Willow Creek Water Quality Sampling
May – September 2016

Findings Report

Finalized November 2017
by the Alaska Department of Environmental Conservation

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1.0 Summary

Increasing development and recreational activity along with continued mining within the Willow Creek watershed raised concerns over possible water quality degradation and changes to physical habitat resulting in impacts to salmon spawning and rearing habitat. In order to address these concerns, water quality monitoring, physical habitat and biotic assessments were conducted in the summer and fall of 2014 and the spring of 2015. DEC staff conducted follow-up water quality monitoring in the summer of 2016 to achieve two years of monitoring to document water quality health. This report presents the findings from the 2016 water quality monitoring.

Water samples were collected from four Willow Creek monitoring locations during May, July, August and September 2016 to represent different river flow conditions. Laboratory analysis for dissolved metals concentrations, macronutrients, alkalinity, hardness, and fecal coliform bacteria was conducted; additionally instream field measurements for pH, specific conductivity, dissolved oxygen, turbidity and temperature were conducted. Microbial Source Tracking (MST) analysis was conducted to help identify bacteria sources.

Willow Creek water quality met all state water quality criteria (WQC) except for fecal coliform bacteria at two monitoring locations downstream of the Parks Highway. Microbial source tracking on these bacteria samples indicated no evidence of ongoing bacteria pollution from human sources. Additionally, one dissolved led result downstream of the Parks Highway exceeded the chronic aquatic life WQC. This was an anomalous result and no other lead results exceeded criteria during the entire study period.

2.0 Introduction

2.1 Background

Willow Creek is an important and popular salmon and rainbow trout stream within the Matanuska-Susitna Borough near the town of Willow, Alaska. Willow Creek supports Chinook, coho, sockeye, pink, and chum salmon, as well as rainbow trout and Arctic grayling. Willow Creek is accessible from the Parks Highway, Willow Creek Parkway, and Willow Fishhook Road. There are state and private camping facilities near the creek as well as fishing guide services. Willow Creek drains 167 square miles and is in Hydrologic Unit Code (HUC) 19020505.

Development increases in the Willow Creek watershed have the potential to disturb riparian areas, contribute to bank erosion and impact water quality. During rain events runoff from parking lots, roads, yards and fields can contribute sediments, salts and metals to surface streams. All of these factors affect the overall ecological health of the stream including aquatic insects, rearing juvenile salmon and resident fish. Fine sediments in large quantities can limit the amount of living space for aquatic insects, clog the gills of rearing juvenile salmon and resident fish, can block oxygen flow to developing salmon eggs, and can also contribute to increased water temperature. Metal pollutants can be toxic to fish particularly during early incubation and can also alter the odor of a stream affecting migrating salmon’s ability to locate spawning areas.
A combination of different land use activities within the Willow Creek drainage could potentially influence water quality and fish habitat. Mining within the upper drainage has been occurring for the past ~ 100 years and is ongoing. Urban development including homes and “hobby” farms, land clearing, and road building has occurred within the watershed and within the river flood-prone area primarily from Shirley-Town Road downstream. Four road bridges cross Willow Creek with two of these (Deneke and Shirley Town) having been lost (and replaced) to floods within the past 10 years. There has been some forest harvest and road building within the Willer-Kash harvest area on the north side of Willow Creek and in the upper Deception Creek drainage. Potential recreational impacts include all-terrain-vehicle trails in the upper drainage and damage to riparian vegetation in the areas of concentrated fishing/camping use primarily downstream of the Parks Highway. Figure 1 shows the Willow Creek drainage.

Figure 1. Location of Willow Creek in south-central Alaska.

2.2 2015 Assessment

In Fiscal Year 2015 (FY15), water quality sampling, biological sampling and habitat measurements were conducted by the Aquatic Restoration & Research Institute (ARRI) under the direction of DEC through an Alaska Clean Water Actions grant. Results of that study are described in the project report by Davis, Davis, Ramage and Briggs (2015) titled “Willow Creek Water Quality and Habitat Assessment” at http://dec.alaska.gov/water/wqsar/pdfs/Reports/Willow-Creek-2015-ADEC.pdf.

Water quality sampling conducted in FY15 documented fecal coliform bacteria 30-day geometric means greater than 20 colony forming units (cfu)/100 milliliters (ml) at two monitoring locations downstream of the Parks Highway (Table 1). The values are in exceedance of the fecal coliform bacteria WQC for the drinking water supply designated use (30-day geometric mean not to exceed 20 cfu/100 ml, and not more than 10% of the samples may exceed 40 cfu/100 ml).
Table 1. FY15 fecal coliform bacteria results for the two sites sampled on Willow Creek. Site Willow03 is immediately downstream of the Parks Highway and site Willow04 is near the mouth of Willow Creek in the Willow Creek State Recreation Area.

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<td>8/4/2014</td>
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<td>8/12/2014</td>
<td>12.00</td>
<td>44.00</td>
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<tr>
<td>8/19/2014</td>
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<td><strong>Geometric Mean</strong></td>
<td><strong>20.25</strong></td>
<td><strong>33.61</strong></td>
</tr>
</tbody>
</table>

3.0 Methods

3.1 Project Objectives 2016

1) Measure stream water chemical and nutrient parameters in upstream reference and downstream developed or higher use areas of Willow Creek to determine if results are within WQC. The additional data will enable DEC to reach a water quality assessment determination.

2) Conduct Microbial Source Tracking (MST) analysis for fecal coliform bacteria results that exceed WQC to determine if the source of the bacteria includes human, dog or horse DNA biomarkers.

3.2 Project Description

3.2.1 Parameters for Laboratory Analysis

This project provided a second year of baseline water quality data in Willow Creek to determine if WQC were being met and evaluated current stream health. The water quality assessment was conducted through implementation of a DEC approved Quality Assurance Project Plan (QAPP). Water sample collection occurred at an upstream reference location and at downstream higher use areas (Figure 2 and Table 2).

Water samples for laboratory analysis were collected at four locations distributed longitudinally in the mainstem of Willow Creek on three separate occasions. In order to characterize seasonal water quality, samples were collected once during spring runoff in May 2016, once during summer base flow conditions in July 2016, and once during fall storms in September 2016. Water samples were laboratory analyzed for nitrate+nitrite nitrogen, ammonia nitrogen, total phosphorus, dissolved organic carbon, alkalinity, hardness, and dissolved metals (ICP/MS using EPA 200.8 methods, including the following metals: silver, aluminum, arsenic, barium, beryllium, cadmium, cobalt, chromium, copper, iron, manganese, molybdenum, nickel, lead, antimony, selenium, thallium, vanadium, and zinc). Dissolved mercury was analyzed using EPA 245.1 methods.

Fecal coliform bacteria sampling occurred five times within a 30-day period during summer base flow and early fall storm flow conditions (mid-July – early August) at three sampling locations. One bacteria sampling site was upstream of the Parks Highway (Willow02) and two sampling sites were
downstream of the highway (Willow03 and Willow04). Water samples were analyzed by SGS Laboratory in Anchorage, AK for fecal coliform bacteria using SM 9222D. If the bacteria counts were greater than 20 cfu/100 ml, the samples underwent MST analysis for presence/absence of human, horse, and/or dog bacteroidetes (DNA sequences) to speciate the bacteria source. If the bacteroidetes were present, then quantification of the concentration of these host fecal indicators occurred.

Microbial source tracking is a set of methods used to determine the host (different animals or human) that contributes fecal pollution to a waterway. Variations in DNA sequences between living organisms makes it possible to distinguish between these organisms through molecular biology techniques (Source Molecular 2016).

Laboratory chain of custody forms were filled out and shipped with the water sample coolers to the project laboratories. SGS North America Inc. laboratory in Anchorage, Alaska conducted the fecal coliform bacteria, dissolved metals, chemical, and nutrient analyses. MST analysis was conducted through Source Molecular Corporation laboratory in Miami, Florida.

Figure 2. Map of Willow Creek and surrounding area with approximate sampling locations. Modified from Davis, et al. 2015.
Table 2. Willow Creek sampling locations with GPS coordinates using NAD83.

<table>
<thead>
<tr>
<th>Sampling Site</th>
<th>Location Description</th>
<th>Latitude</th>
<th>Longitude</th>
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</thead>
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<td>100 meter reach immediately downstream of Deneki Road crossing bridge</td>
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<td>Willow03</td>
<td>100 meter reach quarter mile downstream of Parks Highway crossing</td>
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<td>Willow04</td>
<td>100 meter reach within Willow Creek State Park, upstream of confluence with Susitna River</td>
<td>61.77696</td>
<td>-150.15544</td>
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3.2.2 Field Water Quality Measurements

Field water quality measurements at all four sites included pH, specific conductivity, dissolved oxygen, temperature, and turbidity and were measured using meters concurrent with the water samples collected for laboratory analysis. Specific conductivity, water temperature, dissolved oxygen and pH were measured using a YSI 556 meter and probes. Turbidity was measured using a Hach 2100P turbidimeter using nephelometric turbidity units (NTU). Turbidity measurements involved obtaining three replicate samples at each monitoring location and then calculating an average turbidity value for each location. Meters were calibrated prior to use each sampling date.

Daily stream discharge was obtained each sampling date from the U.S. Geologic Survey (USGS) gauging station 15294005 publically available online. Table 3 outlines the project sampling schedule.

Table 3. Project sample dates for all parameters and all sites in 2016. NA means not applicable and a sample was not taken.

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</table>
4.0 Results

4.1. Dissolved Oxygen, pH, and Specific Conductivity

Results for field water quality measurements are shown in Figures 3 through 5. Dissolved oxygen (mg/l) was consistently highest at site Willow01 in the upper watershed throughout the study. Seasonally, the highest dissolved oxygen levels were measured on September 21, 2016 at all sample sites except Willow04 which is located near a small still water side slough. Stream water pH was over 7.0 on all sampling dates. The pH was highest for all four sites on July 18, 2016 and lowest during the spring sampling on May 18, 2016. Specific conductivity (microsiemens per centimeter (µS/cm)) generally followed a similar pattern to stream water pH with highest readings in July and lowest readings in May as shown in Figure 5.

![Figure 3. Dissolved oxygen (mg/l) at all sampling locations measured during spring flow (May 18), summer base flow (July 18) and during a fall storm flow event (September 21).](image-url)
4.2 Turbidity

Turbidity was very low throughout the 2016 study at all sites and dates. Daily average turbidity values were less than 5 NTU on all sample dates (Figure 6). Even following storm events, turbidity values were low. A high water event (over 2,000 cfs) occurred on September 13, 2016 following heavy rains. Water quality sampling occurred on September 21, 2016 and turbidity values were less than 2 NTU.
Figure 6. Daily average turbidity (NTU) during spring flow (May 18), summer base flow (July 18) and during a fall storm flow event (September 21).

4.3 Dissolved Metals

The Alaska Water Quality Manual for Toxic and Other Deleterious Organic and Inorganic Substances (Toxics Manual) (ADEC 2008) provides water quality criteria for metals (dissolved or total recoverable) and organic substances in freshwater. The manual presents both acute and chronic criteria for aquatic life in freshwater. Acute criteria are based on one-hour averages, while chronic criteria are based on a four-day average concentration.

This study tested for acute criteria, but measurements could be used to indicate potential exceedances of chronic criteria even though four consecutive days of sampling did not occur (ADEC CALM 2017). The Toxics Manual also outlines criteria for human health consumption for uses of drinking, culinary, food processing, and growth and propagation of aquatic life.

Measurements of dissolved metals in water samples are shown in Table 4 for each sampling date. Results are in micrograms per liter (µg/l). The lead result at monitoring location Willow03 on July 18, 2016 exceeded chronic criterion. All remaining lead results, including all of the replicate samples, were below detectable levels for lead.

Table 4. Dissolved metals at all four sampling locations, measured during spring flow, summer base flow, and a fall storm flow event. ND indicates metals were below detectable levels. All values are in µg/L.

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</tr>
<tr>
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</tr>
<tr>
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</tr>
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</tr>
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</tr>
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</tr>
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<tr>
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**July 18, 2016**

<table>
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<td>ND</td>
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<td>ND</td>
<td>ND</td>
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<td>Willow03</td>
<td>Willow04</td>
</tr>
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<td>----------</td>
<td>----------</td>
<td>----------</td>
<td>----------</td>
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<td>ND</td>
<td>ND</td>
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<td>3190</td>
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<td>ND</td>
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<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Titanium</td>
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<td>Vanadium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
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<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Antimony</td>
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<th>Willow04</th>
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<td>Antimony</td>
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<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Arsenic</td>
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<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Barium</td>
<td>13.9</td>
<td>8.81</td>
<td>10.2</td>
<td>11.4</td>
</tr>
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<td>Beryllium</td>
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<td>Cadmium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Chromium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Cobalt</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Copper</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>1.00</td>
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<td>Iron</td>
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<td>275</td>
<td>470</td>
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<td>Lead</td>
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<td>2660</td>
<td>1530</td>
<td>1700</td>
<td>1720</td>
</tr>
<tr>
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<td>7.27</td>
<td>5.06</td>
<td>20.3</td>
<td>30.8</td>
</tr>
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<td>Mercury</td>
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<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Nickel</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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<td>530</td>
<td>605</td>
<td>696</td>
<td>711</td>
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<td>Selenium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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<tr>
<td>Silicon</td>
<td>3250</td>
<td>3550</td>
<td>4160</td>
<td>4330</td>
</tr>
<tr>
<td>Silver</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Sodium</td>
<td>3370</td>
<td>2530</td>
<td>4050</td>
<td>4090</td>
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<tr>
<td>Thallium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Tin</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Titanium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
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<td>Vanadium</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Zinc</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Aluminum</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Antimony</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>
4.4 Nutrient Concentrations including Alkalinity and Hardness

Alkalinity and hardness results are shown in Figures 7 and 8, respectively. Alkalinity ranged from 15.8 mg/l (Willow02 in May 2016) to 30.7 mg/l (Willow01 in July 2016). Hardness, as calcium carbonate (CaCO₃), ranged from 16.3 mg/l (Willow02 in May 2016) to 39.2 mg/l (Willow01 in July 2016). Alkalinity and hardness did not display great variation throughout the sampling periods. Willow01 and Willow04 had higher alkalinity than Willow02 and Willow03 at each sampling event. Willow01 consistently had the highest hardness value. Willow02 consistently had the lowest hardness value.

Dissolved organic carbon (DOC), shown in Figure 9, had the lowest result values during summer base flow conditions (July) and the highest results during the fall storm sampling (September). DOC values increased moving from upstream to downstream locations.

Concentrations of total phosphorus, dissolved phosphorus, nitrate and nitrite nitrogen, and ammonia nitrogen are shown in Table 5. Total phosphorus remained fairly constant for each sampling event except for a peak at Willow04 in May. Dissolved phosphorus was not detected in any of the samples. This is likely because the laboratory did not have the ability to detect dissolved phosphorus to the very low levels that likely occur in Willow Creek. Inorganic nitrogen levels were low, and were below detectable levels for most sites in July and September 2016. Nitrogen concentrations were higher in May 2016 during leaf out and the onset of terrestrial production and were detected in low levels at most sites.
Figure 8. Hardness (mg/l CaCO$_3$) at all sampling locations measured during spring flow (May 18), summer base flow (July 18) and during a fall storm flow event (September 21).

Figure 9. Dissolved organic carbon (mg/l) at all sampling locations measured during spring flow (May 18), summer base flow (July 18) and during a fall storm flow event (September 21).
Table 5. Total phosphorus, dissolved phosphorus, inorganic nitrogen (nitrate+nitrite), and ammonia-nitrogen, measured at all four sampling locations during spring flow, summer base flow, and a fall storm flow event. ND indicates results were below detectable levels.

