottle labels and tags agree with COC.....	Yes
All VOC vials free of air bubbles.....	Yes
Sufficient amount of sample sent in each bottle.....	Yes

Analysis	Due	TAT	Expires	Comments
18B0021-01 MW-24-013118 [Water] Sampled 31-Jan-2018 10:35 (GMT-08:00)				
Pacific Time (US & Canada)				
A = VOA Vial, Clear, 40 mL, HCL B = VOA Vial, Clear, 40 mL, HCL C = VOA Vial, Clear, 40 mL, HCL D = VOA Vial, Clear, 40 mL				
E = VOA Vial, Clear, 40 mL				
RSK-175 Dissolved Gases (MEE)	16-Feb-2018 15:00	10	14-Feb-2018 10:35	
8260C VOA	16-Feb-2018 15:00	10	14-Feb-2018 10:35	

Reviewed By _____ Date _____



Cooler Receipt Form

ARI Client: Aspect Consulting
 COC No(s): _____ NA
 Assigned ARI Job No: 18B0021

Project Name: Art Brass Plat. by VOCs
 Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____
 Tracking No: _____ NA

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of to cooler? YES NO
 Were custody papers included with the cooler? YES NO
 Were custody papers properly filled out (ink, signed, etc.) YES NO
 Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry) 1.8°C 4.4°C
 Time: 1649
 If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: D005206
 Cooler Accepted by: SBW 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: _____

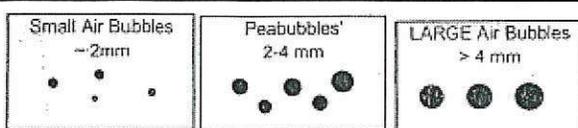
Samples Logged by: SBW Date: 2/11/2017 Time: 1717

**** 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)



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 16:22

MW-24-013118
18B0021-01 (Water)

Volatile Organic Compounds

Method: EPA 8260C

Sampled: 01/31/2018 10:35

Instrument: NT3

Analyzed: 02-Feb-2018 18:33

Sample Preparation: Preparation Method: EPA 5030 (Purge and Trap)
Preparation Batch: BGB0033 Sample Size: 10 mL
Prepared: 02-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Vinyl Chloride	75-01-4	1	0.06	0.20	ND	ug/L	U
Chloroethane	75-00-3	1	0.09	0.20	ND	ug/L	U
1,1-Dichloroethene	75-35-4	1	0.05	0.20	ND	ug/L	U
trans-1,2-Dichloroethene	156-60-5	1	0.05	0.20	ND	ug/L	U
1,1-Dichloroethane	75-34-3	1	0.05	0.20	ND	ug/L	U
cis-1,2-Dichloroethene	156-59-2	1	0.04	0.20	0.13	ug/L	J
1,1,1-Trichloroethane	71-55-6	1	0.04	0.20	ND	ug/L	U
1,2-Dichloroethane	107-06-2	1	0.07	0.20	ND	ug/L	U
Trichloroethene	79-01-6	1	0.05	0.20	ND	ug/L	U
Tetrachloroethene	127-18-4	1	0.05	0.20	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	94.5	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	97.4	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	99.6	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	99.6	%	



Aspect Consulting, LLC.
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Seattle WA, 98104

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 16:22

MW-24-013118
18B0021-01 (Water)

Dissolved Gases

Method: EPA RSK-175

Sampled: 01/31/2018 10:35

Instrument: FID6

Analyzed: 08-Feb-2018 13:40

Sample Preparation: Preparation Method: No Prep - Volatiles
Preparation Batch: BGB0167 Sample Size: 10 mL
Prepared: 08-Feb-2018 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Methane	74-82-8	1	0.65	11500	ug/L	
Ethane	74-84-0	1	1.23	ND	ug/L	U
Ethene	74-85-1	1	1.14	ND	ug/L	U
<i>Surrogate: Propane</i>			72-122 %	91.0	%	



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 16:22

Volatile Organic Compounds - Quality Control

Batch BGB0033 - EPA 5030 (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGB0033-BLK1)											
						Prepared: 02-Feb-2018	Analyzed: 02-Feb-2018 12:38				
Vinyl Chloride	ND	0.06	0.20	ug/L							U
Chloroethane	ND	0.09	0.20	ug/L							U
1,1-Dichloroethene	ND	0.05	0.20	ug/L							U
trans-1,2-Dichloroethene	ND	0.05	0.20	ug/L							U
1,1-Dichloroethane	ND	0.05	0.20	ug/L							U
cis-1,2-Dichloroethene	ND	0.04	0.20	ug/L							U
1,1,1-Trichloroethane	ND	0.04	0.20	ug/L							U
1,2-Dichloroethane	ND	0.07	0.20	ug/L							U
Trichloroethene	ND	0.05	0.20	ug/L							U
Tetrachloroethene	ND	0.05	0.20	ug/L							U
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.88			ug/L	5.00		97.7	80-129			
<i>Surrogate: Toluene-d8</i>	5.00			ug/L	5.00		99.9	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	5.03			ug/L	5.00		101	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.91			ug/L	5.00		98.2	80-120			
LCS (BGB0033-BS1)											
						Prepared: 02-Feb-2018	Analyzed: 02-Feb-2018 10:06				
Vinyl Chloride	8.99	0.06	0.20	ug/L	10.0		89.9	66-133			
Chloroethane	8.24	0.09	0.20	ug/L	10.0		82.4	60-155			
1,1-Dichloroethene	9.36	0.05	0.20	ug/L	10.0		93.6	69-135			
trans-1,2-Dichloroethene	9.29	0.05	0.20	ug/L	10.0		92.9	78-128			
1,1-Dichloroethane	9.33	0.05	0.20	ug/L	10.0		93.3	76-124			
cis-1,2-Dichloroethene	9.10	0.04	0.20	ug/L	10.0		91.0	80-121			
1,1,1-Trichloroethane	9.11	0.04	0.20	ug/L	10.0		91.1	79-123			
1,2-Dichloroethane	9.26	0.07	0.20	ug/L	10.0		92.6	75-123			
Trichloroethene	9.68	0.05	0.20	ug/L	10.0		96.8	80-120			
Tetrachloroethene	9.83	0.05	0.20	ug/L	10.0		98.3	80-120			
<i>Surrogate: 1,2-Dichloroethane-d4</i>	4.59			ug/L	5.00		91.7	80-129			
<i>Surrogate: Toluene-d8</i>	5.02			ug/L	5.00		100	80-120			
<i>Surrogate: 4-Bromofluorobenzene</i>	5.45			ug/L	5.00		109	80-120			
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>	4.81			ug/L	5.00		96.3	80-120			
LCS Dup (BGB0033-BSD1)											
						Prepared: 02-Feb-2018	Analyzed: 02-Feb-2018 10:31				
Vinyl Chloride	9.45	0.06	0.20	ug/L	10.0		94.5	66-133	4.98	30	
Chloroethane	8.53	0.09	0.20	ug/L	10.0		85.3	60-155	3.38	30	
1,1-Dichloroethene	9.50	0.05	0.20	ug/L	10.0		95.0	69-135	1.55	30	



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

Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 16:22

Volatile Organic Compounds - Quality Control

Batch BGB0033 - EPA 5030 (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BGB0033-BSD1)					Prepared: 02-Feb-2018 Analyzed: 02-Feb-2018 10:31						
trans-1,2-Dichloroethene	9.54	0.05	0.20	ug/L	10.0		95.4	78-128	2.59	30	
1,1-Dichloroethane	9.65	0.05	0.20	ug/L	10.0		96.5	76-124	3.41	30	
cis-1,2-Dichloroethene	9.35	0.04	0.20	ug/L	10.0		93.5	80-121	2.70	30	
1,1,1-Trichloroethane	9.36	0.04	0.20	ug/L	10.0		93.6	79-123	2.76	30	
1,2-Dichloroethane	9.54	0.07	0.20	ug/L	10.0		95.4	75-123	2.96	30	
Trichloroethene	9.97	0.05	0.20	ug/L	10.0		99.7	80-120	2.95	30	
Tetrachloroethene	9.75	0.05	0.20	ug/L	10.0		97.5	80-120	0.79	30	
Surrogate: 1,2-Dichloroethane-d4	4.66			ug/L	5.00		93.2	80-129			
Surrogate: Toluene-d8	5.07			ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	5.30			ug/L	5.00		106	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.84			ug/L	5.00		96.7	80-120			



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Project: Art Brass
Project Number: 050067-014J-02
Project Manager: Adam Griffin

Reported:
14-Feb-2018 16:22

Dissolved Gases - Quality Control

Batch BGB0167 - No Prep - Volatiles

Instrument: FID6 Analyst: LH

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BGB0167-BLK1)		Prepared: 08-Feb-2018 Analyzed: 08-Feb-2018 09:34								
Methane	ND	0.65	ug/L							U
Ethane	ND	1.23	ug/L							U
Ethene	ND	1.14	ug/L							U
<i>Surrogate: Propane</i>	1730		ug/L	1800		96.1	72-122			
LCS (BGB0167-BS1)		Prepared: 08-Feb-2018 Analyzed: 08-Feb-2018 09:06								
Methane	682		ug/L	656		104	80-120			
Ethane	1270		ug/L	1230		103	80-120			
Ethene	1150		ug/L	1150		100	80-120			
<i>Surrogate: Propane</i>	1780		ug/L	1800		99.1	62-122			
LCS Dup (BGB0167-BSD1)		Prepared: 08-Feb-2018 Analyzed: 08-Feb-2018 12:04								
Methane	709		ug/L	656		108	80-120	3.85	30	
Ethane	1300		ug/L	1230		106	80-120	2.39	30	
Ethene	1170		ug/L	1150		102	80-120	1.76	30	
<i>Surrogate: Propane</i>	1810		ug/L	1800		101	62-122			



Aspect Consulting, LLC.