<table>
<thead>
<tr>
<th>Monitoring Date</th>
<th>Willow01</th>
<th>Willow02</th>
<th>Willow03</th>
<th>Willow04</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Phosphorus (µg/L)</strong></td>
<td>5/18/2016</td>
<td>45</td>
<td>32.5</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>7/18/2016</td>
<td>3.5</td>
<td>8.9</td>
<td>4.4</td>
</tr>
<tr>
<td></td>
<td>9/21/2016</td>
<td>16.9</td>
<td>7.7</td>
<td>13.6</td>
</tr>
<tr>
<td><strong>Dissolved Phosphorus (µg/L)</strong></td>
<td>5/18/2016</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td>7/18/2016</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td>9/21/2016</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Nitrate + Nitrite Nitrogen (mg/l)</strong></td>
<td>5/18/2016</td>
<td>0.0564</td>
<td>0.0576</td>
<td>0.0512</td>
</tr>
<tr>
<td></td>
<td>7/18/2016</td>
<td>ND</td>
<td>0.107</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td>9/21/2016</td>
<td>ND</td>
<td>0.0308</td>
<td>ND</td>
</tr>
<tr>
<td><strong>Ammonia Nitrogen (mg/l)</strong></td>
<td>5/18/2016</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td>7/18/2016</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td></td>
<td>9/21/2016</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
</tbody>
</table>

4.5 Fecal Coliform Bacteria

Table 6 shows the fecal coliform bacteria results at monitoring sites Willow02, Willow03, and Willow04 for five sampling dates along with stream discharge (cfs) and observed weather for each sampling date. Fecal coliform counts were highest at Willow04, the farthest downstream site; with a geometric mean of 34.28 cfu/100 ml. The fecal coliform bacteria geometric mean exceeded 20 cfu/100 ml at all three monitoring locations. This is the most stringent state water quality criteria for the Water Supply designated use. Fecal coliform bacteria did not exceed water quality criteria for other designated water uses (ADEC 2017).

Table 6. Fecal coliform bacteria (cfu/100 ml) results over a 30-day period for calculating the geometric mean.

<table>
<thead>
<tr>
<th>Date</th>
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<th>Willow03</th>
<th>Willow04</th>
<th>Discharge; Weather Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/19/2016</td>
<td>14</td>
<td>25</td>
<td>59</td>
<td>375 cfs; dry weather</td>
</tr>
<tr>
<td>7/25/2016</td>
<td>59</td>
<td>20</td>
<td>47</td>
<td>700 cfs; heavy rain 24 hours prior to sampling and morning of sampling. Let up during sampling.</td>
</tr>
<tr>
<td>7/26/2016</td>
<td>44</td>
<td>61</td>
<td>87</td>
<td>520 cfs; intermittent rain 24 hours prior</td>
</tr>
<tr>
<td>8/1/2016</td>
<td>25</td>
<td>23</td>
<td>25</td>
<td>375 cfs; light intermittent showers 24 hours prior</td>
</tr>
<tr>
<td>8/8/2016</td>
<td>57</td>
<td>86</td>
<td>118</td>
<td>685 cfs; heavy rain 24 hours prior but dry during sampling</td>
</tr>
<tr>
<td>Geometric Mean</td>
<td>30.61</td>
<td>22.57</td>
<td>34.28</td>
<td></td>
</tr>
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</table>
4.6 Microbial Source Tracking

Microbial source tracking was conducted on 12 samples based on the fecal coliform bacteria results shown in Table 6. DNA biomarkers for human (two different biomarkers used), horse, and dog were examined. For results that returned with DNA present, a second step, termed quantification, occurred. Quantification is used to quantify the amount of that fecal biomarker present in the sample result. Quantification is useful for determining how much of the bacteria load different hosts are contributing. Table 7 shows MST and quantification results.

Table 7. MST results for Willow Creek fecal coliform bacteria water quality samples. ND is not detected and <LOQ is less than the laboratory limit of quantification. A blank means sample was not analyzed.

<table>
<thead>
<tr>
<th>Sample Date and Site</th>
<th>Human Dorei</th>
<th>Human EPA</th>
<th>Horse</th>
<th>Dog</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>7/19/2016 Willow04</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td></td>
<td>Human and dog absent</td>
</tr>
<tr>
<td>7/25/2016 Willow02</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td></td>
<td>Human and horse absent</td>
</tr>
<tr>
<td>7/26/2016 Willow03</td>
<td>ND</td>
<td></td>
<td>ND</td>
<td></td>
<td>Human and dog absent</td>
</tr>
<tr>
<td>7/26/2016 Willow04</td>
<td>Present</td>
<td>ND</td>
<td>Present &lt;LOQ</td>
<td>1 Human biomarker present but too low to quantify. Dog present but too low to quantify</td>
<td></td>
</tr>
<tr>
<td>8/8/2016 Willow03</td>
<td>Present &lt;LOQ</td>
<td>ND</td>
<td>ND</td>
<td></td>
<td>1 Human biomarker present but too low to quantify</td>
</tr>
<tr>
<td>8/8/2016 Willow04</td>
<td>ND</td>
<td></td>
<td>Present &lt;LOQ</td>
<td>Human absent. Dog present but too low to quantify</td>
<td></td>
</tr>
</tbody>
</table>

4.7 Stream Discharge

Willow Creek daily discharge data (USGS gauge 15294005) was downloaded from the USGS gauging station information web page on each sampling date and also at the end of the sampling project. Figure 10 shows the daily mean discharge for the period of May – September 2016 as compared to the 30 year median discharge. Discharge was higher than the 30 year median in May but more closely matched the median in June. Daily mean discharge in July, August, and September was more variable with several storm events creating spikes in the daily mean discharge. In particular, mid-September had a very large storm event and daily discharge exceeded 2,000 cfs (Figure 11).
Figure 10. Daily discharge for the 2016 project as measured at USGS gauging station on Willow Creek upstream of Shirley Towne Dr. in Willow. Blue line is 2016 daily mean discharge as compared to the 30 year median discharge value (gold line).

Figure 11. USGS gauging data showing high water event on September 13-14, 2016. Water quality monitoring occurred on September 21.
4.8 Water and Air Temperature

Figure 12 summarizes water temperature data collected during each water quality monitoring date at each site sampled for that date. Willow01, the farthest upstream site, had the coldest temperatures throughout the study. Water temperatures became warmer at each downstream monitoring location with Willow04 recording the highest water temperatures throughout the study.

Air temperature was measured at each sampling location on every monitoring date (Figure 13) except for Willow01 on 7/18/2016 and Willow02 on 7/25/2016 when the sampling equipment failed. Air and water temperatures tended to follow a similar pattern throughout the study.

Water and air temperatures are measured in degrees Celsius (°C).

Figure 12. Water temperature (°C) at all sampling locations measured during all monitoring dates.
Figure 13. Air temperature (°C) at all sampling locations measured during all monitoring dates.

5.0 Discussion

The results of this study indicate that water quality in Willow Creek is overall in good condition and meets WQC. Field measurements of water chemistry were consistent throughout the data collection period. Stream water pH remained between 7.00 and 7.80 on all sampling dates, with lower measurements in the spring and higher measurements in July coinciding with warmer water temperatures. Specific conductivity was highest in July and typically had a higher value at Willow01 and then decreased at Willow02 with each farther downstream monitoring location increasing. Higher conductivity at Willow01 may be indicative of increased mineralization of the stream at higher altitudes. Dissolved oxygen was above WQC at all sites on all monitoring dates. All of these field measurement findings are consistent with the 2015 Willow Creek assessment (Davis, et al. 2015).

All measured dissolved metals in Willow Creek fell below state acute and chronic toxicity criteria for freshwater (ADEC 2008) except for one lead result at Willow03 on July 18 that was 3.28 µg/l and exceeded the chronic criterion. The replicate sample at Willow03 taken immediately after taking the first sample did not detect any lead. The anomalous result may have been a sampling error with a contaminated vial or a laboratory error while being processed. Alternatively, there might have been some type of lead contamination detected in the one sample but no others during the entire study period. This chronic lead result is based on a single sample on one day. Any future monitoring efforts should consider conducting a 4-day sampling regime to get a true 4-day average to compare to the chronic criterion.

Aluminum was present at all monitoring locations in September after a storm event but was generally not detected in the spring or summer sampling events. The detected aluminum was in a dissolved form and not comparable to acute and chronic criteria which uses total recoverable...
aluminum (ADEC 2008). If aluminum becomes a water quality concern, future monitoring should analyze for total recoverable aluminum.

Alkalinity and hardness remained consistent throughout the study, and measurements were similar to those in the 2015 Willow Creek assessment (Davis, et al. 2015). Levels of inorganic nitrogen and ammonia nitrogen were low. Ammonia nitrogen was only detected in one sample in the spring. Nitrate+nitrite nitrogen was detected at all four monitoring locations in May but only at Willow02 during the remaining sampling events in July and September. As stated in the 2015 Willow Creek assessment report (Davis, et al. 2015), it is likely that nitrogen is a limiting nutrient in Willow Creek. Low stream nitrogen has been observed previously in other area streams during the growing season as nitrogen is taken up by upland and riparian vegetation.

Turbidity was consistently very low with daily averages, and all readings within the daily average, less than the most stringent WQC of 5 NTU over the natural condition. Monitoring location Willow01 was used for establishing the natural condition. All turbidity results for all dates and sites were less than 5 NTU over the natural condition. The highest turbidity for all sites was during spring sampling in May (daily average 2.66 NTU). Lowest turbidity values were during summer base flow in July (1.01 NTU daily average). Turbidity values increased slightly during September fall storm sampling (daily average 1.49 NTU). Turbidity values in 2016 were consistent with the low turbidity measured in the 2015 Willow Creek assessment (Davis, et al. 2015).

State water quality standards outline water temperature criteria for use by anadromous fish, stating that temperatures should not exceed 20 degrees centigrade (C) at any time; not exceed 13 degrees C for spawning areas and egg and fry incubation; and temperatures should not exceed 15 degrees C for fish migration and rearing areas (ADEC 2017). During water temperature grab sampling, three monitoring locations exceeded 13 degrees C and two locations exceeded 15 degrees C (Willow03 and Willow04). Stream temperature was lowest at upstream monitoring locations and increased at downstream monitoring locations. Because water temperatures were only recorded once per day at each location, it does not give a complete picture of how water temperature varies throughout a 24 hour period.

Due to unsafe sampling conditions at site Willow04, samples were taken near shore on an outside stream bend adjacent to a still-water side slough. However, the other sampling sites were in the main stream channel in riffle reaches. This may have contributed to some of the warmer water temperature (and increased bacteria) readings at Willow04. Even so, water temperatures were generally optimal for salmon rearing at all of the monitoring locations during the summer months and measured values are unlikely to negatively affect salmon migration.

Levels of fecal coliform bacteria exceeded both conditions in the Water Supply designated use criterion (30-day geometric mean not to exceed 20 cfu/100 ml, and not more than 10% of the samples may exceed 40 cfu/100 ml). As shown in Table 1, this result is consistent with findings from the 2015 Willow Creek assessment (Davis, et al. 2015). Bacteria levels remained consistent throughout the sampling period and do not indicate large amounts of sewage or fecal waste entering Willow Creek. The fecal coliform Water Recreation criteria were met.
All of the Willow Creek water quality monitoring occurred prior to DEC adopting new freshwater recreation criteria to include *Escherichia coli* (*E. coli*) (ADEC 2017). As such, no *E. coli* analysis occurred. This bacteria species should be added for any future Willow Creek monitoring efforts.

After conducting MST analysis, both Willow03 and Willow04 found biomarkers for human and dog present but at levels too low to quantify (Table 7). A property with horses near the creek is immediately upstream of site Willow02. However, no horse biomarkers were present in the MST analysis of the water sample taken downstream of this property.

The fecal coliform bacteria present in Willow Creek are most likely naturally occurring from wildlife sources with a possibility of sporadic bacteria associated with dogs or even possibly human. Evidence of beaver, gulls, moose and other wildlife were present during all water monitoring dates and sites.

MST sensitivity and specificity are important considerations when evaluating MST results (USEPA 2005). The Human Dorei biomarker is more sensitive than the Human EPA biomarker but both marker types have high credibility (USEPA 2011). None of the samples detected the Human EPA biomarker. The very low levels of Human Dorei and dog detected during MST analysis indicates very small amounts of sporadic contamination. Results were too low for the laboratory to quantify.

Monitoring location Willow04 is located near a still water side slough draining a wetland area. There is beaver activity upstream and downstream of the monitoring location. Detecting fecal coliform bacteria at this location is not surprising. On 8/8/2016 Willow04 recorded the highest fecal coliform bacteria result during the entire study of 118 cfu/100 ml. However, this same sample was absent of human biomarkers during MST analysis.

Human Dorei will at times cross-react with dog biomarkers (Griffith, et al. 2013) and show a positive detect for human biomarkers when it is actually dog. This could be the case at Willow04 on 7/26/2016. It is important to note that on 8/8/2016 Human Dorei was absent and dog was detected but at levels too low to quantify from site Willow04. This raises the question if an analysis cross-reaction occurred on the 7/26/2016 sample for Willow04 and the detected Human Dorei biomarker may have actually been a dog biomarker. It is also possible the positive dog biomarkers are actually detecting wild canids such as fox or coyote especially since monitoring location Willow04 is in a relatively remote state park and located upstream of the campground. No research has been conducted on possible MST cross-reactions between dog and beaver biomarkers.

Frequency of detection is an important aspect of MST analysis (Cao, et al. 2013). If a biomarker is detected at very low levels but not every time, it is evidence that there is likely not an ongoing source of bacteria pollution; it is not persistent pollution.

If human bacteria is actually present in Willow Creek it is at very low levels, not from a continuous discharge, and is very sporadic. Sand bar rest rooms are a possible source for the Human Dorei biomarker especially since the bacteria was only detected in the downstream reaches of the stream where people fish, raft, camp, and recreate. Wet weather higher bacteria results might indicate movement of fecal material (from any source) from near shore areas into the stream.
6.0 Recommendations

Willow Creek water quality currently meets state water quality criteria. Recommendations are to keep Willow Creek water quality from degrading. This can be done through land use management, education, and implementing best management practices for construction and mining operations. Land use management actions to consider include: encouraging riparian buffers along the stream corridor, not building in the flood zone, and managing stormwater runoff so it does not directly discharge to the creek. Best management practices for mining operations and construction activities vary by site conditions but preventing sediment or other polluted runoff from entering Willow Creek are important components.

Education actions to consider include encouraging campground visitors to pick up their dog’s fecal waste and disposing of it in trash cans (and not in the river). This will lead to less likelihood of dog fecal material polluting Willow Creek. Best management practices could include installing pet waste baggie stations with signage and trash bins at the campgrounds.

Signage and other outreach avenues could be implemented to help people learn how to properly dispose of their fecal waste while fishing, rafting, camping or recreating in remote areas of Willow Creek that have no restroom facilities available.

7.0 References


Appendix A: Project Photos

Looking downstream of monitoring location Willow01 in September 2016

Looking across monitoring location Willow01 in September 2016

Looking downstream of monitoring location Willow02 in September 2016
<table>
<thead>
<tr>
<th>Looking upstream of monitoring location Willow02 in May 2016</th>
<th><img src="image1" alt="Looking upstream of monitoring location Willow02 in May 2016" /></th>
</tr>
</thead>
<tbody>
<tr>
<td>Looking downstream of monitoring location Willow03 in July 2016</td>
<td><img src="image2" alt="Looking downstream of monitoring location Willow03 in July 2016" /></td>
</tr>
<tr>
<td>Looking upstream of monitoring location Willow03 in July 2016. Note people fishing and a dog on the bank.</td>
<td><img src="image3" alt="Looking upstream of monitoring location Willow03 in July 2016" /></td>
</tr>
</tbody>
</table>
Looking downstream of monitoring location Willow04 in May 2016. The near bank on the left side of the photo had evidence of recent beaver activity.

Looking upstream of monitoring location Willow04 in May 2016. Note still water side slough in the right of the photo.

Bird feces observed on rocks next to the creek at monitoring location Willow03

Recent beaver activity in the riparian area adjacent to monitoring location Willow04
Appendix B: Laboratory Reports
Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Forest Taylor                                 Date
Project Manager
Forest.Taylor@sgs.com
Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.
Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

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SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

* The analyte has exceeded allowable regulatory or control limits.
! Surrogate out of control limits.
B Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB Closing Continuing Calibration Verification
CL Control Limit
D The analyte concentration is the result of a dilution.
DF Dilution Factor
DL Detection Limit (i.e., maximum method detection limit)
E The analyte result is above the calibrated range.
F Indicates value that is greater than or equal to the DL
GT Greater Than
IB Instrument Blank
ICV Initial Calibration Verification
J The quantitation is an estimation.
JL The analyte was positively identified, but the quantitation is a low estimation.
LCS(D) Laboratory Control Spike (Duplicate)
LOD Limit of Detection (i.e., 1/2 of the LOQ)
LOQ Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT Less Than
M A matrix effect was present.
MB Method Blank
MS(D) Matrix Spike (Duplicate)
ND Indicates the analyte is not detected.
Q QC parameter out of acceptance range.
R Rejected
RPD Relative Percent Difference
U Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content.

All DRO/RRO analyses are integrated per SOP.
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**Method**
- SM21 2320B: Alkalinity as CaCO3 QC
- SM21 4500-NH3 G: Ammonia-N (W) SM21 4500-NH3 G
- SM21 2340B: Dissolved Hardness as CaCO3 ICP-MS
- SM 5310B: Dissolved Organic Carbon
- SM21 4500NO3-F: Flow Injection Analysis
- EP245.1: Mercury EPA 245.1 DISSOLVED
- EP200.8: Metals in Drinking Water by ICP-MS DISSO
- SM21 4500P-B,E: Total Phosphorus (W)
**Detectable Results Summary**

**Client Sample ID:** Willow 01  
**Lab Sample ID:** 1162494001

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**Waters Department**

**Client Sample ID:** Willow 02  
**Lab Sample ID:** 1162494002

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## Detectable Results Summary

**Client Sample ID:** Willow 03  
**Lab Sample ID:** 1162494003

### Dissolved Metals by ICP/MS

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**Waters Department**

### Dissolved Metals by ICP/MS

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## Detectable Results Summary

**Client Sample ID:** Willow 03 Rep  
**Lab Sample ID:** 1162494005

### Dissolved Metals by ICP/MS

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### Results of Willow 01

| Client Sample ID: | Willow 01 |
| Client Project ID: | Willow Creek |
| Lab Sample ID: | 1162494001 |
| Lab Project ID: | 1162494 |

- **Collection Date:** 05/18/16 10:18
- **Received Date:** 05/18/16 17:02
- **Matrix:** Drinking Water
- **Solids (%):**

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### Batch Information

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- **Prep Date/Time:** 05/23/16 12:57
- **Prep Initial Wt./Vol.:** 25 mL
- **Prep Extract Vol:** 50 mL

- **Analytical Batch:** MCV5708
- **Analytical Method:** EP245.1
- **Analyst:** NEG
- **Analytical Date/Time:** 05/23/16 19:05
- **Container ID:** 1162494001-A

---

J flagging is activated
Results of Willow 01

Client Sample ID: Willow 01
Client Project ID: Willow Creek
Lab Sample ID: 1162494001
Lab Project ID: 1162494

Collection Date: 05/18/16 10:18
Received Date: 05/18/16 17:02
Matrix: Drinking Water
Solids (%):
Location:

Results by Dissolved Metals by ICP/MS

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Batch Information

Analytical Batch: MMS9393
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 06/09/16 13:42
Container ID: 1162494001-A

Parameter
Hardness as CaCO3

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</tr>
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J flagging is activated

Print Date: 06/27/2016 11:33:13AM

SGS North America Inc.
200 West Potter Drive Anchorage, AK 95518
907.562.2343 907.561.5301 www.us.sgs.com
Results of Willow 01

Client Sample ID: Willow 01
Client Project ID: Willow Creek
Lab Sample ID: 1162494001
Lab Project ID: 1162494
Collection Date: 05/18/16 10:18
Received Date: 05/18/16 17:02
Matrix: Drinking Water
Solids (%):
Location:

Results by Dissolved Metals by ICP/MS

Batch Information

Analytical Batch: MMS9393
Analytical Method: SM21 2340B
Analyst: VDL
Analytical Date/Time: 06/09/16 13:42
Container ID: 1162494001-A

Prep Batch: MXX29827
Prep Method: E200.2
Prep Date/Time: 06/06/16 14:02
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 06/27/2016 11:33:13AM

J flagging is activated
**Client Sample ID:** Willow 01  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494001  
**Lab Project ID:** 1162494

### Results of Willow 01

**Collection Date:** 05/18/16 10:18  
**Received Date:** 05/18/16 17:02  
**Matrix:** Drinking Water  
**Solids (%):**

#### Results by Waters Department

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**Batch Information**

- **Analytical Batch:** WTC2599  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Analytical Date/Time:** 05/19/16 16:28  
- **Container ID:** 1162494001-D

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**Batch Information**

- **Analytical Batch:** WTI4456  
- **Analytical Method:** SM21 2320B  
- **Analyst:** ACF  
- **Analytical Date/Time:** 05/20/16 20:33  
- **Container ID:** 1162494001-B

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**Batch Information**

- **Prep Batch:** WXX11510  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 05/24/16 14:30  
- **Prep Initial Wt./Vol.:** 6 mL  
- **Prep Extract Vol:** 6 mL

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**Print Date:** 06/27/2016 11:33:13AM

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J flagging is activated
## Results of Willow 01

**Client Sample ID:** Willow 01  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494001  
**Lab Project ID:** 1162494  

**Collection Date:** 05/18/16 10:18  
**Received Date:** 05/18/16 17:02  
**Matrix:** Drinking Water  
**Solids (%):** Location:

### Batch Information

- **Analytical Batch:** WFI2478  
- **Analytical Method:** SM21 4500NO3-F  
- **Analyst:** NEG  
- **Analytical Date/Time:** 05/19/16 13:51  
- **Container ID:** 1162494001-B

### Results by Waters Department

#### Parameter

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#### Batch Information

- **Prep Batch:** WXX11517  
- **Prep Method:** SM21 4500P-B,E  
- **Prep Date/Time:** 05/31/16 17:58  
- **Prep Initial Wt./Vol.:** 5 mL  
- **Prep Extract Vol:** 25 mL  

---

Print Date: 06/27/2016 11:33:13AM  

J flagging is activated
### Results of Willow 02

**Client Sample ID:** Willow 02  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494002  
**Lab Project ID:** 1162494  
**Collection Date:** 05/18/16 10:24  
**Received Date:** 05/18/16 17:02  
**Matrix:** Water (Surface, Eff., Ground)

### Dissolved Metals

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### Batch Information

- **Analytical Batch:** MCV5708  
- **Analytical Method:** EP245.1  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL  
- **Prep Date/Time:** 05/23/16 12:57  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Batch:** MXX29782  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 05/23/16 12:57  
- **Prep Extract Vol:** 50 mL  

**Print Date:** 06/27/2016 11:33:13AM
## Results of Willow 02

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<td>06/09/16 13:48</td>
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### Batch Information

- **Analytical Batch:** MMS9393
- **Analytical Method:** EP200.8
- **Analyst:** VDL
- **Analytical Date/Time:** 06/09/16 13:48
- **Container ID:** 1162494002-A

- **Prep Batch:** MXX29827
- **Prep Method:** E200.2
- **Prep Date/Time:** 06/06/16 14:02
- **Prep Initial Wt./Vol.:** 20 mL
- **Prep Extract Vol:** 50 mL

### Additional Parameters

- **Hardness as CaCO3**
  - **Result Qual:** 16.3
  - **LOQ/CL:** 5.00
  - **DL:** 5.00
  - **Units:** mg/L
  - **DF:** 1
  - **Allowable Limits:**
  - **Date Analyzed:** 06/09/16 13:48

J flagging is activated
**Results of Willow 02**

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<th>Willow 02</th>
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<tr>
<td>Lab Sample ID</td>
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<tr>
<td>Lab Project ID</td>
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<tr>
<td>Matrix</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Solids (%)</td>
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<tr>
<td>Location</td>
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**Results by Dissolved Metals by ICP/MS**

**Batch Information**

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<td>Analytical Method</td>
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<tr>
<td>Analyst</td>
<td>VDL</td>
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</tr>
<tr>
<td>Prep Date/Time</td>
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<tr>
<td>Prep Initial Wt./Vol.</td>
<td>20 mL</td>
</tr>
<tr>
<td>Prep Extract Vol.</td>
<td>50 mL</td>
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Print Date: 06/27/2016 11:33:13AM

J flagging is activated
### Results of Willow 02

- **Client Sample ID:** Willow 02
- **Client Project ID:** Willow Creek
- **Lab Sample ID:** 1162494002
- **Lab Project ID:** 1162494

#### Collection Date
- 05/18/16 10:24

#### Received Date
- 05/18/16 17:02

#### Matrix
- Water (Surface, Eff., Ground)

#### Solids (%):

#### Location:

#### Results by Waters Department

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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>LOQ/CL</th>
<th>CL</th>
<th>DL</th>
<th>Limits</th>
<th>Date Analyzed</th>
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<tr>
<td>Total Organic Carbon, Dissolved</td>
<td>1.19</td>
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<td>mg/L</td>
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#### Batch Information

- **Analytical Batch:** WTC2599
- **Analytical Method:** SM 5310B
- **Analyst:** VDL
- **Analytical Date/Time:** 05/19/16 16:43
- **Container ID:** 1162494002-D

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<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Alkalinity</td>
<td>15.8</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
<td>1</td>
<td>110.0</td>
<td>3.10</td>
<td>05/20/16 20:42</td>
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#### Batch Information

- **Analytical Batch:** WTI4456
- **Analytical Method:** SM21 2320B
- **Analyst:** ACF
- **Analytical Date/Time:** 05/20/16 20:42
- **Container ID:** 1162494002-B

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<th>CL</th>
<th>DL</th>
<th>Limits</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>1</td>
<td>0.100</td>
<td>0.0310</td>
<td>05/24/16 15:27</td>
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#### Batch Information

- **Prep Batch:** WXX11510
- **Prep Method:** METHOD
- **Prep Date/Time:** 05/24/16 14:30
- **Prep Initial Wt./Vol.:** 6 mL
- **Prep Extract Vol:** 6 mL

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<th>DL</th>
<th>Units</th>
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<th>CL</th>
<th>DL</th>
<th>Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0576 J</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td>0.100</td>
<td>0.0300</td>
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<tr>
<td>Nitrite-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td>0.100</td>
<td>0.0300</td>
<td>05/19/16 13:53</td>
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Print Date: 06/27/2016 11:33:13AM

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### Results of Willow 02

**Client Sample ID:** Willow 02  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494002  
**Lab Project ID:** 1162494  
**Collection Date:** 05/18/16 10:24  
**Received Date:** 05/18/16 17:02  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

### Results by Waters Department

#### Batch Information

- **Analytical Batch:** WFI2478
- **Analytical Method:** SM21 4500NO3-F
- **Analyst:** NEG
- **Analytical Date/Time:** 05/19/16 13:53  
- **Container ID:** 1162494002-B

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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
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<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.0325 J</td>
<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
<td>1</td>
<td>0.0155</td>
<td>06/01/16 11:41</td>
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</table>

#### Batch Information

- **Analytical Batch:** WDA3792
- **Analytical Method:** SM21 4500P-B,E
- **Analyst:** NEG
- **Analytical Date/Time:** 06/01/16 11:41  
- **Container ID:** 1162494002-C

- **Prep Batch:** WXX11517  
- **Prep Method:** SM21 4500P-B,E  
- **Prep Date/Time:** 05/31/16 17:58  
- **Prep Initial Wt./Vol.:** 5 mL  
- **Prep Extract Vol:** 25 mL

---

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Results of Willow 03

Client Sample ID: Willow 03
Client Project ID: Willow Creek
Lab Sample ID: 1162494003
Lab Project ID: 1162494

Collection Date: 05/18/16 13:09
Received Date: 05/18/16 17:02
Matrix: Water (Surface, Eff., Ground)
Solids (%): 
Location:

Results by Dissolved Metals

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<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
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<td>0.0620</td>
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Batch Information

Analytical Batch: MCV5708
Analytical Method: EP245.1
Analyst: NEG
Analytical Date/Time: 05/23/16 19:11
Container ID: 1162494003-A

Prep Batch: MXX29782
Prep Method: METHOD
Prep Date/Time: 05/23/16 12:57
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 50 mL

Print Date: 06/27/2016 11:33:13AM
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# Results of Willow 03

**Client Sample ID:** Willow 03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494003  
**Lab Project ID:** 1162494  
**Collection Date:** 05/18/16 13:09  
**Received Date:** 05/18/16 17:02  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

## Dissolved Metals by ICP/MS

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<td>17.6 J</td>
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<td>6.20</td>
<td>ug/L</td>
<td>1</td>
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</tr>
<tr>
<td>Antimony</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 13:51</td>
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</tr>
<tr>
<td>Arsenic</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
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<tr>
<td>Barium</td>
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<td>0.940</td>
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<tr>
<td>Beryllium</td>
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<td>0.400</td>
<td>0.130</td>
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<td>Cadmium</td>
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<td>0.500</td>
<td>0.150</td>
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<td>ug/L</td>
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<td>Chromium</td>
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<td>Copper</td>
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<td>Manganese</td>
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<tr>
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<td>Nickel</td>
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# Batch Information

**Analytical Batch:** MMS9393  
**Analytical Method:** EP200.8  
**Analyst:** VDL  
**Analytical Date/Time:** 06/09/16 13:51  
**Container ID:** 1162494003-A

**Prep Batch:** MXX29827  
**Prep Method:** E200.2  
**Prep Date/Time:** 06/06/16 14:02  
**Prep Initial Wt./Vol.:** 20 mL  
**Prep Extract Vol:** 50 mL

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**Parameter**  
**Result Qual**  
**LOQ/CL**  
**DL**  
**Units**  
**DF**  
**Allowable Limits**  
**Date Analyzed**

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<th>DL</th>
<th>Units</th>
<th>DF</th>
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Print Date: 06/27/2016 11:33:13AM  
J flagging is activated
**Results of Willow 03**

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<tr>
<td>Matrix:</td>
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<td>Solids (%):</td>
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<td>Location:</td>
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**Results by Dissolved Metals by ICP/MS**

**Batch Information**

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<tr>
<td>Analyst:</td>
<td>VDL</td>
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<tr>
<td>Container ID:</td>
<td>1162494003-A</td>
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</table>

| Prep Batch:  | MXX29827 |
| Prep Method: | E200.2 |
| Prep Date/Time: | 06/06/16 14:02 |
| Prep Initial Wt./Vol.: | 20 mL |
| Prep Extract Vol: | 50 mL |

Print Date: 06/27/2016 11:33:13AM

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200 West Potter Drive Anchorage, AK 95518
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J flagging is activated
Results of Willow 03

Client Sample ID: Willow 03
Client Project ID: Willow Creek
Lab Sample ID: 1162494003
Lab Project ID: 1162494

Collection Date: 05/18/16 13:09
Received Date: 05/18/16 17:02
Matrix: Water (Surface, Eff., Ground)
Solids (%): Location:

Results by Waters Department

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<th>Parameter</th>
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<th>DL</th>
<th>Units</th>
<th>DF</th>
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<tr>
<td></td>
<td></td>
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<td>0.150</td>
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Batch Information

Analytical Batch: WTC2599
Analytical Method: SM 5310B
Analyst: VDL
Analytical Date/Time: 05/19/16 16:57
Container ID: 1162494003-D

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<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Alkalinity</td>
<td>17.0</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
<td>1</td>
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<tr>
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<td>3.10</td>
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Batch Information

Analytical Batch: WTI4456
Analytical Method: SM21 2320B
Analyst: ACF
Analytical Date/Time: 05/20/16 20:51
Container ID: 1162494003-B

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<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>1</td>
<td>0.0310</td>
<td>05/24/16 15:29</td>
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<tr>
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Batch Information

Prep Batch: WXX11510
Prep Method: METHOD
Prep Date/Time: 05/24/16 14:30
Prep Initial Wt./Vol.: 6 mL
Prep Extract Vol: 6 mL

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<th>DL</th>
<th>Units</th>
<th>DF</th>
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<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0512 J</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td></td>
<td>05/19/16 13:54</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td></td>
<td>05/19/16 13:54</td>
</tr>
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<td></td>
<td></td>
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</table>

J flagging is activated
### Results of Willow 03

**Client Sample ID:** Willow 03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494003  
**Lab Project ID:** 1162494

**Collection Date:** 05/18/16 13:09  
**Received Date:** 05/18/16 17:02  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

---

### Batch Information

Analytical Batch: WFI2478  
Analytical Method: SM21 4500NO3-F  
Analyst: NEG  
Analytical Date/Time: 05/19/16 13:54  
Container ID: 1162494003-B

---

### Results by Waters Department

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<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.0360 J</td>
<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
<td>1</td>
<td>06/01/16 11:43</td>
<td></td>
</tr>
</tbody>
</table>

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**Prep Batch:** WXX11517  
**Prep Method:** SM21 4500P-B,E  
**Prep Date/Time:** 05/31/16 17:58  
**Prep Initial Wt./Vol.:** 5 mL  
**Prep Extract Vol:** 25 mL

---

**Analytical Batch:** WDA3792  
**Analytical Method:** SM21 4500P-B,E  
**Analytical Date/Time:** 06/01/16 11:43  
**Container ID:** 1162494003-C

---

**Prep Batch:** WXX11517  
**Prep Method:** SM21 4500P-B,E  
**Prep Date/Time:** 05/31/16 17:58  
**Prep Initial Wt./Vol.:** 5 mL  
**Prep Extract Vol:** 25 mL

---

**Print Date:** 06/27/2016 11:33:13AM

---

J flagging is activated
# Results of Willow 04

**Client Sample ID:** Willow 04  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494004  
**Lab Project ID:** 1162494  
**Collection Date:** 05/18/16 14:14  
**Received Date:** 05/18/16 17:02  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

## Results by Dissolved Metals

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<th>Parameter</th>
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<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
<td>1</td>
<td></td>
<td>05/23/16 19:25</td>
</tr>
</tbody>
</table>

## Batch Information

- **Analytical Batch:** MCV5709  
- **Analytical Method:** EP245.1  
- **Analyst:** NEG  
- **Analytical Date/Time:** 05/23/16 19:25  
- **Container ID:** 1162494004-A  
- **Prep Batch:** MXX29783  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 05/23/16 12:57  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL  

---

Print Date: 06/27/2016 11:33:13AM  
J flagging is activated
### Results by Dissolved Metals by ICP/MS

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<th>DF</th>
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<th>Date Analyzed</th>
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</thead>
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<tr>
<td>Aluminum</td>
<td>20.2</td>
<td>20.0</td>
<td>6.20</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 13:57</td>
<td></td>
</tr>
<tr>
<td>Antimony</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 13:57</td>
<td></td>
</tr>
<tr>
<td>Arsenic</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 13:57</td>
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<tr>
<td>Barium</td>
<td>7.80</td>
<td>3.00</td>
<td>0.940</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 13:57</td>
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</tr>
<tr>
<td>Beryllium</td>
<td>0.200 U</td>
<td>0.400</td>
<td>0.130</td>
<td>ug/L</td>
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<tr>
<td>Cadmium</td>
<td>0.250 U</td>
<td>0.500</td>
<td>0.150</td>
<td>ug/L</td>
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<td>Calcium</td>
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<td>500</td>
<td>150</td>
<td>ug/L</td>
<td>1</td>
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<td>Chromium</td>
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<td>0.620</td>
<td>ug/L</td>
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<tr>
<td>Cobalt</td>
<td>2.00 U</td>
<td>4.00</td>
<td>1.20</td>
<td>ug/L</td>
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<tr>
<td>Copper</td>
<td>0.724 J</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
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<tr>
<td>Iron</td>
<td>143 J</td>
<td>250</td>
<td>78.0</td>
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<tr>
<td>Lead</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
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<tr>
<td>Magnesium</td>
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<tr>
<td>Manganese</td>
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<td>Molybdenum</td>
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<tr>
<td>Nickel</td>
<td>1.00 U</td>
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<td>0.620</td>
<td>ug/L</td>
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<td>Potassium</td>
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<td>Selenium</td>
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<td>Silver</td>
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<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
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<tr>
<td>Sodium</td>
<td>3050</td>
<td>500</td>
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<td>ug/L</td>
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<tr>
<td>Thallium</td>
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<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
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<tr>
<td>Tin</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
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<td>Titanium</td>
<td>3.13 U</td>
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<td>Vanadium</td>
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<td>6.20</td>
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<td>Zinc</td>
<td>2.50 U</td>
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<td>ug/L</td>
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</table>

**Batch Information**

- **Prep Batch**: MXX29827
- **Prep Method**: E200.2
- **Prep Date/Time**: 06/06/16 14:02
- **Prep Initial Wt./Vol.**: 20 mL
- **Prep Extract Vol**: 50 mL

**Analytical Batch**: MMS9393
**Analytical Method**: EP200.8
**Analyst**: VDL
**Prep Date/Time**: 06/06/16 13:57
**Analytical Date/Time**: 06/09/16 13:57
**Container ID**: 1162494004-A

---

**Additional Information**

- **Print Date**: 06/27/2016 11:33:13AM
- **J flagging is activated**

---

**Note**: The results show the concentration of various metals and other elements in the sample, with specified units and limits for each parameter. The dates and times are detailed for the collection, receipt, and analysis processes.
Results of Willow 04

Client Sample ID: Willow 04
Client Project ID: Willow Creek
Lab Sample ID: 1162494004
Lab Project ID: 1162494

Collection Date: 05/18/16 14:14
Received Date: 05/18/16 17:02
Matrix: Water (Surface, Eff., Ground)

Solids (%): Location:

Results by Dissolved Metals by ICP/MS

Batch Information

Analytical Batch: MMS9393
Analytical Method: SM21 2340B
Analyst: VDL
Analytical Date/Time: 06/09/16 13:57
Container ID: 1162494004-A

Prep Batch: MXX29827
Prep Method: E200.2
Prep Date/Time: 06/06/16 14:02
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

J flagging is activated
### Results of Willow 04

**Client Sample ID:** Willow 04  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1162494004  
**Lab Project ID:** 1162494  
**Collection Date:** 05/18/16 14:14  
**Received Date:** 05/18/16 17:02  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):** Location:

#### Results by Waters Department

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<tr>
<th>Parameter</th>
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<th>Units</th>
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<tbody>
<tr>
<td>Total Organic Carbon, Dissolved</td>
<td>1.46</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
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**Batch Information**
- **Analytical Batch:** WTC2599  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Analytical Date/Time:** 05/19/16 17:10  
- **Container ID:** 1162494004-D

<table>
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<th>DF</th>
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<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>17.5</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
<td>1</td>
<td>05/20/16 21:00</td>
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</tr>
</tbody>
</table>

**Batch Information**
- **Analytical Batch:** WTI4456  
- **Analytical Method:** SM21 2320B  
- **Analyst:** ACF  
- **Analytical Date/Time:** 05/20/16 21:00  
- **Container ID:** 1162494004-B

<table>
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<th>Units</th>
<th>DF</th>
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<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0375 J</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
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**Batch Information**
- **Analytical Batch:** WDA3787  
- **Prep Batch:** WXX11510  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 05/24/16 14:30  
- **Prep Initial Wt./Vol.:** 6 mL  
- **Prep Extract Vol:** 6 mL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0836 J</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td>05/19/16 13:56</td>
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</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td>05/19/16 13:56</td>
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</tbody>
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**Print Date:** 06/27/2016 11:33:13AM  
**J flagging is activated**
## Results of Willow 04

- **Client Sample ID:** Willow 04  
- **Client Project ID:** Willow Creek  
- **Lab Sample ID:** 1162494004  
- **Lab Project ID:** 1162494  
- **Collection Date:** 05/18/16 14:14  
- **Received Date:** 05/18/16 17:02  
- **Matrix:** Water (Surface, Eff., Ground)  
- **Solids (%):**  
- **Location:**

### Batch Information

- **Analytical Batch:** WFI2478  
- **Analytical Method:** SM21 4500NO3-F  
- **Analyst:** NEG  
- **Analytical Date/Time:** 05/19/16 13:56  
- **Container ID:** 1162494004-B

### Parameters

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<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.145</td>
<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
<td>1</td>
<td></td>
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### Batch Information

- **Prep Batch:** WXX11517  
- **Prep Method:** SM21 4500P-B,E  
- **Prep Date/Time:** 05/31/16 17:58  
- **Prep Initial Wt./Vol.:** 5 mL  
- **Prep Extract Vol:** 25 mL  
- **Container ID:** 1162494004-C

---

J flagging is activated
Results of Willow 03 Rep

Client Sample ID: Willow 03 Rep
Client Project ID: Willow Creek
Lab Sample ID: 1162494005
Lab Project ID: 1162494

Collection Date: 05/18/16 13:10
Received Date: 05/18/16 17:02
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Dissolved Metals

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<tr>
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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
<td>1</td>
<td></td>
<td>05/23/16 19:31</td>
</tr>
</tbody>
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Batch Information

Analytical Batch: MCV5709
Analytical Method: EP245.1
Analyst: NEG
Analytical Date/Time: 05/23/16 19:31
Container ID: 1162494005-A

Prep Batch: MXX29783
Prep Method: METHOD
Prep Date/Time: 05/23/16 12:57
Prep Initial WT/Vol.: 25 mL
Prep Extract Vol: 50 mL
Results by **Dissolved Metals by ICP/MS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
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<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Aluminum</td>
<td>16.9 J</td>
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<td>6.20</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 14:03</td>
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</tr>
<tr>
<td>Antimony</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
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<tr>
<td>Arsenic</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
<td>1</td>
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<tr>
<td>Barium</td>
<td>7.48</td>
<td>3.00</td>
<td>0.940</td>
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<tr>
<td>Beryllium</td>
<td>0.200 U</td>
<td>0.400</td>
<td>0.130</td>
<td>ug/L</td>
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<td>Cadmium</td>
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<td>0.500</td>
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<tr>
<td>Calcium</td>
<td>5070</td>
<td>500</td>
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<tr>
<td>Chromium</td>
<td>1.00 U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/L</td>
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<tr>
<td>Cobalt</td>
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<td>4.00</td>
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<tr>
<td>Copper</td>
<td>0.627 J</td>
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<tr>
<td>Iron</td>
<td>125 U</td>
<td>250</td>
<td>78.0</td>
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<tr>
<td>Lead</td>
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<td>0.0620</td>
<td>ug/L</td>
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<tr>
<td>Magnesium</td>
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<td>50.0</td>
<td>15.0</td>
<td>ug/L</td>
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<tr>
<td>Manganese</td>
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<tr>
<td>Molybdenum</td>
<td>1.00 U</td>
<td>2.00</td>
<td>0.620</td>
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<tr>
<td>Nickel</td>
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<tr>
<td>Phosphorus</td>
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<tr>
<td>Potassium</td>
<td>544</td>
<td>500</td>
<td>150</td>
<td>ug/L</td>
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<td>06/09/16 14:03</td>
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<td>Selenium</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
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<tr>
<td>Silicon</td>
<td>2840</td>
<td>1000</td>
<td>310</td>
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<tr>
<td>Silver</td>
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<td>ug/L</td>
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<td></td>
</tr>
<tr>
<td>Sodium</td>
<td>2920</td>
<td>500</td>
<td>150</td>
<td>ug/L</td>
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<td>06/09/16 14:03</td>
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</tr>
<tr>
<td>Thallium</td>
<td>0.500 U</td>
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<td>0.310</td>
<td>ug/L</td>
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</tr>
<tr>
<td>Tin</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
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<td></td>
</tr>
<tr>
<td>Titanium</td>
<td>3.13 U</td>
<td>6.25</td>
<td>3.13</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 14:03</td>
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</tr>
<tr>
<td>Vanadium</td>
<td>10.0 U</td>
<td>20.0</td>
<td>6.20</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 14:03</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>2.50 U</td>
<td>5.00</td>
<td>2.50</td>
<td>ug/L</td>
<td>1</td>
<td>06/09/16 14:03</td>
<td></td>
</tr>
</tbody>
</table>

**Batch Information**

- **Analytical Batch:** MMS9393
- **Analytical Method:** EP200.8
- **Analyst:** VDL
- **Analytical Date/Time:** 06/09/16 14:03
- **Container ID:** 1162494005-A

- **Prep Batch:** MXX29827
- **Prep Method:** E200.2
- **Prep Date/Time:** 06/06/16 14:02
- **Prep Initial Wt./Vol.:** 20 mL
- **Prep Extract Vol:** 50 mL

**Parameter**

<table>
<thead>
<tr>
<th>Hardness as CaCO3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Result Qual: 17.4</td>
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</tbody>
</table>

*J flagging is activated*
### Results of Willow 03 Rep

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>Willow 03 Rep</th>
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<tbody>
<tr>
<td>Client Project ID:</td>
<td>Willow Creek</td>
</tr>
<tr>
<td>Lab Sample ID:</td>
<td>1162494005</td>
</tr>
<tr>
<td>Lab Project ID:</td>
<td>1162494</td>
</tr>
</tbody>
</table>

| Collection Date: | 05/18/16 13:10 |
| Received Date: | 05/18/16 17:02 |
| Matrix: | Water (Surface, Eff., Ground) |
| Solids (%): | |
| Location: | |

### Batch Information

| Analytical Batch: | MMS9393 |
| Analytical Method: | SM21 2340B |
| Analyst: | VDL |
| Analytical Date/Time: | 06/09/16 14:03 |
| Container ID: | 1162494005-A |

| Prep Batch: | MXX29827 |
| Prep Method: | E200.2 |
| Prep Date/Time: | 06/06/16 14:02 |
| Prep Initial Wt./Vol.: | 20 mL |
| Prep Extract Vol: | 50 mL |

---

Print Date: 06/27/2016 11:33:13AM

J flagging is activated
## Results of Willow 03 Rep

Client Sample ID: **Willow 03 Rep**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1162494005  
Lab Project ID: 1162494  
Collection Date: 05/18/16 13:10  
Received Date: 05/18/16 17:02  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Waters Department

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>LOQ/CL</th>
<th>CL</th>
<th>DL</th>
<th>Qual</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon, Dissolved</td>
<td>1.36</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
<td>1</td>
<td>0.200</td>
<td>0.100</td>
<td>0.100</td>
<td></td>
<td>05/19/16 17:27</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WTC2599  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Analytical Date/Time:** 05/19/16 17:27  
- **Container ID:** 1162494005-D