401 Second Avenue South, Suite 201

Seattle WA, 98104

Project: Art Brass

Project Number: 050067-014J-02

Project Manager: Adam Griffin

Reported:

14-Feb-2018 16:22

Certified Analyses included in this Report

Analyte	Certifications
EPA 8260C in Water	
Chloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrolein	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acetone	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Iodomethane	DoD-ELAP,NELAP,CALAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP,CALAP,WADOE
Carbon Disulfide	DoD-ELAP,NELAP,CALAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,CALAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Butanone	DoD-ELAP,NELAP,CALAP,WADOE
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,CALAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE



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Reported:
14-Feb-2018 16:22

trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
2-Hexanone	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromoethane	DoD-ELAP,NELAP,CALAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Styrene	DoD-ELAP,NELAP,CALAP,WADOE
Bromoform	DoD-ELAP,NELAP,CALAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
Bromobenzene	DoD-ELAP,NELAP,CALAP,WADOE
Isopropyl Benzene	DoD-ELAP,NELAP,CALAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
s-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP,CALAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP,CALAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Naphthalene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,CALAP,WADOE
n-Hexane	WADOE
2-Pentanone	WADOE



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Reported:
14-Feb-2018 16:22

EPA RSK-175 in Water

Methane	NELAP
Ethane	NELAP
Ethene	NELAP
Acetylene	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



Aspect Consulting, LLC.

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Project: Art Brass

Project Number: 050067-014J-02

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Reported:

14-Feb-2018 16:22

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.
- E The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
- 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.



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

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: 1850022 Turn-around Requested: Standard Page: 1 of 1

ARI Client Company: Aspect Consulting Phone: 206-780-7746 Date: 2/1/18 Ice Present?

Client Contact: Adam Griffin No. of Coolers: Cooler Temps:

Client Project Name: ATI Brass Paving Metals Pilot Study

Client Project #: 05007-0145-01 Samplers: ADD

Sample ID	Date	Time	Matrix	No. Containers
MW-3-012918	1/29/18	1800	H2O	7
MW-8-013118	1/31/18	1345		6
MW-1-013118	1/31/18	1500		6
MW-3-30-013118	1/31/18	1620		6
IW-1-020118	2/1/18	0905		7
IW-2-020118	2/1/18	1440		7
PSW-6-020118	2/1/18	1015		7
PSW-7-020118	2/1/18	1320		9
PSW-7-020118-D	2/1/18	1320		1
PSW-8-020118	2/1/18	1130	↓	7

Comments/Special Instructions:

Relinquished by: (Signature) Amelia Bates Received by: (Signature) Paul Walker

Printed Name: Amelia Bates Date & Time: 2/1/18 1649

Company: Aspect

Relinquished by: (Signature) Received by: (Signature)

Printed Name: Date & Time:

Company:

Sample ID	Analysis Requested										Notes/Comments
	Diss. Metals (EPA 200.8)	Diss. Metals (EPA 6010)	As, Ba, Mn	Diss. Metals (EPA 6010)	Diss. Metals (Al, Ca, Fe, Mg, K, Na, Ni, Pb)	Alkalinity (EPA 310.1)	TOC (EPA 415.1 or 9000)	Chloride (EPA 300.1)	Sulfate (EPA 300.0)	Acidity (SM 2310B)	
MW-3-012918	X	X	X	X	X	X	X	X	X	X	
MW-8-013118	X	X	X	X	X	X	X	X	X	X	
MW-1-013118	X	X	X	X	X	X	X	X	X	X	
MW-3-30-013118	X	X	X	X	X	X	X	X	X	X	
IW-1-020118	X	X	X	X	X	X	X	X	X	X	
IW-2-020118	X	X	X	X	X	X	X	X	X	X	
PSW-6-020118	X	X	X	X	X	X	X	X	X	X	
PSW-7-020118	X	X	X	X	X	X	X	X	X	X	
PSW-7-020118-D	X	X	X	X	X	X	X	X	X	X	
PSW-8-020118	X	X	X	X	X	X	X	X	X	X	

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



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: 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.
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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

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

Analysis	Due	TAT	Expires	Comments
18B0022-02 MW-8-013118 [Water] Sampled 31-Jan-2018 13:45 (GMT-08:00) Pacific Time (US & Canada)				
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	

18B0022-03 MW-1-013118 [Water] Sampled 31-Jan-2018 15:00 (GMT-08:00) Pacific Time (US & Canada)				
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	

18B0022-04 MW-3-30-013118 [Water] Sampled 31-Jan-2018 16:20 (GMT-08:00) Pacific Time (US & Canada)				
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

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

Analysis	Due	TAT	Expires	Comments
18B0022-05 IW-1-020118 [Water] Sampled 01-Feb-2018 09:05 (GMT-08:00) Pacific Time (US & Canada)				
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	

18B0022-06 IW-2-020118 [Water] Sampled 01-Feb-2018 14:40 (GMT-08:00) Pacific Time (US & Canada)				
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

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

Analysis	Due	TAT	Expires	Comments
18B0022-07 PSW-6-020118 [Water] Sampled 01-Feb-2018 10:15 (GMT-08:00) Pacific Time (US & Canada)				
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	

18B0022-08 IW-7-020118 [Water] Sampled 01-Feb-2018 13:20 (GMT-08:00) Pacific Time (US & Canada) MS/MSD				
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

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

Analysis	Due	TAT	Expires	Comments
18B0022-09 IW-7-020118-D [Water] Sampled 01-Feb-2018 13:20 (GMT-08:00) Pacific Time (US & Canada)				
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	

18B0022-10 PSW-8-020118 [Water] Sampled 01-Feb-2018 11:30 (GMT-08:00) Pacific Time (US & Canada)				
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

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



WORK ORDER

18B0022

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

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

Client: Aspect Consulting, LLC.		Project Manager: Amanda Volgardsen	
Project: Art Brass		Project Number: [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
Sample ID: 18B0022-01				
Sampled: 01/29/18 18:00 Matrix: Water				
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;"> 18B0022-01 A Small OJ, 500 mL </div>				
Sample ID: 18B0022-02				
Sampled: 01/31/18 13:45 Matrix: Water				
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;"> 18B0022-02 A Small OJ, 500 mL </div>				
Sample ID: 18B0022-03				
Sampled: 01/31/18 15:00 Matrix: Water				
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;"> 18B0022-03 A Small OJ, 500 mL </div>				
Sample ID: 18B0022-04				
Sampled: 01/31/18 16:20 Matrix: Water				
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;"> 18B0022-04 A 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
Sample ID: 18B0022-05				
Sampled: 02/01/18 09:05 Matrix: Water				
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				
Sample ID: 18B0022-06				
Sampled: 02/01/18 14:40 Matrix: Water				
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				
Sample ID: 18B0022-07				
Sampled: 02/01/18 10:15 Matrix: Water				
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				
Sample ID: 18B0022-08				
Sampled: 02/01/18 13:20 Matrix: Water				
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				
Sample ID: 18B0022-09				
Sampled: 02/01/18 13:20 Matrix: Water				
Acidity, SM2310 Full Titration Curve (Subc)	02/16/18	02/15/18 13:20		
<i>Containers Supplied:</i>				
Sample ID: 18B0022-10				
Sampled: 02/01/18 11:30 Matrix: Water				
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 cooler #1 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: _____

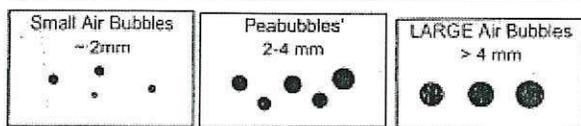
Samples Logged by: JSW Date: 2/11/2018 Time: 1717

**** 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

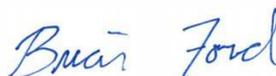
Samples Received: 02/06/2018

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.



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

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

¹Cp

²Tc

³Ss

⁴Cn

⁵Sr

⁶Qc

⁷Gl

⁸Al

⁹Sc



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	WG1072418

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	WG1072418

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	WG1072418

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	WG1072418

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	WG1072418

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	WG1072418

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	WG1072418

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	WG1072418

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	WG1072418

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 ug/l	MB Qualifier	MB MDL ug/l	MB RDL ug/l
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 ug/l	DUP Result ug/l	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 ug/l	DUP Result ug/l	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 ug/l	LCS Result ug/l	LCS Rec. %	LCSD Result ug/l	LCSD Rec. %	Rec. Limits %	LCSD Qualifier	RPD %	RPD Limits %
Acidity	20000	22000	110	22000	110	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, 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.