<table>
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<tr>
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<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>LOQ/CL</th>
<th>CL</th>
<th>DL</th>
<th>Qual</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>16.6</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
<td>1</td>
<td>0.200</td>
<td>0.100</td>
<td>0.100</td>
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<td>05/20/16 21:09</td>
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### Batch Information

- **Analytical Batch:** WTI4456  
- **Analytical Method:** SM21 2320B  
- **Analyst:** ACF  
- **Analytical Date/Time:** 05/20/16 21:09  
- **Container ID:** 1162494005-B

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>LOQ/CL</th>
<th>CL</th>
<th>DL</th>
<th>Qual</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0788 J</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>1</td>
<td>0.200</td>
<td>0.100</td>
<td>0.100</td>
<td></td>
<td>05/24/16 17:44</td>
</tr>
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### Batch Information

- **Prep Batch:** WXX11510  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 05/24/16 14:30  
- **Prep Initial Wt./Vol.:** 6 mL  
- **Prep Extract Vol.:** 6 mL

<table>
<thead>
<tr>
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<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>LOQ/CL</th>
<th>CL</th>
<th>DL</th>
<th>Qual</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0604 J</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td>0.500</td>
<td>0.100</td>
<td>0.100</td>
<td></td>
<td>05/19/16 13:58</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td>0.500</td>
<td>0.100</td>
<td>0.100</td>
<td></td>
<td>05/19/16 13:58</td>
</tr>
</tbody>
</table>

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Print Date: 06/27/2016 11:33:13AM  
SGS North America Inc.  
200 West Potter Drive Anchorage, AK 95518  
† 907.562.2343 † 907.561.5301 www.us.sgs.com  

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Results of Willow 03 Rep

Client Sample ID: Willow 03 Rep
Client Project ID: Willow Creek
Lab Sample ID: 1162494005
Lab Project ID: 1162494

Collection Date: 05/18/16 13:10
Received Date: 05/18/16 17:02
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Waters Department

Batch Information

Analytical Batch: WFI2478
Analytical Method: SM21 4500NO3-F
Analyst: NEG
Analytical Date/Time: 05/19/16 13:58
Container ID: 1162494005-B

<table>
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<th>Parameter</th>
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<th>DL</th>
<th>DF</th>
<th>Units</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.0155 J</td>
<td>0.0500</td>
<td>0.0155</td>
<td>1</td>
<td>mg/L</td>
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<td>06/01/16 11:45</td>
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Prep Batch Information

Prep Batch: WXX11517
Prep Date/Time: 05/31/16 17:58
Prep Initial Wt./Vol.: 5 mL
Prep Extract Vol: 25 mL

Print Date: 06/27/2016 11:33:13AM

J flagging is activated
# Method Blank

**Blank ID:** MB for HBN 1734839 [MXX/29782]

**Matrix:** Water (Surface, Eff., Ground)

**Blank Lab ID:** 1325987

**QC for Samples:**
1162494001, 1162494002, 1162494003

## Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
</tr>
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## Batch Information

- **Analytical Batch:** MCV5708
- **Analytical Method:** EP245.1
- **Instrument:** PSA Millennium mercury AA
- **Analyst:** NEG
- **Analytical Date/Time:** 5/23/2016 5:25:29PM

- **Prep Batch:** MXX29782
- **Prep Method:** METHOD
- **Prep Date/Time:** 5/23/2016 12:57:00PM
- **Prep Initial Wt./Vol.:** 25 mL
- **Prep Extract Vol:** 50 mL
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1162494 [MXX29782]
Blank Spike Lab ID: 1325988
Date Analyzed: 05/23/2016 17:28

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162494001, 1162494002, 1162494003

**Results by EP245.1**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>4</td>
<td>4.10</td>
<td>103</td>
<td>(85-115)</td>
</tr>
</tbody>
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**Batch Information**

- Analytical Batch: MCV5708
- Analytical Method: EP245.1
- Instrument: PSA Millennium mercury AA
- Analyst: NEG
- Prep Batch: MXX29782
- Prep Method: METHOD
- Prep Date/Time: 05/23/2016 12:57
- Spike Init Wt./Vol.: 4 ug/L
- Extract Vol: 50 mL
- Dupe Init Wt./Vol.: Extract Vol:
# Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100U</td>
<td>8.00</td>
<td>8.04</td>
<td>101</td>
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<td>70-130</td>
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## Batch Information

- **Analytical Batch:** MCV5708
- **Analytical Method:** EP245.1
- **Instrument:** PSA Millennium mercury AA
- **Analyst:** NEG
- **Analytical Date/Time:** 5/23/2016 6:09:26PM
- **Prep Batch:** MXX29782
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 5/23/2016 12:57:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL

---

Print Date: 06/27/2016 11:33:32AM

SGS North America Inc. | 200 West Potter Drive Anchorage, AK 95518 | T 907.562.2343 F 907.561.5301  www.us.sgs.com | Member of SGS Group
### Matrix Spike Summary

Original Sample ID: 1162491002  
MS Sample ID: 1325990 MS  
Analysis Date: 05/23/2016 18:50  
QC for Samples: 1162494001, 1162494002, 1162494003  
Matrix: Water (Surface, Eff., Ground)

### Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike (ug/L)</th>
<th>Result (ug/L)</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result (ug/L)</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.200U</td>
<td>8.00</td>
<td>6.38</td>
<td>80</td>
<td></td>
<td></td>
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<td></td>
<td>70-130</td>
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### Batch Information

- **Analytical Batch:** MCV5708  
- **Analytical Method:** EP245.1  
- **Instrument:** PSA Millennium mercury AA  
- **Analyst:** NEG  
- **Prep Batch:** MXX29782  
- **Prep Method:** Digestion Mercury 245.1 (W)  
- **Prep Date/Time:** 5/23/2016 12:57:00PM  
- **Prep Initial Wt./Vol.:** 25.00mL  
- **Prep Extract Vol:** 50.00mL  
- **Analytical Date/Time:** 5/23/2016 6:53:26PM
**Method Blank**

Blank ID: MB for HBN 1734845 [MXX/29783]  
Matrix: Water (Surface, Eff., Ground)  
Blank Lab ID: 1326011  
QC for Samples:  
1162494004, 1162494005

**Results by EP245.1**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: MCV5709
- Analytical Method: EP245.1
- Instrument: PSA Millennium mercury AA
- Analyst: NEG
- Analytical Date/Time: 5/23/2016 7:19:48PM

- Prep Batch: MXX29783
- Prep Method: METHOD
- Prep Date/Time: 5/23/2016 12:57:00PM
- Prep Initial Wt./Vol.: 25 mL
- Prep Extract Vol: 50 mL
### Blank Spike Summary

Blank Spike ID: LCS for HBN 1162494 [MXX29783]
Blank Spike Lab ID: 1326012
Date Analyzed: 05/23/2016 19:22

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162494004, 1162494005

### Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>4</td>
<td>3.66</td>
<td>91</td>
<td>(85-115)</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch**: MCV5709
- **Analytical Method**: EP245.1
- **Instrument**: PSA Millennium mercury AA
- **Analyst**: NEG

- **Prep Batch**: MXX29783
- **Prep Method**: METHOD
- **Prep Date/Time**: 05/23/2016 12:57
- **Spike Init Wt./Vol.**: 4 ug/L
- **Extract Vol.**: 50 mL
- **Dupe Init Wt./Vol.**: Extract Vol.
### Matrix Spike Summary

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<tr>
<th>Original Sample ID</th>
<th>MS Sample ID</th>
<th>MSD Sample ID</th>
<th>QC for Samples</th>
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<td>1162494004</td>
<td>1326013 MS</td>
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<td>1162494004, 1162494005</td>
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</table>

**Analysis Date:** 05/23/2016 19:25

**Matrix:** Water (Surface, Eff., Ground)

### Results by EP245.1

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<tr>
<td></td>
<td>Result</td>
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<tr>
<td></td>
<td>Rec (%)</td>
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<table>
<thead>
<tr>
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<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.100U</td>
<td>8.00</td>
<td>6.95</td>
<td>0</td>
<td>70-130</td>
</tr>
</tbody>
</table>

### Batch Information

- **Prep Batch:** MXX29783
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 5/23/2016 12:57:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
- **Prep Batch:** MXX29783
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 5/23/2016 12:57:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
- **Prep Batch:** MXX29783
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 5/23/2016 12:57:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
- **Prep Batch:** MXX29783
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 5/23/2016 12:57:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
### Method Blank

Blank Lab ID: 1328079

QC for Samples:
1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by EP200.8

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<th>DL</th>
<th>Units</th>
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### Batch Information

Analytical Batch: MMS9393
Analytical Method: EP200.8
Instrument: Perkin Elmer NexIon P5
Analyst: VDL
Analytical Date/Time: 6/9/2016 1:36:52PM

Prep Batch: MXX29827
Prep Method: E200.2
Prep Date/Time: 6/6/2016 2:02:25PM
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 06/27/2016 11:33:36AM
## Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1162494 [MXX29827]
**Blank Spike Lab ID:** 1328080
**Date Analyzed:** 06/09/2016 13:39

**Matrix:** Water (Surface, Eff., Ground)

**QC for Samples:** 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by EP200.8

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### Batch Information

**Analytical Batch:** MMS9393
**Analytical Method:** EP200.8
**Instrument:** Perkin Elmer NexIon P5
**Analyst:** VDL

**Prep Batch:** MXX29827
**Prep Method:** E200.2
**Prep Date/Time:** 06/06/2016 14:02
**Spike Init Wt./Vol.:** 1000 ug/L
**Extract Vol.:** 50 mL
**Dupe Init Wt./Vol.:** Extract Vol.

Print Date: 06/27/2016 11:33:38AM

SGS North America Inc. 200 West Potter Drive Anchorage, AK 95518 t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group
# Matrix Spike Summary

Original Sample ID: 1162494001  
MS Sample ID: 1328081 MS  
MSD Sample ID: 

Analysis Date: 06/09/2016 13:42  
Analysis Date: 06/09/2016 13:45  
Matrix: Drinking Water  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

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## Batch Information

Analytical Batch: MMS9393  
Analytical Method: EP200.8  
Instrument: Perkin Elmer Nexion P5  
Analyst: VDL  
Analytical Date/Time: 6/9/2016 1:45:49PM  
Prep Batch: MXX29827  
Prep Method: DW Digest for Metals on ICP-MS  
Prep Date/Time: 6/6/2016 2:02:25PM  
Prep Initial Wt./Vol.: 20.00mL  
Prep Extract Vol: 50.00mL
### Method Blank

Blank ID: MB for HBN 1734463 [WFI/2478]  
Matrix: Water (Surface, Eff., Ground)  
Blank Lab ID: 1325291  
QC for Samples:  
1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by SM21 4500NO3-F

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### Batch Information

- Analytical Batch: WFI2478  
- Analytical Method: SM21 4500NO3-F  
- Instrument: Astoria segmented flow  
- Analyst: NEG  
- Analytical Date/Time: 5/19/2016 12:35:01PM
## Method Blank

Blank ID: MB for HBN 1734463 [WFI/2478]  
Blank Lab ID: 1325301  
Matrix: Water (Surface, Eff., Ground)

QC for Samples:  
1162494001, 1162494002, 1162494003, 1162494004, 1162494005

## Results by SM21 4500NO3-F

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## Batch Information

- Analytical Batch: WFI2478  
- Analytical Method: SM21 4500NO3-F  
- Instrument: Astoria segmented flow  
- Analyst: NEG  
- Analytical Date/Time: 5/19/2016 2:31:35PM
Blank Spike Summary

Blank Spike ID: LCS for HBN 1162494 [WFI2478]
Blank Spike Lab ID: 1325290
Date Analyzed: 05/19/2016 12:33

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

Results by SM21 4500NO3-F

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<th>Parameter</th>
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Batch Information

Analytical Batch: WFI2478
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: NEG
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1162494 [WFI2478]
Blank Spike Lab ID: 1325299
Date Analyzed: 05/19/2016 14:29

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

**Results by SM21 4500NO3-F**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>2.5</td>
<td>2.83</td>
<td>113</td>
<td>(70-130)</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>2.5</td>
<td>2.54</td>
<td>101</td>
<td>(90-110)</td>
</tr>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>5</td>
<td>5.37</td>
<td>107</td>
<td>(90-110)</td>
</tr>
</tbody>
</table>

**Batch Information**

Analytical Batch: WFI2478
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: NEG

Prep Batch: 2.5 mg/L Extract Vol: 5 mL
Prep Method: Spike Init Wt./Vol.: 2.5 mg/L Extract Vol: 5 mL
Prep Date/Time: Dupe Init Wt./Vol.: Extract Vol:
### Matrix Spike Summary

<table>
<thead>
<tr>
<th>Original Sample ID</th>
<th>Analysis Date: 05/19/2016 13:58</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS Sample ID</td>
<td>Analysis Date: 05/19/2016 14:00</td>
</tr>
<tr>
<td>MSD Sample ID</td>
<td>Analysis Date: 05/19/2016 14:01</td>
</tr>
<tr>
<td>QC for Samples:</td>
<td>Matrix: Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1162494001, 1162494002, 1162494003, 1162494004, 1162494005</td>
</tr>
</tbody>
</table>

### Results by SM21 4500NO3-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0604J</td>
<td>2.50</td>
<td>2.65</td>
<td>103</td>
<td>2.50</td>
<td>2.70</td>
<td>106</td>
<td>70-130</td>
<td>2.00</td>
<td>(&lt; 25 )</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500U</td>
<td>2.50</td>
<td>2.58</td>
<td>103</td>
<td>2.50</td>
<td>2.59</td>
<td>104</td>
<td>90-110</td>
<td>0.41</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- **Prep Batch:**
- **Prep Method:**
- **Prep Date/Time:**
- **Prep Initial Wt./Vol.:** 5.00mL
- **Prep Extract Vol:** 5.00mL

- **Analytical Batch:** WF2478
- **Analytical Method:** SM21 4500NO3-F
- **Instrument:** Astoria segmented flow
- **Analyst:** NEG
- **Analytical Date/Time:** 5/19/2016 2:00:05PM
**Method Blank**

Blank ID: MB for HBN 1734700 [WTC/2599]  
Blank Lab ID: 1325612  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1162494001, 1162494002, 1162494003, 1162494004, 1162494005

**Results by SM 5310B**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>0.268J</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WTC2599  
- Analytical Method: SM 5310B  
- Instrument: TOC Analyzer  
- Analyst: VDL  
- Analytical Date/Time: 5/19/2016 1:38:09PM

Print Date: 06/27/2016 11:33:45AM

SGS North America Inc.  
200 West Potter Drive Anchorage, AK 95518  
t 907.562.2343 f 907.561.5301 www.us.sgs.com
### Blank Spike Summary

Blank Spike ID: LCS for HBN 1162494 [WTC2599]  
Blank Spike Lab ID: 1325610  
Date Analyzed: 05/19/2016 13:22  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>75</td>
<td>76.4</td>
<td>102</td>
<td>(80-120)</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WTC2599  
- **Analytical Method:** SM 5310B  
- **Instrument:** TOC Analyzer  
- **Analyst:** VDL  
- **Prep Batch:**  
- **Prep Method:**  
- **Prep Date/Time:**  
- Spike Init Wt./Vol.: 75 mg/L  
- Extract Vol: 30 mL  
- Dupe Init Wt./Vol.:  
- Extract Vol:  

Print Date: 06/27/2016 11:33:46AM
**Matrix Spike Summary**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>0.529</td>
<td>10.0</td>
<td>10.6</td>
<td>101</td>
<td>10.0</td>
<td>10.6</td>
<td>101</td>
<td>75-125</td>
<td>0.19</td>
<td>(&lt; 25)</td>
</tr>
</tbody>
</table>

**Batch Information**

<table>
<thead>
<tr>
<th>Analysis Date/Time: 05/19/2016 13:53</th>
<th>Analysis Date/Time: 05/19/2016 14:06</th>
<th>Analysis Date/Time: 05/19/2016 14:22</th>
</tr>
</thead>
<tbody>
<tr>
<td>QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Analysis Date:**
- Original Sample ID: 1162408002 05/19/2016 13:53
- MS Sample ID: 1325613 MS 05/19/2016 14:06
- MSD Sample ID: 1325614 MSD 05/19/2016 14:22

**Matrix:** Drinking Water

**Results by SM 5310B**

- **Prep Batch:**
- **Prep Method:**
- **Prep Date/Time:**
- **Prep Initial Wt./Vol.:** 30.00mL
- **Prep Extract Vol:** 30.00mL

**Prep Information**

**Analysis Date/Time:**
- 5/19/2016 2:06:51PM

**Print Date:**
- 06/27/2016 11:33:47AM

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- t 907.562.2343 f 907.561.5301 www.us.sgs.com

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**Method Blank**

Blank ID: MB for HBN 1734503 [WTI/4456]  
Blank Lab ID: 1325551  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1162494001, 1162494002, 1162494003, 1162494004, 1162494005

**Results by SM21 2320B**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>5.00U</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Batch Information**

Analytical Batch: WTI4456  
Analytical Method: SM21 2320B  
Instrument: Titration  
Analyst: ACF  
Analytical Date/Time: 5/20/2016 7:40:17PM
## Duplicate Sample Summary

Original Sample ID: 1167928002  
Duplicate Sample ID: 1325553  
Analysis Date: 05/20/2016 18:11  
Matrix: Water (Surface, Eff., Ground)

QC for Samples:

## Results by SM21 2320B

<table>
<thead>
<tr>
<th>NAME</th>
<th>Original</th>
<th>Duplicate</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>ND</td>
<td>5.00U</td>
<td>mg/L</td>
<td>0.00</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

## Batch Information

- Analytical Batch: WTI4456
- Analytical Method: SM21 2320B
- Instrument: Titration
- Analyst: ACF
### Duplicate Sample Summary

Original Sample ID: 1162534002  
Duplicate Sample ID: 1325554  
Analysis Date: 05/20/2016 18:45  
Matrix: Drinking Water  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by SM21 2320B

<table>
<thead>
<tr>
<th>NAME</th>
<th>Original</th>
<th>Duplicate</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>78.8</td>
<td>79.5</td>
<td>mg/L</td>
<td>0.86</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

Analytical Batch: WTI4456  
Analytical Method: SM21 2320B  
Instrument: Titration  
Analyst: ACF

Print Date: 06/27/2016 11:33:49AM  
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t 907.562.2343 f 907.561.5301 www.us.sgs.com  
Member of SGS Group
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1162494 [WTI4456]
Blank Spike Lab ID: 1325552
Date Analyzed: 05/20/2016 18:19

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

**Results by SM21 2320B**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>250</td>
<td>222</td>
<td>89</td>
<td>(85-115)</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WTI4456
- Analytical Method: SM21 2320B
- Instrument: Titration
- Analyst: ACF

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 250 mg/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:
### Method Blank

Blank ID: MB for HBN 1734914 [WXX/11510]  
Blank Lab ID: 1326303  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch**: WDA3787  
- **Analytical Method**: SM21 4500-NH3 G  
- **Instrument**: Discrete Analyzer 2  
- **Analyst**: NEG  
- **Analytical Date/Time**: 5/24/2016 3:13:29PM  
- **Prep Batch**: WXX11510  
- **Prep Method**: METHOD  
- **Prep Date/Time**: 5/24/2016 2:30:00PM  
- **Prep Initial Wt./Vol.**: 6 mL  
- **Prep Extract Vol**: 6 mL
### Blank Spike Summary

Blank Spike ID: LCS for HBN 1162494 [WXX11510]  
Blank Spike Lab ID: 1326304  
Date Analyzed: 05/24/2016 15:15  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

Spike Duplicate ID: LCSD for HBN 1162494 [WXX11510]  
Spike Duplicate Lab ID: 1326305  
Matrix: Water (Surface, Eff., Ground)

### Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/L)</th>
<th>Spike</th>
<th>Rec (%)</th>
<th>Spike Duplicate (mg/L)</th>
<th>Spike</th>
<th>Rec (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td></td>
<td>1</td>
<td>1.03</td>
<td>1</td>
<td>1</td>
<td>1.03</td>
</tr>
</tbody>
</table>

CL: 1.03  RPD CL: (75-125) 0.16  (< 25 )

### Batch Information

Analytical Batch: WDA3787  
Analytical Method: SM21 4500-NH3 G  
Instrument: Discrete Analyzer 2  
Analyst: NEG

Prep Batch: WXX11510  
Prep Method: METHOD  
Prep Date/Time: 05/24/2016 14:30  
Spike Init Wt./Vol.: 1 mg/L  
Extract Vol: 6 mL  
Dupe Init Wt./Vol.: 1 mg/L  
Extract Vol: 6 mL
Matrix Spike Summary

Original Sample ID: 1162355001
MS Sample ID: 1326306 MS
MSD Sample ID: 1326307 MSD
Analysis Date: 05/24/2016 15:18
Analysis Date: 05/24/2016 15:20
Analysis Date: 05/24/2016 15:22
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix Spike (mg/L)</th>
<th>Spike Duplicate (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>Sample</td>
<td>Spike</td>
</tr>
<tr>
<td></td>
<td>0.100U</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WDA3787
Analytical Method: SM21 4500-NH3 G
Instrument: Discrete Analyzer 2
Analyst: NEG
Analytical Date/Time: 5/24/2016 3:20:25PM

Prep Batch: WXX11510
Prep Method: Ammonia by SM21 4500F prep (W)
Prep Date/Time: 5/24/2016 2:30:00PM
Prep Initial Wt./Vol.: 6.00mL
Prep Extract Vol: 6.00mL
### Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.00420J</td>
<td>0.0100</td>
<td>0.0030</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WDA3792
- **Analytical Method:** SM21 4500P-B,E
- **Instrument:** Discrete Analyzer 3
- **Analyst:** NEG
- **Analytical Date/Time:** 6/1/2016 11:34:08AM

- **Prep Batch:** WXX11517
- **Prep Method:** SM21 4500P-B,E
- **Prep Date/Time:** 5/31/2016 5:58:00PM
- **Prep Initial Wt./Vol.:** 25 mL
- **Prep Extract Vol:** 25 mL

Print Date: 06/27/2016 11:33:55AM
### Blank Spike Summary

Blank Spike ID: LCS for HBN 1162494 [WXX11517]  
Blind Spike Lab ID: 1327227  
Date Analyzed: 06/01/2016 11:35  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

Spike Duplicate ID: LCSD for HBN 1162494 [WXX11517]  
Spike Duplicate Lab ID: 1327228  
Matrix: Water (Surface, Eff., Ground)

### Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike Rec (%)</th>
<th>Spike (mg/L)</th>
<th>Spike Rec (%)</th>
<th>Spike (mg/L)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>102</td>
<td>0.2</td>
<td>102</td>
<td>0.2</td>
<td>(75-125)</td>
<td>0.64</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

Analytical Batch: WDA3792  
Analytical Method: SM21 4500P-B,E  
Instrument: Discrete Analyzer 3  
Analyst: NEG  
Prep Batch: WXX11517  
Prep Method: SM21 4500P-B,E  
Prep Date/Time: 05/31/2016 17:58  
Spike Init Wt./Vol.: 0.2 mg/L  
Dupe Init Wt./Vol.: 0.2 mg/L  
Extract Vol: 25 mL  

Print Date: 06/27/2016 11:33:57AM  
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Member of SGS Group  
59 of 64
### Matrix Spike Summary

Original Sample ID: 1162494001  
MS Sample ID: 1327229 MS  
MSD Sample ID: 1327230 MSD  
Analysis Date: 06/01/2016 11:37  
Analysis Date: 06/01/2016 11:39  
Analysis Date: 06/01/2016 11:40  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples: 1162494001, 1162494002, 1162494003, 1162494004, 1162494005

### Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.0450J</td>
<td>1.00</td>
<td>1</td>
<td>96</td>
<td>1.00</td>
<td>0.982</td>
<td>94</td>
<td>75-125</td>
<td>2.00</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

Analytical Batch: WDA3792  
Prep Batch: WXX11517  
Analytical Method: SM21 4500P-B,E  
Prep Method: Total Phosphorus (W) Ext.  
Instrument: Discrete Analyzer 3  
Prep Date/Time: 5/31/2016 5:58:00PM  
Analyst: NEG  
Prep Initial Wt./Vol.: 5.00mL  
Analytical Date/Time: 6/1/2016 11:39:13AM  
Prep Extract Vol: 25.00mL
### Sample Identification and Analysis Details

#### Section 1
- **CLIENT:** ADEC Water Quality
- **PHONE NO:** 376-1855
- **PROJECT NAME:** Willow Creek
- **REPORTS TO:** Laura Eldred, laura.eldred@akslaska.gov
- **INVOICE TO:** ADEC NTP, QUOTE #: 335652

#### Section 2
| Reserved for Lab Use | SAMPLE IDENTIFICATION | DATE mm/dd/yy | TIME HH:MM | MATRIX/MATRIX CODE | METALS | Zn | Pb | Cd | Hg | Ni | Cu | Alkalinity | Nitrate | Nitrite | Ammonia | TOT. PHOS. | DO | Remarks/LOC ID |
|----------------------|-----------------------|---------------|------------|--------------------|--------|----|----|----|----|----|----|------------|----------|---------|---------|----------|----------|----|----------------|
| 1a                   | Willow 01            | 5/18/14       | 10:18      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X |  |
| 2a                   | Willow 01            | 5/18/14       | 10:18      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |
| 2b-d                 | Willow 02            | 5/18/14       | 10:24      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |
| 3a                   | Willow 03            | 5/18/14       | 13:09      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |
| 3b-d                 | Willow 03            | 5/18/14       | 13:09      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |
| 4a                   | Willow 04            | 5/18/14       | 14:14      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |
| 4b-d                 | Willow 04            | 5/18/14       | 14:14      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |
| 5a-d                 | Willow 03 Rep        | 5/18/14       | 13:10      | 3                  | 1      | G | X | X | X | X | X | X | X | X | X | X | X |  |

#### Section 3

- **MATRIX/MATRIX CODE:**
  - Metals
  - Zn
  - Pb
  - Cd
  - Hg
  - Ni
  - Cu
  - Alkalinity
  - Nitrate
  - Nitrite
  - Ammonia
  - TOT. PHOS.
  - DO

- **Remarks/LOC ID:**

#### Section 4
- **DOD Project:** Yes
- **Data Deliverable Requirements:**
  - Level 2
  - SEDD

- **Cooler ID:**

#### Section 5
- **Requested Turnaround Time and/or Special Instructions:**

- **Temp Blank °C:** 6.7
- **Chain of Custody Seal:** (Circle)
  - INTACT
  - BROKEN
  - ABSENT

**Additional Details**

- Received By: [Signatures]
- Date: [Dates]
- Time: [Times]

---

For more information, visit [http://www.sgs.com/terms-and-conditions](http://www.sgs.com/terms-and-conditions)
<table>
<thead>
<tr>
<th>Description</th>
<th>Matrix</th>
<th>Count</th>
<th>Unit Price</th>
<th>EXTENDED</th>
</tr>
</thead>
<tbody>
<tr>
<td>LL 200.8 Diss Scan w/hardness(W)</td>
<td>Water</td>
<td>15</td>
<td>$150.00</td>
<td>$2,250.00</td>
</tr>
<tr>
<td>Metals Digestion, Water</td>
<td>Water</td>
<td>15</td>
<td>$20.00</td>
<td>$300.00</td>
</tr>
<tr>
<td>Mercury Diss. EPA 245.1 (DW)</td>
<td>Water</td>
<td>15</td>
<td>$45.00</td>
<td>$675.00</td>
</tr>
<tr>
<td>Lab Filter for Metals</td>
<td>Water</td>
<td>15</td>
<td>$20.00</td>
<td>$300.00</td>
</tr>
<tr>
<td>Alkalinity, Total as CaCO3 (W)</td>
<td>Water</td>
<td>15</td>
<td>$35.00</td>
<td>$525.00</td>
</tr>
<tr>
<td>Nitrate/Nitrite Combo Flow (W)</td>
<td>Water</td>
<td>15</td>
<td>$50.00</td>
<td>$750.00</td>
</tr>
<tr>
<td>Ammonia by SM 4500G (W)</td>
<td>Water</td>
<td>15</td>
<td>$35.00</td>
<td>$525.00</td>
</tr>
<tr>
<td>Total Phosphorus (W)</td>
<td>Water</td>
<td>15</td>
<td>$50.00</td>
<td>$750.00</td>
</tr>
<tr>
<td>Dissolved Organic Carbon</td>
<td>Water</td>
<td>15</td>
<td>$60.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Fecal Coliform</td>
<td>Water</td>
<td>40</td>
<td>$100.00</td>
<td>$4,000.00</td>
</tr>
<tr>
<td><strong>Total Price:</strong></td>
<td></td>
<td></td>
<td><strong>$10,975.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

SGS will arrange for sample kits to be staged for pickup during normal business hours at Mat-Su Test Lab. Client will arrange for samples to return to SGS.

Mat-Su Test Lab
9161 E. Frontage Rd.
Suite 15
Palmer, AK

Metals to be run in Dissolved 200.8 Scan are: Al, Sb, As, Ba, Be, Cd, Cr, Co, Cu, Pb, Fe, Mn, Mo, Ni, Se, Ag, Tl, V, Zn

SGS will get bacteria results to ADEC as quickly as possible. Any results over 20 cfu will result in a phone call so microbial source tracking can begin.
## SAMPLE RECEIPT FORM

**Review Criteria:**

<table>
<thead>
<tr>
<th>Were custody seals intact? Note # &amp; location, if applicable. COC accompanied samples?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
<th>Comments/Action Taken:</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td>Exemption permitted if sampler hand carries/delivers.</td>
</tr>
</tbody>
</table>

**Temperature blank compliant* (i.e., 0-6°C after CF)?**

- If >6°C, were samples collected <8 hours ago?
  - Yes
  - No
- If <0°C, were all sample containers ice free?
  - Yes
  - No

<table>
<thead>
<tr>
<th>Cooler ID:</th>
<th></th>
<th>@</th>
<th></th>
<th></th>
<th>w/ Therm.ID:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td>6.7</td>
<td></td>
<td></td>
<td>238</td>
<td></td>
</tr>
</tbody>
</table>

**Delivery method (specify all that apply):**

- [ ] Client (hand carried)
- [ ] UPS
- [ ] Lynden
- [ ] AK Air
- [ ] Alert Courier
- [ ] FedEx
- [ ] RAVN
- [ ] C&D Delivery
- [ ] Carlile
- [ ] Pen Air
- [ ] Wap Speed
- [ ] Other: ______

- For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?
  - Yes
  - No

**Were samples received within hold time?**

<table>
<thead>
<tr>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Were samples match COC* (i.e., sample IDs, dates/times collected)? Were analyses requested unambiguous?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Were samples in good condition (no leaks/cracks/breakage)? Packing material used (specify all that apply): Bubble Wrap Separate plastic bags Vermiculite Other:</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Were proper containers (type/mass/volume/preservative*) used? Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples? Were all VOA vials free of headspace (i.e., bubbles ≤6 mm)? Were all soil VOAs field extracted with MeOH+BFB?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For preserved waters (other than VOA vials, LL-Mercury or microbiological analyses), was pH verified and compliant? If pH was adjusted, were bottles flagged (i.e., stickers)?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For special handling (e.g., “MI” soils, foreign soils, lab filter for dissolved…, lab extract for volatiles, Ref Lab, limited volume), were bottles/paperwork flagged (e.g., sticker)? For RUSH/SHORT Hold Time, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>For SITE-SPECIFIC QC, e.g., BMS/BMSD/BDUP, were containers / paperwork flagged accordingly? For any question answered “No,” has the PM been notified and the problem resolved (or paperwork put in their bin)?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Was PEER REVIEW of sample numbering/labeling completed?</th>
<th>Yes</th>
<th>N/A</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Additional notes (if applicable):**