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 ¹	DW21704
Florida	E87487	North Carolina ²	41
Georgia	NELAP	North Dakota	R-140
Georgia ¹	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 ¹	90010	South Dakota	n/a
Kentucky ²	16	Tennessee ^{1,4}	2006
Louisiana	AI30792	Texas	T 104704245-07-TX
Maine	TN0002	Texas ⁵	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		

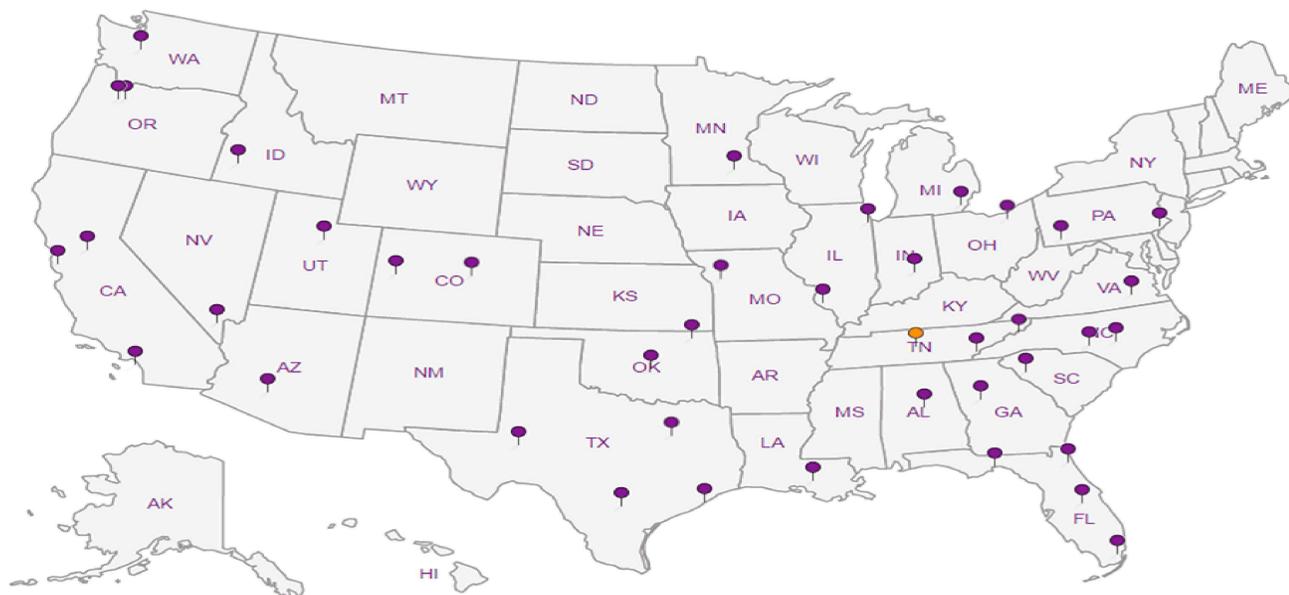
Third Party Federal Accreditations

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

¹ Drinking Water ² Underground Storage Tanks ³ Aquatic Toxicity ⁴ Chemical/Microbiological ⁵ 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

Analysis	Due	Expires	Sub Laboratory ID	Comments
Sample ID: 18B0022-01				
Sampled: 01/29/18 18:00 Matrix: Water				
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
Sample ID: 18B0022-02				
Sampled: 01/31/18 13:45 Matrix: Water				
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
Sample ID: 18B0022-03				
Sampled: 01/31/18 15:00 Matrix: Water				
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
Sample ID: 18B0022-04				
Sampled: 01/31/18 16:20 Matrix: Water				
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
Sample ID: 18B0022-05				
Sampled: 02/01/18 09:05 Matrix: Water				
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				
Sample ID: 18B0022-06				
Sampled: 02/01/18 14:40 Matrix: Water				
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				
Sample ID: 18B0022-07				
Sampled: 02/01/18 10:15 Matrix: Water				
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				
Sample ID: 18B0022-08				
Sampled: 02/01/18 13:20 Matrix: Water				
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				
Sample ID: 18B0022-10				
Sampled: 02/01/18 11:30 Matrix: Water				
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] ssa 2/5/18 @ 1527

Date

Received By: [Signature] 834

Date

2-6-18

Date

0845.000

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: <i>ANACBSTWA</i>	SDG#	<i>1968V58</i>
Cooler Received/Opened On: <i>02/16/2018</i>	Temperature:	<i>0.30 C</i>
Received By: David Riffin		
Signature: 		
Receipt Check List		
COC Seal Present / Intact?	NP	Yes No
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: 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	0.216	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	15.5	ug/L	
Nickel, Dissolved	7440-02-0	100	50.0	11400	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	46.6	ug/L	



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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	1.88	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: 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 ₃	U



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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
18B0022-01RE1 (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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Project: Art Brass
Project Number: 050067-014J-01
Project Manager: Adam Griffin

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	163	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: 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 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	0.0418	mg/L	J
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	51.1	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	3.54	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	13.1	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	11.1	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	41.5	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-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 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	1.99	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-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	58.7	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

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	187	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-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	0.456	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	16.2	ug/L	
Nickel, Dissolved	7440-02-0	100	50.0	18600	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	44.4	ug/L	



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

Reported:
15-Feb-2018 16:32

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	0.823	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	20.2	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	0.413	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	6.76	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	9.20	mg/L	



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

Reported:
15-Feb-2018 16:32

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	1.91	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-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
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 ₃	U



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Project: Art Brass
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	49.2	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-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	219	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	4.62	ug/L	
Zinc, Dissolved	7440-66-6	1	4.00	ND	ug/L	U



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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 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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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)

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	3.96	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-3-30-013118

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	158	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

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	22.2	mg/L	D

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Sulfate	14808-79-8	20	2.00	18.6	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
18B0022-05 (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	0.176	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	23.1	ug/L	
Nickel, Dissolved	7440-02-0	20	10.0	2370	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	34.1	ug/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)

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	0.433	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	0.0287	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	28.2	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	3.05	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	9.53	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	0.561	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	8.65	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	33.8	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	1.88	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: 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	4.45	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	143	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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Seattle WA, 98104

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	0.139	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	10.2	ug/L	
Nickel, Dissolved	7440-02-0	20	10.0	4570	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	35.8	ug/L	



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Project Manager: Adam Griffin

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	0.313	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	0.0054	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	0.0265	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	20.5	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	5.79	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	6.28	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	0.469	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	6.12	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	38.8	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-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	1.97	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-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	3.64	mg/L CaCO3	



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Project Manager: Adam Griffin

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	19.3	mg/L	D



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Project Manager: Adam Griffin

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	145	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

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	0.171	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	1.06	ug/L	
Nickel, Dissolved	7440-02-0	20	10.0	4600	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	50.2	ug/L	



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

Reported:
15-Feb-2018 16:32

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	0.794	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	0.0059	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	0.0487	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	44.5	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	6.37	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	14.8	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	0.906	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	12.5	mg/L	



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

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	1.70	mg/L	



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Project Manager: Adam Griffin

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	6.68	mg/L CaCO ₃	



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

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	49.6	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

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	247	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

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	0.251	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	2.55	ug/L	
Nickel, Dissolved	7440-02-0	50	25.0	8850	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	52.4	ug/L	



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Project Manager: Adam Griffin

Reported:
15-Feb-2018 16:32

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	0.838	mg/L	
Arsenic, Dissolved	7440-38-2	1	0.0047	0.0500	0.0058	mg/L	J
Barium, Dissolved	7440-39-3	1	0.0007	0.0030	0.0319	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	30.0	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	6.30	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	8.93	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	0.596	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	7.98	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	46.8	mg/L	



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

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	1.60	mg/L	



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Project Manager: Adam Griffin

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 CaCO ₃	U



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

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	215	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

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	0.227	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	2.75	ug/L	
Nickel, Dissolved	7440-02-0	50	25.0	8800	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	52.3	ug/L	



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Project: Art Brass

Project Number: 050067-014J-01

Project Manager: Adam Griffin

Reported:

15-Feb-2018 16:32

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	0.223	ug/L	
Copper, Dissolved	7440-50-8	1	0.500	3.25	ug/L	
Nickel, Dissolved	7440-02-0	50	25.0	7510	ug/L	D
Zinc, Dissolved	7440-66-6	1	4.00	54.8	ug/L	



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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	0.869	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	0.0359	mg/L	
Calcium, Dissolved	7440-70-2	1	0.0051	0.0500	30.5	mg/L	
Iron, Dissolved	7439-89-6	1	0.0013	0.0500	4.73	mg/L	
Magnesium, Dissolved	7439-95-4	1	0.0160	0.0500	9.13	mg/L	
Manganese, Dissolved	7439-96-5	1	0.0003	0.0010	0.601	mg/L	
Potassium, Dissolved	7440-09-7	1	0.0520	0.500	8.33	mg/L	
Sodium, Dissolved	7440-23-5	1	0.0114	0.500	38.4	mg/L	



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Project Manager: Adam Griffin

Reported:
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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	1.43	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: 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 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 ₃	U



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Project: Art Brass
Project Number: 050067-014J-01
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	32.9	mg/L	D



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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	188	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

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
Blank (BGB0032-BLK1)											
						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

LCS (BGB0032-BS1)											
						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			

Duplicate (BGB0032-DUP1)											
			Source: 18B0022-08			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	

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

Matrix Spike (BGB0032-MS1)											
			Source: 18B0022-08			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.

Matrix Spike (BGB0032-MS2)											
			Source: 18B0022-08			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.



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

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
Matrix Spike Dup (BGB0032-MSD1)		Source: 18B0022-08		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.

Matrix Spike Dup (BGB0032-MSD2)		Source: 18B0022-08		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.



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

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
Blank (BGB0265-BLK1)											
						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
LCS (BGB0265-BS1)											
						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
Duplicate (BGB0265-DUP1)											
			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	
Matrix Spike (BGB0265-MS1)											
			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			



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

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
Matrix Spike (BGB0265-MS1)		Source: 18B0022-08			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.

Matrix Spike Dup (BGB0265-MSD1)		Source: 18B0022-08			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.



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
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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
Blank (BGB0079-BLK1)										
					Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 13:44					
Alkalinity, Total	ND	1.00	mg/L CaCO3							U
Blank (BGB0079-BLK2)										
					Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 15:50					
Alkalinity, Total	ND	1.00	mg/L CaCO3							U
Duplicate (BGB0079-DUP1)										
		Source: 18B0022-08		Prepared: 05-Feb-2018 Analyzed: 05-Feb-2018 13:44						
Alkalinity, Total	ND	1.00	mg/L CaCO3		ND					U
Reference (BGB0079-SRM1)										
					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			



Aspect Consulting, LLC.
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Project: Art Brass
Project Number: 050067-014J-01
Project Manager: Adam Griffin

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
Blank (BGB0134-BLK1)		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 13:37								
Chloride	ND	0.100	mg/L							U
Sulfate	ND	0.100	mg/L							U
LCS (BGB0134-BS1)		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 13:54								
Chloride	1.49	0.100	mg/L	1.50		99.1	90-110			
LCS (BGB0134-BS2)		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 19:12								
Sulfate	1.57	0.100	mg/L	1.50		105	90-110			
Duplicate (BGB0134-DUP2)		Source: 18B0022-08RE1		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 22:17						
Chloride	27.9	2.00	mg/L		27.6			1.08	20	D
Duplicate (BGB0134-DUP3)		Source: 18B0022-08RE2		Prepared: 07-Feb-2018 Analyzed: 08-Feb-2018 19:26						
Sulfate	217	10.0	mg/L		215			0.97	20	D
Matrix Spike (BGB0134-MS2)		Source: 18B0022-08RE1		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.										
Matrix Spike (BGB0134-MS4)		Source: 18B0022-08RE2		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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Project: Art Brass
Project Number: 050067-014J-01
Project Manager: Adam Griffin

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
Blank (BGB0146-BLK1)		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 17:01								
Total Organic Carbon	ND	0.50	mg/L							U
LCS (BGB0146-BS1)		Prepared: 07-Feb-2018 Analyzed: 07-Feb-2018 17:23								
Total Organic Carbon	20.9	0.50	mg/L	20.0		105	90-110			
Duplicate (BGB0146-DUP1)		Source: 18B0022-08		Prepared: 07-Feb-2018 Analyzed: 08-Feb-2018 02:02						
Total Organic Carbon	1.60	0.50	mg/L		1.60			0.00		
Matrix Spike (BGB0146-MS1)		Source: 18B0022-08		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.



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

Certified Analyses included in this Report

Analyte	Certifications
EPA 200.8 UCT-KED in Water	
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
EPA 300.0 in Water	
Chloride	DoD-ELAP,WADOE,WA-DW,NELAP
Sulfate	DoD-ELAP,WADOE,WA-DW,NELAP
EPA 6010C in Water	
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
EPA 9060A in Water	
Total Organic Carbon	DoD-ELAP,WADOE,NELAP
SM 2320 B-97 in Water	
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



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

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.



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Knoxville, TN 37932
Phone: (865) 573-8188
Fax: (865) 573-8133

Client: Adam Griffin
Aspect Consulting
401 Second Ave South
Suite 201
Seattle, WA 98104

Phone: 206-780-7746

Fax:

Identifier: 006PC

Date Rec: 03/01/2018

Report Date: 03/07/2018

Client Project #: 050067-014J-02

Client Project Name: Art Brass Plating-CVOCs

Purchase Order #:

Analysis Requested: CENSUS, PLFA, Standard Bio-Trap

Reviewed By:

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Client: Aspect Consulting
Project: Art Brass Plating-CVOCs

MI Project Number: 006PC
Date Received: 03/01/2018

Sample Information

Client Sample ID:	DR-1-022818	MW-24-30-0228 18	PSC-CG-142-40 -022818
Sample Date:	02/28/2018	02/28/2018	02/28/2018
Units:	cells/bead	cells/bead	cells/bead
Analyst/Reviewer:	JS	JS	JS

Dechlorinating Bacteria

<i>Dehalococcoides</i>	DHC	3.29E+01	<2.50E+01	5.20E+00 (J)
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Legend:

NA = Not Analyzed NS = Not Sampled J = Estimated gene copies below PQL but above LQL I = Inhibited
 < = Result not detected

Quality Assurance/Quality Control Data

Samples Received 3/1/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
DHC	03/01/2018	03/07/2018	3 °C	104%	non-detect	non-detect



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Phone: 206-780-7746

Fax:

Identifier: 006PC

Date Rec: 03/01/2018

Report Date: 03/13/2018

Client Project #: 050067-014J-02

Client Project Name: Art Brass Plating-CVOCs

Purchase Order #:

Analysis Requested: CENSUS, PLFA, Standard Bio-Trap

Reviewed By:

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MICROBIAL INSIGHTS, INC.

10515 Research Dr., Knoxville, TN 37932
Tel. (865) 573-8188 Fax. (865) 573-8133

PLFA

Client: Aspect Consulting
Project: Art Brass Plating-CVOCs

MI Project Number: 006PC
Date Received: 03/01/2018

Sample Information

Sample Name:	DR-1-022818	MW-24-30-0228	PSC-CG-142
Sample Date:	02/28/2018	02/28/2018	02/28/2018
Sample Matrix:	Std. Bio-Trap	Std. Bio-Trap	Std. Bio-Trap
Analyst/Reviewer:	KH	KH	KH

Biomass Concentrations

Total Biomass (cells/bead)	3.88E+05	9.25E+04	1.30E+05
----------------------------	-----------------	-----------------	-----------------

Community Structure (% total PLFA)

Firmicutes (TerBrSats)	12.79	0.00	0.77
Proteobacteria (Monos)	65.31	75.90	72.59
Anaerobic metal reducers (BrMonos)	0.00	0.00	0.00
SRB/Actinomycetes (MidBrSats)	4.24	0.00	0.00
General (Nsats)	16.48	22.68	25.95
Eukaryotes (polyenoics)	1.16	1.43	0.70

Physiological Status (Proteobacteria only)

Slowed Growth	0.11	0.23	0.33
Decreased Permeability	0.21	0.18	0.00

Legend:

NA = Not Analyzed NS = Not Sampled

Client: Aspect Consulting
 Project: Art Brass Plating-CVOCs

MI Project Number: 006PC
 Date Received: 03/01/2018

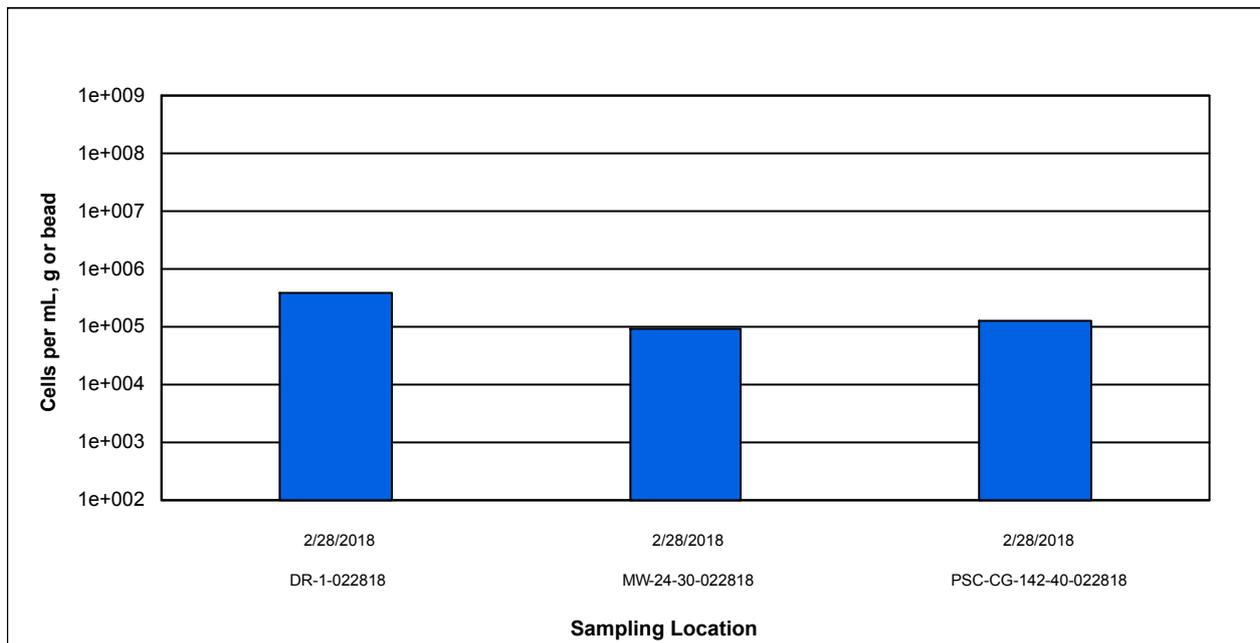


Figure 1. Biomass content is presented as a cell equivalent based on the total amount of phospholipid fatty acids (PLFA) extracted from a given sample. Total biomass is calculated based upon PLFA attributed to bacterial and eukaryotic biomass

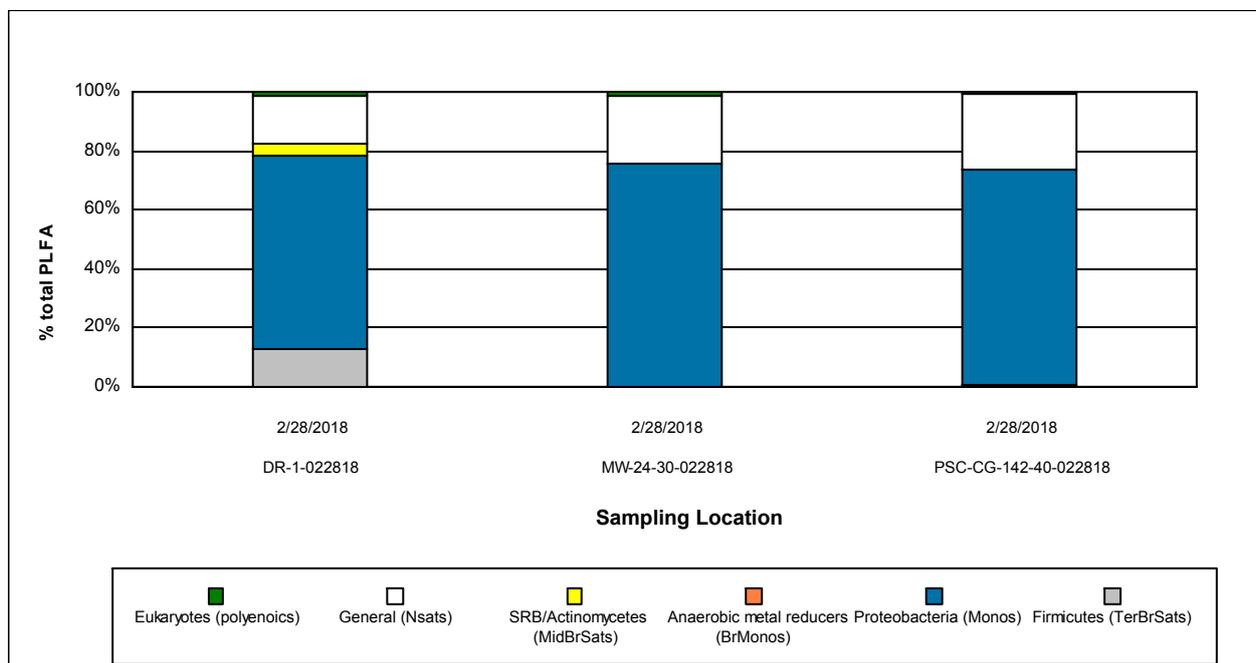


Figure 2. Relative percentages of total PLFA structural groups in the samples analyzed. Structural groups are assigned according to PLFA chemical structure, which is related to fatty acid biosynthesis.