---

**Note to Client:** Any “no” answer above indicates non-compliance with standard procedures and may impact data quality.
### Sample Containers and Preservatives

<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1162494001-A</td>
<td>HNO3 to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494001-B</td>
<td>No Preservative</td>
<td>OK</td>
</tr>
<tr>
<td>1162494001-C</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1162494001-D</td>
<td>HCL to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494002-A</td>
<td>HNO3 to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494002-B</td>
<td>No Preservative</td>
<td>OK</td>
</tr>
<tr>
<td>1162494002-C</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1162494002-D</td>
<td>HCL to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494003-A</td>
<td>HNO3 to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494003-B</td>
<td>No Preservative</td>
<td>OK</td>
</tr>
<tr>
<td>1162494003-C</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1162494003-D</td>
<td>HCL to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494004-A</td>
<td>HNO3 to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494004-B</td>
<td>No Preservative</td>
<td>OK</td>
</tr>
<tr>
<td>1162494004-C</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1162494004-D</td>
<td>HCL to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494005-A</td>
<td>HNO3 to pH &lt; 2</td>
<td>PA</td>
</tr>
<tr>
<td>1162494005-B</td>
<td>No Preservative</td>
<td>OK</td>
</tr>
<tr>
<td>1162494005-C</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1162494005-D</td>
<td>HCL to pH &lt; 2</td>
<td>PA</td>
</tr>
</tbody>
</table>

### Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

**OK** - The container was received at an acceptable pH for the analysis requested.

**BU** - The container was received with headspace greater than 6mm.

**DM** - The container was received damaged.

**FR** - The container was received frozen and not usable for Bacteria or BOD analyses.

**PA** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

**PH** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
To: ADEC-Air & Water Quality  
1700 E. Bogard Rd Bldg B, Suite 103  
Wasilla, AK 99654

Report Number: 1163988  
Client Project: Willow Creek

Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,

SGS North America Inc.

Forest Taylor  
Project Manager  
Forest.Taylor@sgs.com

Print Date: 08/05/2016 4:16:18PM
Refer to sample receipt form for information on sample condition.

**MB for HBN 1739627 [MXX/29985] (1337792) MB**

- 200.8 - Metals analytes nickel and zinc are detected in the MB above the LOQ. The associated sample concentrations are either less than the LOQ or 10 times greater than the concentration in the MB.

**1163955001MS (1339186) MS**

- 4500NH3-G - Ammonia - MS recovery is outside of QC criteria due to sample dilution. Refer to LCS for accuracy requirements.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.*
Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

* The analyte has exceeded allowable regulatory or control limits.
! Surrogate out of control limits.
B Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB Continuing Calibration Verification
CCCV/CVC/CVA/CVCB Closing Continuing Calibration Verification
CL Control Limit
D The analyte concentration is the result of a dilution.
DF Dilution Factor
DL Detection Limit (i.e., maximum method detection limit)
E The analyte result is above the calibrated range.
F Indicates value that is greater than or equal to the DL
GT Greater Than
IB Instrument Blank
ICV Initial Calibration Verification
J The quantitation is an estimation.
JL The analyte was positively identified, but the quantitation is a low estimation.
LCS(D) Laboratory Control Spike (Duplicate)
LOD Limit of Detection (i.e., 1/2 of the LOQ)
LOQ Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT Less Than
M A matrix effect was present.
MB Method Blank
MS(D) Matrix Spike (Duplicate)
ND Indicates the analyte is not detected.
Q QC parameter out of acceptance range.
R Rejected
RPD Relative Percent Difference
U Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.
<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Collected</th>
<th>Received</th>
<th>Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow 01</td>
<td>1163988001</td>
<td>07/18/2016</td>
<td>07/18/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 02</td>
<td>1163988002</td>
<td>07/18/2016</td>
<td>07/18/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03</td>
<td>1163988003</td>
<td>07/18/2016</td>
<td>07/18/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 04</td>
<td>1163988004</td>
<td>07/18/2016</td>
<td>07/18/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03 Rep</td>
<td>1163988005</td>
<td>07/18/2016</td>
<td>07/18/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM21 2320B</td>
<td>Alkalinity as CaCO3 QC</td>
</tr>
<tr>
<td>SM21 4500-NH3 G</td>
<td>Ammonia-N (W) SM21 4500-NH3 G</td>
</tr>
<tr>
<td>SM 5310B</td>
<td>Dissolved Organic Carbon</td>
</tr>
<tr>
<td>EPA 300.0</td>
<td>Ion Chromatographic Analysis</td>
</tr>
<tr>
<td>EP245.1</td>
<td>Mercury EPA 245.1 DISSOLVED</td>
</tr>
<tr>
<td>EP200.8</td>
<td>Metals in Drinking Water by ICP-MS DISSO</td>
</tr>
<tr>
<td>SM21 4500P-B,E</td>
<td>Total Phosphorus (W)</td>
</tr>
</tbody>
</table>

Print Date: 08/05/2016 4:16:22PM

SGS North America Inc. 200 West Potter Drive, Anchorage, AK 99518 t 907.562.2343 f 907.561.5301 www.us.sgs.com
### Detectable Results Summary

**Client Sample ID:** Willow 01  
**Lab Sample ID:** 1163988001  
**Dissolved Metals by ICP/MS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>8.76J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Barium</td>
<td>17.1</td>
<td>ug/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>10900</td>
<td>ug/L</td>
</tr>
<tr>
<td>Copper</td>
<td>0.330J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Magnesium</td>
<td>2960</td>
<td>ug/L</td>
</tr>
<tr>
<td>Manganese</td>
<td>3.47</td>
<td>ug/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>569</td>
<td>ug/L</td>
</tr>
<tr>
<td>Silicon</td>
<td>2350</td>
<td>ug/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>4230</td>
<td>ug/L</td>
</tr>
<tr>
<td>Zinc</td>
<td>3.03J</td>
<td>ug/L</td>
</tr>
</tbody>
</table>

**Waters Department**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon,Dissolved</td>
<td>0.462J</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>0.00350J</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Client Sample ID:** Willow 02  
**Lab Sample ID:** 1163988002  
**Dissolved Metals by ICP/MS**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>11.7J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Barium</td>
<td>10.0</td>
<td>ug/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>7150</td>
<td>ug/L</td>
</tr>
<tr>
<td>Copper</td>
<td>0.321J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1560</td>
<td>ug/L</td>
</tr>
<tr>
<td>Manganese</td>
<td>1.85</td>
<td>ug/L</td>
</tr>
<tr>
<td>Nickel</td>
<td>1.44J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>615</td>
<td>ug/L</td>
</tr>
<tr>
<td>Silicon</td>
<td>2750</td>
<td>ug/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>2980</td>
<td>ug/L</td>
</tr>
<tr>
<td>Zinc</td>
<td>4.59J</td>
<td>ug/L</td>
</tr>
</tbody>
</table>

**Waters Department**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon,Dissolved</td>
<td>0.694</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>0.00890J</td>
<td>mg/L</td>
</tr>
</tbody>
</table>
## Detectable Results Summary

**Client Sample ID:** Willow 03  
**Lab Sample ID:** 1163988003

### Dissolved Metals by ICP/MS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>14.1 J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Barium</td>
<td>11.2</td>
<td>ug/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>8440</td>
<td>ug/L</td>
</tr>
<tr>
<td>Copper</td>
<td>1.19</td>
<td>ug/L</td>
</tr>
<tr>
<td>Iron</td>
<td>89.6 J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Lead</td>
<td>3.28</td>
<td>ug/L</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1680</td>
<td>ug/L</td>
</tr>
<tr>
<td>Manganese</td>
<td>15.1</td>
<td>ug/L</td>
</tr>
<tr>
<td>Nickel</td>
<td>1.74 J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>738</td>
<td>ug/L</td>
</tr>
<tr>
<td>Silicon</td>
<td>3210</td>
<td>ug/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>4520</td>
<td>ug/L</td>
</tr>
<tr>
<td>A kalinity</td>
<td>23.0</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Waters Department

**Total Organic Carbon, Dissolved** 1.03 mg/L  
**Total Phosphorus** 0.00440 J mg/L

---

**Client Sample ID:** Willow 04  
**Lab Sample ID:** 1163988004

### Dissolved Metals by ICP/MS

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<tr>
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<th>Result</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>10.8 J</td>
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</tr>
<tr>
<td>Barium</td>
<td>11.7</td>
<td>ug/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>8000</td>
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<tr>
<td>Copper</td>
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<tr>
<td>Iron</td>
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<td>Magnesium</td>
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<tr>
<td>Manganese</td>
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<tr>
<td>Nickel</td>
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<tr>
<td>Potassium</td>
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<tr>
<td>Silicon</td>
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<tr>
<td>Sodium</td>
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</tr>
<tr>
<td>Zinc</td>
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<tr>
<td>A kalinity</td>
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<td>mg/L</td>
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### Waters Department

**Total Organic Carbon, Dissolved** 1.12 mg/L  
**Total Phosphorus** 0.0128 mg/L
### Detectable Results Summary

**Client Sample ID:** Willow 03 Rep  
**Lab Sample ID:** 1163988005

#### Dissolved Metals by ICP/MS

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<td>Barium</td>
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<td>ug/L</td>
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<td>Calcium</td>
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<td>Copper</td>
<td>0.424J</td>
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<td>Magnesium</td>
<td>1570</td>
<td>ug/L</td>
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<td>Manganese</td>
<td>13.8</td>
<td>ug/L</td>
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<tr>
<td>Nickel</td>
<td>1.62J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Potassium</td>
<td>675</td>
<td>ug/L</td>
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<tr>
<td>Silicon</td>
<td>3050</td>
<td>ug/L</td>
</tr>
<tr>
<td>Sodium</td>
<td>4280</td>
<td>ug/L</td>
</tr>
<tr>
<td>A kalinity</td>
<td>24.4</td>
<td>mg/L</td>
</tr>
<tr>
<td>Nitrate-N</td>
<td>0.105J</td>
<td>mg/L</td>
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<tr>
<td>Total Organic Carbon, Dissolved</td>
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<tr>
<td>Total Phosphorus</td>
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**Waters Department**
### Results of Willow 01

Client Sample ID: Willow 01  
Client Project ID: Willow Creek  
Lab Sample ID: 1163988001  
Lab Project ID: 1163988  
Collection Date: 07/18/16 09:40  
Received Date: 07/18/16 15:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%): Location:

### Results by Dissolved Metals

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<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL (ug/L)</th>
<th>DL (ug/L)</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
<td>1</td>
<td></td>
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### Batch Information

- **Analytical Batch:** MCV5727  
- **Analytical Method:** EP245.1  
- **Analyst:** NEG  
- **Analytical Date/Time:** 08/01/16 19:12  
- **Container ID:** 1163988001-B  
- **Prep Batch:** MXX30051  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 08/01/16 15:20  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL
## Results by Dissolved Metals by ICP/MS

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<th>DL</th>
<th>Units</th>
<th>DF</th>
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<tbody>
<tr>
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<td>8.76 J</td>
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</tr>
<tr>
<td>Antimony</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
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<td>07/23/16 18:32</td>
</tr>
<tr>
<td>Arsenic</td>
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<td>1.50</td>
<td>ug/L</td>
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<td>Beryllium</td>
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<tr>
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<tr>
<td>Calcium</td>
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<td>500</td>
<td>150</td>
<td>ug/L</td>
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<tr>
<td>Chromium</td>
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<tr>
<td>Cobalt</td>
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<tr>
<td>Copper</td>
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<tr>
<td>Iron</td>
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<tr>
<td>Lead</td>
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<tr>
<td>Magnesium</td>
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<td>15.0</td>
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<tr>
<td>Manganese</td>
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<tr>
<td>Molybdenum</td>
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<tr>
<td>Nickel</td>
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<td>2.00</td>
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<tr>
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<td>1.00</td>
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<td>ug/L</td>
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<td>07/23/16 18:32</td>
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<tr>
<td>Tin</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
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<td>07/23/16 18:32</td>
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<tr>
<td>Titanium</td>
<td>3.13 U</td>
<td>6.25</td>
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<tr>
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</tbody>
</table>
**Results of Willow 01**

Client Sample ID: Willow 01  
Client Project ID: Willow Creek  
Lab Sample ID: 1163988001  
Lab Project ID: 1163988

| Collection Date: 07/18/16 09:40 |
| Received Date: 07/18/16 15:16 |
| Matrix: Water (Surface, Eff., Ground) |
| Solids (%): |
| Location: |

**Results by Dissolved Metals by ICP/MS**

### Batch Information

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<thead>
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<th>Prep Batch: MXX29985</th>
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<td>Analyst: VDL</td>
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<td>Analytical Date/Time: 07/23/16 18:32</td>
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<table>
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<tr>
<th>Analytical Batch: MMS9463</th>
<th>Prep Batch: MXX29985</th>
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<tbody>
<tr>
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<tr>
<td>Analytical Date/Time: 07/26/16 16:50</td>
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<tr>
<td>Container ID: 1163988001-B</td>
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<table>
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<tr>
<td>Container ID: 1163988001-B</td>
<td>Prep Extract Vol: 50 mL</td>
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</table>
**Results of Willow 01**

**Client Sample ID:** Willow 01  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988001  
**Lab Project ID:** 1163988

**Collection Date:** 07/18/16 09:40  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)

**Results by Waters Department**

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<tr>
<th>Parameter</th>
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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.100 U</td>
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<td>0.0620</td>
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**Batch Information**

Analytical Batch: WIC5554  
Analytical Method: EPA 300.0  
Analyst: ACF

Prep Batch: WXX11560  
Prep Method: METHOD  
Prep Date/Time: 07/19/16 11:55  
Prep Initial Wt./Vol.: 10 mL  
Prep Extract Vol.: 10 mL

<table>
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<th>LOQ/CL</th>
<th>DL</th>
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<tbody>
<tr>
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**Batch Information**

Analytical Batch: WTC2614  
Analytical Method: SM 5310B  
Analyst: VDL

Analytical Date/Time: 07/21/16 11:37  
Container ID: 1163988001-G

<table>
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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Alkalinity</td>
<td>30.7</td>
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**Batch Information**

Analytical Batch: WTI4486  
Analytical Method: SM21 2320B  
Analyst: ACF

Analytical Date/Time: 07/20/16 18:08  
Container ID: 1163988001-C

<table>
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<tr>
<th>Parameter</th>
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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
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Print Date: 08/05/2016 4:16:24PM

J flagging is activated
Results of Willow 01

Client Sample ID: Willow 01
Client Project ID: Willow Creek
Lab Sample ID: 1163988001
Lab Project ID: 1163988

Collection Date: 07/18/16 09:40
Received Date: 07/18/16 15:16
Matrix: Water (Surface, Eff., Ground)
Solids (%): Location:

Results by Waters Department

Batch Information

Analytical Batch: WDA3818
Analytical Method: SM21 4500-NH3 G
Analyst: NEG
Analytical Date/Time: 07/20/16 13:10
Container ID: 1163988001-E

Prep Batch: WXX11567
Prep Method: METHOD
Prep Date/Time: 07/20/16 12:30
Prep Initial Wt./Vol.: 6 mL
Prep Extract Vol: 6 mL