Quality Assurance/Quality Control Data

Samples Received 3/1/2018

Component	Date Prepared	Date Analyzed	Arrival Temperature	Positive Control	Extraction Blank	Negative Control
PLFA	03/01/2018	03/13/2018	3 °C	105%	non-detect	non-detect

Certificate of Analysis

Date of certificate: February 5, 2018

Client: Aspect Consulting

401 2nd Ave. S., Suite 201

Seattle, WA 98104

Project name/location: Art Brass Plating, Seattle, WA

Project number: 050067

Contact people: Delia Massey (dmassey@aspectconsulting.com)

Adam Griffin (agriffin@aspectconsulting.com)

Samples collected by: ACO

Date samples shipped: January 31, 2018

Date samples rec'd at OUL: February 1, 2018

Date analyzed by OUL: February 5, 2018

Included with certificate of analysis: Table of results
and copy of sample collection data sheet

Results for water samples analyzed for the presence of fluorescein, eosine, rhodamine WT (RWT) and sulforhodamine B (SRB) dyes.

Peak wavelengths are reported in nanometers (nm); dye concentrations are reported in parts per billion (ppb).

OUL Number	Station Name	Date/Time Collected	Fluorescein Results		Eosine Results		RWT Results		SRB Results	
			Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)	Peak (nm)	Conc. (ppb)
C8325	DR-1-012918	1/29/18 1145	ND		ND		ND		ND	
C8326	DR-2-013018	1/30/18 0900	ND		ND		ND		ND	
C8327	PSW-1-013018	1/30/18 1020	ND		ND		ND		ND	
C8328	PSW-2-013018	1/30/18 1130	ND		ND		ND		ND	
C8329	PSW-3-013018	1/30/18 1405	ND		ND		ND		ND	
C8330	PSW-4-013018	1/30/18 1525	ND		ND		ND		ND	
C8331	PSW-5-013018	1/30/18 1235	ND		ND		ND		ND	
C8332	MW-24-30-012918	1/29/18 1340	ND		ND		ND		ND	
C8333	MW-24-50-013018	1/30/18 1635	ND		ND		ND		ND	

Note: Dye concentrations are based upon standards used at the OUL. The standard concentrations are based upon the as sold weight of the dye that the OUL uses.

If the client is not using OUL dyes, the client should provide the OUL with a sample of the dye to compare to the OUL dyes.

Footnotes:

ND = No dye detected

Thomas J. Aley, PHG and RG



OZARK UNDERGROUND LABORATORY, INC.

1572 Aley Lane Protem, MO 65733 (417) 785-4289 fax (417) 785-4290 email: contact@ozarkundergroundlab.com

SAMPLE COLLECTION DATA SHEET for FLUORESCENCE ANALYSIS

Project Art Brass Plating #050067-0145-R2 Week No: _____ Samples Collected By: ACO
 Samples Shipped By: _____ Samples Received By: C. Aley, OUL
 Date Samples Shipped: 1/31/18 Date Samples Received: 2-1-18 Time Samples Received: 1300 Return Cooler? Yes No
 Bill to: Aspect Consulting Send Results to: Adam Griffin, Aspect Consulting
 Analyze for: Fluorescein Eosine Rhodamine WT Other SRB Ship cooler to: Aspect Consulting

OUL use only		<i>Please indicate stations where dye was visible in the field</i>						OUL use only
# CHAR REC'D	LAB NUMBER <i>Water</i>	STATION NUMBER	STATION NAME	PLACED		COLLECTED		# WATER REC'D
				DATE	TIME	DATE	TIME	
0	C8325		DR-1-012918			1/29/18	1145	1
0	C8326		DR-2-013018			1/30/18	0900	1
0	C8327		PSW-1-013018			1/30/18	1020	1
0	C8328		PSW-2-013018			1/30/18	1130	1
0	C8329		PSW-3-013018			1/30/18	1405	1
0	C8330		PSW-4-013018			1/30/18	1525	1
0	C8331		PSW-5-013018			1/30/18	1235	1
0	C8332		MW-24-30-012918			1/29/18	1340	1
0	C8333		MW-24-50-013018			1/30/18	1635	1

COMMENTS _____

This sheet filled out by OUL staff? Yes (No) Charts for samples on this page proofed by OUL: CA
 OUL Project No. 1705 Date Analyzed: 2/5/18 Analyzed By: AC/OUL

APPENDIX F

Health and Safety Plan



PROJECT-SPECIFIC HEALTH AND SAFETY PLAN

Property Name:	Art Brass Plating		
Project Number:	050067		
Prepared By:	Delia Massey	Date:	3/2/2018
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

PROPERTY LOCATION	Art Brass Plating 5516 3rd Avenue South Seattle, WA
NEAREST HOSPITAL	Harborview Medical Center 325 9th Ave, Seattle, WA 98104 Attached figure F-1 shows route to hospital.
EMERGENCY RESPONDERS	Police, Ambulance, Fire 911
OTHER CONTACTS	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
IN EVENT OF EMERGENCY, CALL FOR HELP AS SOON AS POSSIBLE	Give the following information: <ul style="list-style-type: none"> ✓ Where You Are: address, cross streets, or landmarks ✓ Phone Number you are calling from ✓ What Happened: type of accident, injury ✓ How Many Persons need help ✓ What is Being Done for the victims ✓ You Hang Up Last: let whomever you called hang up first

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

Property Name:	Art Brass Plating	
Property Location or Address:	5516 3 rd Ave South	
Owners/Tenants:	Dean Allstrom/Art Brass Plating	
Current Property Use:	Metal Finishing (including plating, polishing, and powder coating)	
Past Use of Property (if different):	Residential	
Designated Hazardous Waste Site?	No	If yes, specify federal, state, or other:
Industrial Site?	Yes	

Topography:	Flat
Surround Land Use/Nearest Population:	Primarily commercial/light industrial with a few residences; nearest population to north and west
Drinking Water/Sanitary Facilities:	On-site
Site Map:	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.
- The contamination reduction zone will be located adjacent to the driller's mobile decontamination trailer, and will include steam cleaning equipment for equipment decontamination.
- 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

Proposed Work Activities On-Site:	<ul style="list-style-type: none"> • Drilling and development of injection wells. • Injection of <i>in situ</i> treatment • Routine groundwater monitoring
Objectives of Site Activities:	Evaluate the <i>in situ</i> treatment of the downgradient trichloroethene plume
Proposed Work Dates:	<i>January 2018 – September 2019</i>
Will On-site Personnel Potentially be Exposed to Hazardous Substances?	<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"> • VOCs, including dry cleaner solvents: Trichloroethene (TCE), cis-1,2-DCE, vinyl chloride • Heavy Metals (arsenic, barium, iron, manganese, etc.) • Injection reagent (iron salts)
Do Personnel Conducting Site Activities have Training in Accordance with WAC 296-843-200?	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"> • Decontamination process, involving Alconox wash, tap water rinse, and deionized water rinse (with air dry). • Dedicated tubing used for groundwater sampling will be disposed of or retained (bagged) for future use, but not decontaminated.
<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"> • Steam clean drilling equipment and excavator bucket that advances below ground surface.
<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"> • Wash boots and rain gear that have come into contact with soil or groundwater with Alconox/tap water and air dry. • Dispose of disposable personal protective equipment (PPE such as gloves, Tyvek) into Department of Transportation (DOT)-approved and appropriately labeled 55-gallon drums. • To prevent distribution of contaminants outside the exclusion zone, do not allow unnecessary vehicles inside the exclusion zone.
<p>Soil cuttings, monitoring well purge water, and decontamination wastewater will be managed in the following manner:</p>	<ul style="list-style-type: none"> • 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. • 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.

7 HAZARD ANALYSIS

The potential hazards and corresponding control measures for planned site work activities are as follows:

Work Activity	Primary Potential Hazards	Control Measures
Drilling injection wells/injection oversight	<ul style="list-style-type: none"> • Getting hit by drill rig equipment, especially from overhead. 	<ul style="list-style-type: none"> • Stay back from rig whenever possible and stay alert. • Modified Level D PPE (with hard hat, traffic vest, steel-toe boots).
	<ul style="list-style-type: none"> • Excessive noise. 	<ul style="list-style-type: none"> • Wear hearing protection.
	<ul style="list-style-type: none"> • Chemical exposure (skin contact, ingestion, inhalation). 	<ul style="list-style-type: none"> • Modified Level D PPE. • Air monitoring.
Well development and groundwater sampling	<ul style="list-style-type: none"> • Chemical exposure (skin or eye contact, ingestion). 	<ul style="list-style-type: none"> • Modified Level D PPE. • Securely join pump tubing and other connectors.
All	<ul style="list-style-type: none"> • Getting hit by other trucks working on the property. 	<ul style="list-style-type: none"> • Wear traffic vest. • Stay back from roads and stay alert.
	<ul style="list-style-type: none"> • Railroad traffic on road entering site. 	<ul style="list-style-type: none"> • Stay alert to railroad traffic. • Obey railroad alerts at road crossings.
	<ul style="list-style-type: none"> • Heat stress 	<ul style="list-style-type: none"> • Take breaks, seek shade, and increase fluid intake.

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 ³ Ba: 0.5 mg/m ³ Fe: -- Mn: 5 mg/m ³	As: -- Ba: -- Fe: -- Mn: --	As: 0.01 mg/m ³ Ba: 1100mg/m ³ Fe: -- Mn: 500 mg/m ³	As: C Ba: T Fe: -- Mn: --
EHC [®] Liquid Reagent Mix (iron salts)	Injection reagent	1 mg/m ³	--	--	--

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 AIR MONITORING

Air monitoring will be conducted for all subsurface explorations (soil borings, monitoring wells, and test pit excavations) to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring can be used to define exclusion zones. Air monitoring can also be conducted to evaluate relative concentrations of volatile organic compounds in samples.

The following equipment will be used to monitor air quality in the breathing zone during work activities:

Monitoring Instrument	Calibration Frequency	Parameters of Interest	Sampling Frequency
PID	Daily	Volatile organic compounds	<ul style="list-style-type: none"> During collection of each soil sample during drilling.

Use the following action levels to determine the appropriate level of personal protection to be used during field activities:

Monitoring Instrument	Reading in Breathing Zone	Action	Comments
PID	10 PID units above background for 5 minutes	Confirm with detector tube (<i>TCE</i>) or upgrade to Level C (air-purifying respirator with organic vapor cartridge).	Alternatively, use engineering controls (ventilation) or leave location and return at a later time.
PID	100 PID units above background for 5 minutes	Leave location pending further evaluation by Aspect Corporate Safety Officer.	

10 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:	

11 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 large plastic totes, with sealed lid on top. Reagent will be pumped out from the totes and totes will not be tipped on their side.		

12 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.		

13 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.

14 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 north on 3rd Ave S toward S Lucile St | 36 ft |
| ➔ 2. Turn right at S Lucile St | 338 ft |
| ➡ 3. Turn left at 4th Ave S | 1.2 mi
3 mins |
| ➔ 4. Turn right at S Spokane St | 0.2 mi
1 min |
| 5. Take the ramp to Columbian Way/I-5 N | 0.1 mi |
| 6. Merge onto W Seattle Bridge | 328 ft |
| 7. Merge onto I-5 N via the ramp to Vancouver BC | 1.2 mi
2 mins |
| 8. Take exit 164A for James St/Dearborn St toward Madison St | 1.0 mi
2 mins |
| 9. Follow signs for James St | 0.3 mi |
| ➔ 10. Turn right at James St | 0.1 mi |
| ➔ 11. Turn right at 9th Ave | 0.2 mi |

B Harborview Medical Center
325 9th Ave, Seattle, WA 98104

[Hide Maps](#) Overview



End



Map data ©2008 NAVTEQ™, Sanborn

Safety Data Sheet

INTRACID RHODAMINE WT LIQUID

Safety Data Sheet dated: 5/13/2015 - version 1

Date of first edition: 5/13/2015

1. IDENTIFICATION

Product identifier

Mixture identification:

Trade name: INTRACID RHODAMINE WT LIQUID

Other means of identification:

Trade code: A45171566

Recommended use of the chemical and restrictions on use

Recommended use: Industrial color additive

Restrictions on use: Not Determined

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Sensient Colors LLC

2515 N. Jefferson

63106 St. Louis, MO (USA)

Phone: 1 800-325-8110

Emergency Number(CHEMTREC): 1-800-424-9300

2. HAZARD(S) IDENTIFICATION

The identity of the individual components of this product is proprietary information and is considered a trade secret pursuant to 29 CFR 1910.1200

Hazardous components as defined in the OSHA Hazard Communication Standard: components with a HEALTH hazard (carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins, nephrotoxins, neurotoxins, etc..) and/or a PHYSICAL hazard (a combustible liquid, a compressed gas, explosive, flammable, an organic peroxide, an oxidizer, pyrophoric, unstable (reactive) or water-reactive, etc.)



Classification of the chemical

Skin Irrit. 2 Causes skin irritation.

Eye Irrit. 2B Causes eye irritation

Label elements

Symbols:



Warning

Code	Description
------	-------------

H315	Causes skin irritation.
------	-------------------------

H320	Causes eye irritation
------	-----------------------

Code	Description
------	-------------

P264	Wash ... Thoroughly after handling.
------	-------------------------------------

P280	Wear protective gloves/protective clothing/eye protection/face protection.
------	--

P302+P352	IF ON SKIN: Wash with plenty of water/...
-----------	---

P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
----------------	--

P321	Specific treatment (see ... On this label).
------	---

P332+P313	If skin irritation occurs: Get medical advice/attention.
-----------	--

P337+P313	If eye irritation persists: Get medical advice/attention.
-----------	---

P362+P364 Take off contaminated clothing and wash it before reuse.

Ingredient(s) with unknown acute toxicity:

None

Hazards not otherwise classified identified during the classification process:

None

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substances

Not Determined

Mixtures

Hazardous components within the meaning of 29 CFR 1910.1200 and related classification:

List of components

Qty	Name	Ident. Numb.	Classification	Registration Number
10-12.5 %	RHODAMINE LIQUID	CAS:65392-81-6 EC:265-730-6	Skin Irrit. 2, H315; Eye Irrit. 2B, H320	
10-12.5 %	RHODAMINE LIQUID	CAS:75701-30-3 EC:278-292-6	Skin Irrit. 2, H315; Eye Irrit. 2B, H320	
1-3 %	TRIMELLITIC ACID	CAS:528-44-9 EC:208-432-3	Skin Irrit. 2, H315; Eye Irrit. 2A, H319; STOT SE 3, H335	

4. FIRST AID MEASURES

Description of first aid measures

In case of skin contact:

- Immediately take off all contaminated clothing and shoes.
- Immediately remove any contaminated clothing, shoes or stockings.
- After contact with skin, wash immediately with soap and plenty of water.

In case of eye contact:

- Wash immediately and thoroughly with running water, keeping eyelids regularly raised, for at least 15 minutes. Cold water may be used. Check for and remove any contact lenses at once. OBTAIN A MEDICAL EXAMINATION.
- Protect the eyes with a sterile gauze or a clean, dry handkerchief.

In case of ingestion:

- Do not induce vomiting, get medical attention showing the MSDS and label hazardous.

In case of inhalation:

- Remove casualty to fresh air and keep warm and at rest.

Most important symptoms/effects, acute and delayed

- Eye irritation
- Eye damages
- Skin Irritation
- Erythema

Indication of any immediate medical attention and special treatment needed

In case of accident or unwellness, seek medical advice immediately (show directions for use or safety data sheet if possible).

5. FIRE-FIGHTING MEASURES

Extinguishing media

Suitable extinguishing media:

- Water, CO2, foam, chemical powders, according to the materials involved in the fire.
- In case of fire, use foam, dry chemical, CO2.

Unsuitable extinguishing media:

None in particular.

Specific hazards arising from the chemical

- Do not inhale explosion and combustion gases.
- Burning produces heavy smoke.
- Hazardous combustion products: Not Determined
- Explosive properties: Not Determined
- Oxidising properties: Not Determined

Special protective equipment and precautions for fire-fighters

- Use suitable breathing apparatus .
- Collect contaminated fire extinguishing water separately. This must not be discharged into drains.
- Move undamaged containers from immediate hazard area if it can be done safely.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

- Wear personal protection equipment.
- Remove persons to safety.
- See protective measures under point 7 and 8.

Methods and material for containment and cleaning up

- Suitable material for taking up: dry and inert absorbing material (e.g. vermiculite, sand, earth).
 - Wash with plenty of water.
-

7. HANDLING AND STORAGE

Precautions for safe handling

- Avoid contact with skin and eyes, inhalation of vapours and mists.
- Don't use empty container before they have been cleaned.
- Before making transfer operations, assure that there aren't any incompatible material residuals in the containers.
- Contaminated clothing should be changed before entering eating areas.
- Do not eat or drink while working.
- See also section 8 for recommended protective equipment.

Conditions for safe storage, including any incompatibilities

- Storage temperature: Not Determined
 - Incompatible materials:
 - None in particular.
 - Instructions as regards storage premises:
 - Adequately ventilated premises.
-

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

No Data Available

Appropriate engineering controls: Not Determined

Individual protection measures

Eye/face protection:

Use close fitting safety goggles, don't use eye lens.

Skin protection:

Use clothing that provides comprehensive protection to the skin, e.g. cotton, rubber, PVC or viton.

Hand protection:

Use protective gloves that provide comprehensive protection, e.g. P.V.C., neoprene or rubber.

Respiratory protection:

Not Determined

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

- Physical State Liquid
- Appearance: Liquid,
- Odour: Not Determined
- Odour threshold: Not Determined
- pH: 10.50
- Melting point/ range: Not Determined
- Boiling point/ range: Not Determined
- Flash point: > 100°C / 212°F
- Evaporation rate: Not Determined
- Upper/lower flammability or explosive limits: Not Determined
- Vapour density: Not Determined
- Vapour pressure: Not Determined
- Density: Not Determined
- Water solubility: Not Determined
- Lipid solubility: Not Determined
- Partition coefficient (n-octanol/water): Not Determined
- Auto-ignition temperature: Not Determined
- Decomposition temperature: Not Determined
- Viscosity: Not Determined
- Explosive properties: Not Determined
- Oxidising properties: Not Determined
- Flammability (Solid, Gas): Not Determined

Other information

Substance group relevant properties: Not Determined

Miscibility: Not Determined

Fat Solubility: Not Determined

Conductivity: Not Determined

10. STABILITY AND REACTIVITY

Reactivity

Stable under normal conditions.

Chemical stability

Data not Available.

Possibility of hazardous reactions

Burning produces carbon monoxide and/or carbon dioxide.

Conditions to avoid

Stable under normal conditions of temperature and pressure.

Incompatible materials

Avoid strong oxidizing agents, peroxides, acids, alkali metals.

Hazardous decomposition products

Burning produces carbon monoxide and/or carbon dioxide.

11. TOXICOLOGICAL INFORMATION

Information on toxicological effects

Toxicological information of the product: No Data Available

Substance(s) listed on the IARC Monographs:

None

Substance(s) listed as OSHA Carcinogen(s):

None

Substance(s) listed as NIOSH Carcinogen(s):

None

Substance(s) listed on the NTP report on Carcinogens:

None

12. ECOLOGICAL INFORMATION

Toxicity

Adopt good working practices, so that the product is not released into the environment.

Eco-toxicity:

List of Eco-Toxicological properties of the product

No Data Available

Persistence and degradability

Not Determined

Bioaccumulative potential

Not Determined

Mobility in soil

Not Determined

Other adverse effects

Not Determined

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Recover if possible. In so doing, comply with the local and national regulations currently in force.

14. TRANSPORT INFORMATION

UN number

ADR-UN number: N/A

DOT-UN Number: N/A

IATA-Un number: N/A

IMDG-Un number: N/A

UN proper shipping name

ADR-Shipping Name: N/A
DOT Proper Shipping Name: N/A
IATA-Technical name: N/A
IMDG-Technical name: N/A

Transport hazard class(es)

ADR-Class: N/A
DOT Hazard Class: N/A
IATA-Class: N/A
IMDG-Class: N/A

Packing group

ADR-Packing Group: N/A
Exempted for ADR: N/A
IATA-Packing group: N/A
IMDG-Packing group: N/A

Environmental hazards

Marine pollutant: No
Environmental Pollutant: Not Determined

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

Not Determined

Special precautions

Department of Transportation (DOT):

DOT-Special Provision(s): N/A
DOT Label(s): N/A
DOT Symbol: N/A
DOT Cargo Aircraft: N/A
DOT Passenger Aircraft: N/A
DOT/TDG Bulk: N/A
DOT Non-Bulk: N/A

Road and Rail (ADR-RID):

ADR-Label: N/A
ADR-Upper number: N/A
ADR Tunnel Restriction Code: N/A

Air (IATA):

IATA-Passenger Aircraft: N/A
IATA-Cargo Aircraft: N/A
IATA-Label: N/A
IATA-Sub Risk: N/A
IATA-Erg: N/A
IATA-Special Provisioning: N/A

Sea (IMDG):

IMDG-Stowage Code: N/A
IMDG-Stowage Note: N/A
IMDG-Sub Risk: N/A
IMDG-Special Provisioning: N/A
IMDG-Page: N/A
IMDG-Label: N/A
IMDG-EMS: N/A
IMDG-MFAG: N/A

15. REGULATORY INFORMATION**USA - Federal regulations****TSCA - Toxic Substances Control Act****TSCA inventory:**

All the components are listed on the TSCA inventory

TSCA listed substances:

RHODAMINE LIQUID	is listed in TSCA Section 8b
RHODAMINE LIQUID	is listed in TSCA Section 8b
TRIMELLITIC ACID	is listed in TSCA Section 8b, Section 5

SARA - Superfund Amendments and Reauthorization Act

Section 302 - Extremely Hazardous Substances:

no substances listed

Section 304 - Hazardous substances:

no substances listed

Section 313 - Toxic chemical list:

no substances listed

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act

Substance(s) listed under CERCLA:

no substances listed

CAA - Clean Air Act

CAA listed substances:

no substances listed

CWA - Clean Water Act

CWA listed substances:

no substances listed

USA - State specific regulations

California Proposition 65

Substance(s) listed under California Proposition 65:

no substances listed

Massachusetts Right to know

Substance(s) listed under Massachusetts Right to know:

no substances listed

Pennsylvania Right to know

Substance(s) listed under Pennsylvania Right to know:

no substances listed

New Jersey Right to know

Substance(s) listed under New Jersey Right to know:

no substances listed

16. OTHER INFORMATION

Code	Description
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H320	Causes eye irritation
H335	May cause respiratory irritation.

Safety Data Sheet dated: 5/13/2015 - version 1

The information contained herein is based on our state of knowledge at the above-specified date. It refers solely to the product indicated and constitutes no guarantee of particular quality. The information relates only to the specific material and may not be valid for such material used in combination with any other material or in any process.

This document was prepared by a competent person who has received appropriate training.

It is the duty of the user to ensure that this information is appropriate and complete with respect to the specific use intended.

This MSDS cancels and replaces any preceding release.

Legend to abbreviations and acronyms used in the safety data sheet:

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road.

RID: Regulation Concerning the International Transport of Dangerous Goods by Rail

IMDG: International Maritime Code for Dangerous Goods

IATA: International Air Transport Association

IATA-DGR: Dangerous Goods Regulation by the "International Air Transport Association" (IATA)

ICAO: International Civil Aviation Organization

ICAO-TI: Technical Instructions by the "International Civil Aviation Organization" (ICAO)

GHS: Globally Harmonized System of Classification and Labeling of Chemicals
CLP: Classification, Labeling, Packaging
EINECS: European Inventory of Existing Commercial Chemical Substances
INCI: International Nomenclature of Cosmetic Ingredients
CAS: Chemical Abstracts Service (division of the American Chemical Society)
GefStoffVO: Ordinance on Hazardous Substances, Germany
LC50: Lethal concentration, for 50 percent of test population
LD50: Lethal dose, for 50 percent of test population
DNEL: Derived No Effect Level
PNEC: Predicted No Effect Concentration
TLV: Threshold Limiting Value
TWATLV: Threshold Limiting Value for the Time Weighted Average 8 hour day.(ACGIH Standard)
STEL: Short Term Exposure limit
STOT: Specific Target Organ Toxicity
WGK: German Water Hazard Class
KSt: Explosion coefficient
y for the damage.

SAFETY DATA SHEET
EHC® Liquid Reagent Mix

SDS # : EHCLM-C
Revision date: 2016-02-03
Format: NA
Version 1.01



1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product Name EHC® Liquid Reagent Mix

Other means of identification

Alternate Commercial Name EHC®-L Mix; EHC® Liquid - Solid Component

Recommended use of the chemical and restrictions on use

Recommended Use: Bioremediation product for the remediation of contaminated soil and groundwater

Restrictions on Use: Not for drinking water purification treatment.

Manufacturer/Supplier

PeroxyChem LLC
2005 Market Street
Suite 3200
Philadelphia, PA 19103
Phone: +1 267/ 422-2400 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone number

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Combustible dust

GHS Label elements, including precautionary statements

EMERGENCY OVERVIEW

Warning

Hazard Statements

May form combustible dust concentrations in air

Precautionary Statements - Prevention

Keep away from all ignition sources including heat, sparks and flame.

Keep container closed and grounded.

Prevent dust accumulations to minimize explosion hazard.

Hazards not otherwise classified (HNOC)

No hazards not otherwise classified were identified.

Other Information

CONTAINMENT HAZARD: Any vessel that contains wet EHC must be vented due to potential pressure build up from fermentation gases

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS-No	Weight %
Iron salt	Proprietary	92-97
amino acid	Proprietary	3-7

Occupational exposure limits, if available, are listed in section 8

4. FIRST AID MEASURES

Eye Contact	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids intermittently. Consult a physician.
Skin Contact	Wash off with warm water and soap. Get medical attention if irritation develops and persists.
Inhalation	Remove from exposure, lie down. If symptoms persist, call a physician.
Ingestion	If swallowed, do not induce vomiting - seek medical advice.
Protection of first-aiders	No information available.
Most important symptoms and effects, both acute and delayed	Gastrointestinal effects. Inhalation of dust in high concentration may cause irritation of respiratory system.
Indication of immediate medical attention and special treatment needed, if necessary	Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific Hazards Arising from the Chemical	Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Hazardous Combustion Products	Carbon oxides (COx).
Explosion data	
Sensitivity to Mechanical Impact	Not sensitive.
Sensitivity to Static Discharge	Not sensitive.

Protective equipment and precautions for firefighters As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions For personal protection see Section 8. Avoid dispersal of dust in the air (i.e., cleaning dust surfaces with compressed air.).

Other Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Use only non-sparking tools.

Environmental Precautions No special environmental precautions required.

Methods for Containment Sweep or vacuum up spillage and return to container. Avoid wetting dust and clean up as a dry powder with appropriate PPE for handling dry dusty materials; store in containers that keep material dry, segregated but allow to vent. Avoid dispersal of dust in the air (i.e., cleaning dust surfaces with compressed air.). Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Material may be recycled when contamination is not a problem.

Methods for cleaning up Following product recovery, flush area with water.

7. HANDLING AND STORAGE

Handling Avoid contact with skin, eyes and clothing. Do not ingest. Ensure adequate ventilation. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powdered material can build static electricity when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmosphere.

Storage Keep tightly closed in a dry and cool place. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible products . Strong oxidizing agents

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines Ingredients with workplace control parameters.

Chemical name	ACGIH TLV	OSHA PEL	NIOSH	Mexico
Iron salt	TWA: 1 mg/m ³	-	-	-
Chemical name	British Columbia	Quebec	Ontario TWAEV	Alberta
Iron salt	TWA: 1 mg/m ³	TWA: 1.0 mg/m ³	TWA: 1 mg/m ³	TWA: 1 mg/m ³

Appropriate engineering controls

Engineering measures Ensure adequate ventilation, especially in confined areas. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in the handling of this product contain explosion relief vents or an explosion suppression or an oxygen-deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.

Individual protection measures, such as personal protective equipment

Eye/Face Protection	Safety glasses with side-shields.
Skin and Body Protection	Wear suitable protective clothing.
Hand Protection	Protective gloves
Respiratory Protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Dry powder
Physical State	Solid
Color	light gray
Odor	Slight
Odor threshold	No information available
pH	4.5 (1% solution)
Melting point/freezing point	100 °C
Boiling Point/Range	No information available
Flash point	Not applicable
Evaporation Rate	No information available
Flammability (solid, gas)	May be combustible at high temperatures
Flammability Limit in Air	
Upper flammability limit:	No information available
Lower flammability limit:	No information available
Vapor pressure	No information available
Vapor density	No information available
Density	No information available
Specific gravity	No information available
Water solubility	Fairly soluble
Solubility in other solvents	
Partition coefficient	No information available
Autoignition temperature	
Decomposition temperature	No information available
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	Low level dust explosion hazard
K_{st}	76 bar-m/sec: St1 Class dust
Oxidizing properties	No information available
Molecular weight	No information available
Bulk density	Not applicable

10. STABILITY AND REACTIVITY

None under normal use conditions

Chemical Stability	Stable under recommended storage conditions. Decomposes on heating.
Possibility of Hazardous Reactions	None under normal processing.
Hazardous polymerization	Hazardous polymerization does not occur.
Conditions to avoid	To avoid thermal decomposition, do not overheat.
Incompatible materials	Strong oxidizing agents.
Hazardous Decomposition Products	Carbon oxides (COx).

11. TOXICOLOGICAL INFORMATION

Product Information

LD50 Oral	Iron Salt: 2100 mg/kg (guinea pig) Cysteine: 1890 mg/kg (rat)
LD50 Dermal	No information available
LC50 Inhalation	No information available
Sensitization	Not expected to be sensitizing based on the components.

Information on toxicological effects

Symptoms Dust is irritating eyes, nose, throat, and lungs.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Carcinogenicity	Contains no ingredient listed as a carcinogen.
Mutagenicity	This product is not recognized as mutagenic by Research Agencies
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects	Not expected to have significant environmental effects
Persistence and degradability	No information available.
Bioaccumulation	No information available.
Mobility	No information available.
Other Adverse Effects	None known.

13. DISPOSAL CONSIDERATIONS

Waste disposal methods	It must undergo special treatment, e.g. at suitable disposal site, to comply with local regulations.
Contaminated Packaging	Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT NOT REGULATED

15. REGULATORY INFORMATION

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic health hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA/EPCRA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

International Inventories

Component	TSCA (United States)	DSL (Canada)	EINECS/EL INCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)	NZIoC (New Zealand)
Iron salt (92-97)	X	X	X			X	X	X	X
amino acid (3-7)	X	X	X	X	X	X	X	X	X

CANADA

WHMIS Hazard Class Non-controlled

16. OTHER INFORMATION

NFPA	Health Hazards 1	Flammability 1	Stability 0	Special Hazards -
HMIS	Health Hazards 1	Flammability 1	Physical hazard 0	Special precautions -

NFPA/HMIS Ratings Legend Severe = 4; Serious = 3; Moderate = 2; Slight = 1; Minimal = 0

**Uniform Fire Code
References**

COMBUSTIBLE DUST/POWDER
 Refer to NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, for safe handling.

Revision date: 2016-02-03
Revision note (M)SDS sections updated 9
Issuing Date: 2016-01-26

Disclaimer

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Prepared By:

PeroxyChem

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End of Safety Data Sheet

SAFETY DATA SHEET
ELS™ Microemulsion

SDS # : ELS-C
Revision date: 2015-07-22
Format: NA
Version 1



1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product Name ELS™ Microemulsion

Other means of identification

Synonyms Lecithin: L- α -Phosphatidylcholine, Azolectin; Sodium Benzoate: Benzoic acid sodium salt; Sorbitan monooleate, ethoxylated: Polyoxyethylenesorbitan monooleate

Recommended use of the chemical and restrictions on use

Recommended Use: Bioremediation product for the remediation of contaminated soil and groundwater

Restrictions on Use: Not for drinking water purification treatment.

Manufacturer/Supplier

PeroxyChem LLC
2005 Market Street
Suite 3200
Philadelphia, PA 19103
Phone: +1 267/ 422-2400 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone number

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

This material is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

GHS Label elements, including precautionary statements

EMERGENCY OVERVIEW

Hazards not otherwise classified (HNOC)

No hazards not otherwise classified were identified.

Other Information

CONTAINMENT HAZARD: Any vessel that contains wet ELS must be vented due to potential pressure build up from fermentation gases

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS-No	Weight %
Sorbitan monooleate, ethoxylated	9005-65-6	2-4
Lecithin	8002-43-5	20-30
Water	7732-18-5	60-80
Sodium Benzoate	532-32-1	2-4

Synonyms are provided in Section 1.

4. FIRST AID MEASURES

Eye Contact	In case of contact, immediately flush eyes with plenty of water. Get medical attention if irritation develops and persists.
Skin Contact	Wash skin with soap and water. Get medical attention if irritation develops and persists.
Inhalation	Move to fresh air in case of accidental inhalation of vapors. Consult a physician if necessary.
Ingestion	Drink 1 or 2 glasses of water. Get medical attention if symptoms occur. If swallowed, do not induce vomiting - seek medical advice. Never give anything by mouth to an unconscious person.
Most important symptoms and effects, both acute and delayed	None known
Indication of immediate medical attention and special treatment needed, if necessary	Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Carbon dioxide (CO ₂). Dry chemical. Dry powder.
Specific Hazards Arising from the Chemical	. Combustible material: may burn but does not ignite readily
Explosion data	
Sensitivity to Mechanical Impact	Not sensitive.
Sensitivity to Static Discharge	Not sensitive.
Protective equipment and precautions for firefighters	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions For personal protection see Section 8.

Other	For further clean-up instructions, call PeroxyChem Emergency Hotline number listed in Section 1 "Product and Company Identification" above.
Environmental Precautions	No special environmental precautions required.
Methods for Containment	Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.
Methods for cleaning up	After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling	Handle in accordance with good industrial hygiene and safety practice.
Storage	Any vessel that contains wet ELS must be vented due to potential pressure build up from fermentation gases. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible products	Water, Alkalis

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.
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Appropriate engineering controls

Engineering measures	None under normal use conditions.
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Individual protection measures, such as personal protective equipment

Eye/Face Protection	Safety glasses with side-shields.
Skin and Body Protection	Wear suitable protective clothing.
Hand Protection	Protective gloves
Respiratory Protection	Use only with adequate ventilation.
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Light amber emulsion
Physical State	Liquid
Color	No information available
Odor	odorless
Odor threshold	No information available
pH	6.5 - 6.9
Melting point/freezing point	Not applicable No data available
Boiling Point/Range	No information available
Flash point	> 200 °F
Evaporation Rate	No information available
Flammability (solid, gas)	No information available
Flammability Limit in Air	
Upper flammability limit:	No information available
Lower flammability limit:	No information available
Vapor pressure	No information available

Vapor density	No information available
Density	No information available
Specific gravity	No information available
Water solubility	Dispersible in water
Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	Not explosive
Oxidizing properties	Non-oxidizing
Molecular weight	No information available
Bulk density	Not applicable

10. STABILITY AND REACTIVITY

Reactivity	None under normal use conditions
Chemical Stability	Stable under recommended storage conditions.
Possibility of Hazardous Reactions	None under normal processing.
Hazardous polymerization	Hazardous polymerization does not occur.
Conditions to avoid	Temperatures above 71°C
Incompatible materials	Water, Alkalis.
Hazardous Decomposition Products	None under normal use.

11. TOXICOLOGICAL INFORMATION

Product Information

Ingredients in this product have been designated as GRAS (Generally Recognized as Safe) by government agencies.

LD50 Oral	There are no data available for this product
LD50 Dermal	There are no data available for this product
LC50 Inhalation	No information available

Sensitization Not expected to be sensitizing based on the components.

Information on toxicological effects

Symptoms No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Carcinogenicity Contains no ingredient listed as a carcinogen.

Mutagenicity No information available

Reproductive toxicity No information available.

STOT - single exposure No information available.
STOT - repeated exposure No information available.

Aspiration hazard No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects Contains no substances known to be hazardous to the environment or that are not degradable in waste water treatment plants

Persistence and degradability Expected to biodegrade, based on component information.

Bioaccumulation Bioaccumulation is unlikely.

Mobility Will likely be mobile in the environment due to its water solubility but will likely degrade over time.

Other Adverse Effects None known.

13. DISPOSAL CONSIDERATIONS

Waste disposal methods Can be landfilled or incinerated, when in compliance with local regulations.

Contaminated Packaging Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT NOT REGULATED

15. REGULATORY INFORMATION

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic health hazard	NO
Fire hazard	NO
Sudden release of pressure hazard	NO
Reactive Hazard	NO

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

International Inventories

Component	TSCA (United States)	DSL (Canada)	EINECS/EL INCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)	NZIoC (New Zealand)
Sorbitan monooleate, ethoxylated 9005-65-6 (2-4)	X	X	X	X	X	X	X	X	X
Lecithin 8002-43-5 (20-30)	X	X	X		X	X	X	X	X
Sodium Benzoate 532-32-1 (2-4)	X	X	X	X	X	X	X	X	X

Mexico - Grade Minimum risk, Grade 0

CANADA

WHMIS Hazard Class Non-controlled

16. OTHER INFORMATION

NFPA	Health Hazards 1	Flammability 0	Stability 0	Special Hazards -
HMIS	Health Hazards 1	Flammability 0	Physical hazard 0	Special precautions -

NFPA/HMIS Ratings Legend Severe = 4; Serious = 3; Moderate = 2; Slight = 1; Minimal = 0

Revision date: 2015-07-22
Revision note Initial Release
Issuing Date: 2015-07-14

Disclaimer

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Prepared By:

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End of Safety Data Sheet

APPENDIX G

Operational Logs