<table>
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<tr>
<th>Parameter</th>
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<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
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<td>mg/L</td>
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Batch Information

Analytical Batch: WDA3826
Analytical Method: SM21 4500P-B,E
Analyst: NEG
Analytical Date/Time: 07/28/16 12:52
Container ID: 1163988001-E

Prep Batch: WXX11570
Prep Method: SM21 4500P-B,E
Prep Date/Time: 07/26/16 14:30
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 08/05/2016 4:16:24PM
J flagging is activated
### Results of Willow 02

**Client Sample ID:** Willow 02  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988002  
**Lab Project ID:** 1163988

**Collection Date:** 07/18/16 10:47  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)

### Results by Dissolved Metals

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<tr>
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<th>DL</th>
<th>Units</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
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### Batch Information

- **Analytical Batch:** MCV5727  
- **Analytical Method:** EP245.1  
- **Analyst:** NEG

- **Prep Batch:** MXX30051  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 08/01/16 15:20  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol.:** 50 mL
Results of Willow 02

Client Sample ID: Willow 02
Client Project ID: Willow Creek
Lab Sample ID: 1163988002
Lab Project ID: 1163988

Collection Date: 07/18/16 10:47
Received Date: 07/18/16 15:16
Matrix: Water (Surface, Eff., Ground)

Solids (%):
Location:

Results by Dissolved Metals by ICP/MS

<table>
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<tr>
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<th>DL</th>
<th>Units</th>
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<tbody>
<tr>
<td>Aluminum</td>
<td>11.7 J</td>
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J flagging is activated
Results of Willow 02

Client Sample ID: Willow 02
Client Project ID: Willow Creek
Lab Sample ID: 1163988002
Lab Project ID: 1163988

Collection Date: 07/18/16 10:47
Received Date: 07/18/16 15:16
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Dissolved Metals by ICP/MS

Batch Information

Analytical Batch: MMS961
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 07/23/16 18:35
Container ID: 1163988002-B

Prep Batch: MXX29985
Prep Method: E200.2
Prep Date/Time: 07/21/16 11:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS963
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 07/26/16 16:53
Container ID: 1163988002-B

Prep Batch: MXX29985
Prep Method: E200.2
Prep Date/Time: 07/21/16 11:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS9475
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 08/02/16 19:33
Container ID: 1163988002-B

Prep Batch: MXX30034
Prep Method: E200.2
Prep Date/Time: 07/29/16 09:34
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Print Date: 08/05/2016 4:16:24PM

J flagging is activated
### Results of Willow 02

**Client Sample ID:** Willow 02  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988002  
**Lab Project ID:** 1163988  
**Collection Date:** 07/18/16 10:47  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**

### Results by Waters Department

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<th>DL</th>
<th>Units</th>
<th>DF</th>
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<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.107 J</td>
<td>0.200</td>
<td>0.0620</td>
<td>mg/L</td>
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**Batch Information**

- **Analytical Batch:** WIC5554  
- **Analytical Method:** EPA 300.0  
- **Analyst:** ACF  
- **Analytical Date/Time:** 07/19/16 15:52  
- **Container ID:** 1163988002-D

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<td>Total Organic Carbon, Dissolved</td>
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**Batch Information**

- **Analytical Batch:** WTC2614  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Analytical Date/Time:** 07/21/16 11:50  
- **Container ID:** 1163988002-G

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<td>Alkalinity</td>
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**Batch Information**

- **Analytical Batch:** WTI4486  
- **Analytical Method:** SM21 2320B  
- **Analyst:** ACF  
- **Analytical Date/Time:** 07/20/16 18:15  
- **Container ID:** 1163988002-C

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<tr>
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**J flagging is activated**
### Results of Willow 02

Client Sample ID: **Willow 02**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1163988002  
Lab Project ID: 1163988  
Collection Date: 07/18/16 10:47  
Received Date: 07/18/16 15:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Waters Department

#### Batch Information

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<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
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#### Batch Information

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<td>Total Phosphorus</td>
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<td>0.00310</td>
<td>mg/L</td>
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**J flagging is activated**
# Results of Willow 03

**Client Sample ID:** Willow 03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988003  
**Lab Project ID:** 1163988  
**Collection Date:** 07/18/16 11:38  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**  

## Results by Dissolved Metals

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<tr>
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<td>ug/L</td>
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## Batch Information

- **Analytical Batch:** MCV5727  
- **Analytical Method:** EP245.1  
- **Analyst:** NEG  
- **Analytical Date/Time:** 08/01/16 19:18  
- **Container ID:** 1163988003-B  
- **Prep Batch:** MXX30051  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 08/01/16 15:20  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL
### Results of Willow 03

**Client Sample ID:** Willow 03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988003  
**Lab Project ID:** 1163988  
**Collection Date:** 07/18/16 11:38  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**

**Location:**

### Results by Dissolved Metals by ICP/MS

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<tr>
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Results of Willow 03

Client Sample ID: Willow 03
Client Project ID: Willow Creek
Lab Sample ID: 1163988003
Lab Project ID: 1163988

Collection Date: 07/18/16 11:38
Received Date: 07/18/16 15:16
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Dissolved Metals by ICP/MS

Batch Information

Analytical Batch: MMS9461
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 07/23/16 18:38
Container ID: 1163988003-B
Prep Batch: MXX29985
Prep Method: E200.2
Prep Date/Time: 07/21/16 11:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS9463
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 07/26/16 17:02
Container ID: 1163988003-B
Prep Batch: MXX29985
Prep Method: E200.2
Prep Date/Time: 07/21/16 11:05
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL

Analytical Batch: MMS9475
Analytical Method: EP200.8
Analyst: VDL
Analytical Date/Time: 08/02/16 19:36
Container ID: 1163988003-B
Prep Batch: MXX30034
Prep Method: E200.2
Prep Date/Time: 07/29/16 09:34
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL
### Results of Willow 03

**Client Sample ID:** Willow 03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988003  
**Lab Project ID:** 1163988  
**Collection Date:** 07/18/16 11:38  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

### Results by Waters Department

#### Nitrate-N
- Result: 0.100 mg/L  
- Units: mg/L  
- DF: 1  
- Allowable Limits: 0.0620  
- Date Analyzed: 07/19/16 16:14

#### Nitrite-N
- Result: 0.100 mg/L  
- Units: mg/L  
- DF: 1  
- Allowable Limits: 0.0620  
- Date Analyzed: 07/19/16 16:14

### Batch Information

#### Nitrate-N
- Prep Batch: WXX11560  
- Prep Method: METHOD  
- Prep Date/Time: 07/19/16 11:55  
- Prep Initial Wt./Vol.: 10 mL  
- Prep Extract Vol: 10 mL

#### Total Organic Carbon, Dissolved
- Result: 1.03 mg/L  
- Units: mg/L  
- DF: 1  
- Allowable Limits: 0.150  
- Date Analyzed: 07/21/16 12:03

### Batch Information

#### Total Organic Carbon, Dissolved
- Analytical Batch: WTC2614  
- Analytical Method: SM 5310B  
- Analyst: VDL  
- Analytical Date/Time: 07/21/16 12:03  
- Container ID: 1163988003-G

### Batch Information

#### Alkalinity
- Result: 23.0 mg/L  
- Units: mg/L  
- DF: 1  
- Allowable Limits: 3.10  
- Date Analyzed: 07/20/16 18:21

### Batch Information

#### Alkalinity
- Analytical Batch: WTI4486  
- Analytical Method: SM21 2320B  
- Analyst: ACF  
- Analytical Date/Time: 07/20/16 18:21  
- Container ID: 1163988003-C

### Batch Information

#### Ammonia-N
- Result: 0.0500 mg/L  
- Units: mg/L  
- DF: 1  
- Allowable Limits: 0.0310  
- Date Analyzed: 07/20/16 13:16

---

J flagging is activated

SGS North America Inc.  
200 West Potter Drive Anchorage, AK 95518  
Tel 907.562.2343 Fax 907.561.5301  www.us.sgs.com
Results of Willow 03

Client Sample ID: Willow 03
Client Project ID: Willow Creek
Lab Sample ID: 1163988003
Lab Project ID: 1163988

Collection Date: 07/18/16 11:38
Received Date: 07/18/16 15:16
Matrix: Water (Surface, Eff., Ground)

Solids (%):

Location:

Batch Information

Analytical Batch: WDA3818
Analytical Method: SM21 4500-NH3 G
Analyst: NEG
Analytical Date/Time: 07/20/16 13:16
Container ID: 1163988003-E

Prep Batch: WXX11567
Prep Method: METHOD
Prep Date/Time: 07/20/16 12:30
Prep Initial Wt./Vol.: 6 mL
Prep Extract Vol: 6 mL

Analytical Batch: WDA3826
Analytical Method: SM21 4500P-B,E
Analyst: NEG
Analytical Date/Time: 07/28/16 12:54
Container ID: 1163988003-E

Prep Batch: WXX11570
Prep Method: SM21 4500P-B,E
Prep Date/Time: 07/26/16 14:30
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

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J flagging is activated
## Results of Willow 04

- **Client Sample ID:** Willow 04
- **Client Project ID:** Willow Creek
- **Lab Sample ID:** 1163988004
- **Lab Project ID:** 1163988
- **Collection Date:** 07/18/16 12:53
- **Received Date:** 07/18/16 15:16
- **Matrix:** Water (Surface, Eff., Ground)
- **Solids (%):**

### Results by Dissolved Metals

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<td>Mercury</td>
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### Batch Information

- **Prep Batch:** MXX40051
- **Prep Method:** METHOD
- **Prep Date/Time:** 08/01/16 15:20
- **Prep Initial Wt./Vol.:** 25 mL
- **Prep Extract Vol.:** 50 mL

---

---
# Results of Willow 04

Client Sample ID: **Willow 04**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1163988004  
Lab Project ID: 1163988  
Collection Date: 07/18/16 12:53  
Received Date: 07/18/16 15:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

## Results by Dissolved Metals by ICP/MS

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### Results of Willow 04

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### Batch Information

#### Results by Dissolved Metals by ICP/MS

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<td>VDL</td>
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<td>Analytical Date/Time:</td>
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### Results of Willow 04

- **Client Sample ID:** Willow 04
- **Client Project ID:** Willow Creek
- **Lab Sample ID:** 1163988004
- **Lab Project ID:** 1163988

**Collection Date:** 07/18/16 12:53  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):** Location:

#### Results by Waters Department

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**Batch Information**

- **Analytical Batch:** WIC5554  
- **Analytical Method:** EPA 300.0  
- **Prep Batch:** WXX11560  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 07/19/16 11:55  
- **Prep Initial Wt./Vol.:** 10 mL  
- **Prep Extract Vol.:** 10 mL

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**Batch Information**

- **Analytical Batch:** WTC2614  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Prep Batch:** WXX11560  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 07/19/16 11:55  
- **Prep Initial Wt./Vol.:** 10 mL  
- **Prep Extract Vol.:** 10 mL

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**Batch Information**

- **Analytical Batch:** WTI4486  
- **Analytical Method:** SM21 2320B  
- **Analyst:** ACF  
- **Prep Batch:** WXX11560  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 07/19/16 11:55  
- **Prep Initial Wt./Vol.:** 10 mL  
- **Prep Extract Vol.:** 10 mL

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**Print Date:** 08/05/2016 4:16:24PM  
**J flagging is activated**
Results of Willow 04

Client Sample ID: Willow 04  
Client Project ID: Willow Creek  
Lab Sample ID: 1163988004  
Lab Project ID: 1163988

Collection Date: 07/18/16 12:53  
Received Date: 07/18/16 15:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:

Results by Waters Department

Batch Information

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<th>Parameter</th>
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Batch Information

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<th>Date Analyzed</th>
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Print Date: 08/05/2016 4:16:24PM  
J flagging is activated
### Results of Willow 03 Rep

**Client Sample ID:** Willow 03 Rep  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1163988005  
**Lab Project ID:** 1163988  
**Collection Date:** 07/18/16 11:42  
**Received Date:** 07/18/16 15:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**  

### Results by Dissolved Metals

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<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Mercury</td>
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<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
<td>1</td>
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### Batch Information

- **Analytical Batch:** MCV5727  
- **Analytical Method:** EP245.1  
- **Analyst:** NEG  
- **Analytical Date/Time:** 08/01/16 19:24  
- **Container ID:** 1163988005-B  

- **Prep Batch:** MXX30051  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 08/01/16 15:20  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL

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J flagging is activated
### Results by Dissolved Metals by ICP/MS

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<tr>
<td>Arsenic</td>
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J flagging is activated
Results of Willow 03 Rep

Client Sample ID: Willow 03 Rep  
Client Project ID: Willow Creek  
Lab Sample ID: 1163988005  
Lab Project ID: 1163988

Collection Date: 07/18/16 11:42  
Received Date: 07/18/16 15:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

Results by Dissolved Metals by ICP/MS

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<th>Results of Willow 03 Rep</th>
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Analytical Method: | EP200.8  
Analyst: | VDL  
Analytical Date/Time: | 07/23/16 18:44  
Container ID: | 1163988005-B  
Prep Batch: | MXX29985  
Prep Method: | E200.2  
Prep Date/Time: | 07/21/16 11:05  
Prep Initial Wt./Vol.: | 20 mL  
Prep Extract Vol: | 50 mL |
| Analytical Batch: | MMS9463  
Analytical Method: | EP200.8  
Analyst: | VDL  
Analytical Date/Time: | 07/26/16 17:08  
Container ID: | 1163988005-B  
Prep Batch: | MXX29985  
Prep Method: | E200.2  
Prep Date/Time: | 07/21/16 11:05  
Prep Initial Wt./Vol.: | 20 mL  
Prep Extract Vol: | 50 mL |
| Analytical Batch: | MMS9475  
Analytical Method: | EP200.8  
Analyst: | VDL  
Analytical Date/Time: | 08/02/16 19:42  
Container ID: | 1163988005-B  
Prep Batch: | MXX30034  
Prep Method: | E200.2  
Prep Date/Time: | 07/29/16 09:34  
Prep Initial Wt./Vol.: | 20 mL  
Prep Extract Vol: | 50 mL |
### Results of Willow 03 Rep

- **Client Sample ID:** Willow 03 Rep  
- **Client Project ID:** Willow Creek  
- **Lab Sample ID:** 1163988005  
- **Lab Project ID:** 1163988  
- **Collection Date:** 07/18/16 11:42  
- **Received Date:** 07/18/16 15:16  
- **Matrix:** Water (Surface, Eff., Ground)  
- **Solids (%):**  
- **Location:**

### Results by Waters Department

#### Nitrate-N
- **Result:** 0.105 mg/L  
- **LOQ/CL:** 10.200  
- **DL:** 0.0620  
- **Units:** mg/L  
- **Allowable Limits:**  
- **Date Analyzed:** 07/19/16 16:59

#### Nitrite-N
- **Result:** 0.100 mg/L  
- **LOQ/CL:** 10.200  
- **DL:** 0.0620  
- **Units:** mg/L  
- **Allowable Limits:**  
- **Date Analyzed:** 07/19/16 16:59

### Batch Information

- **Prep Batch:** WXX11560  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 07/19/16 11:55  
- **Prep Initial Wt./Vol.:** 10 mL  
- **Prep Extract Vol:** 10 mL

#### Total Organic Carbon, Dissolved
- **Result:** 1.04 mg/L  
- **LOQ/CL:** 10.500  
- **DL:** 0.150  
- **Units:** mg/L  
- **Allowable Limits:**  
- **Date Analyzed:** 07/21/16 12:30

### Batch Information

- **Analytical Batch:** WTC2614  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Analytical Date/Time:** 07/21/16 12:30  
- **Container ID:** 1163988005-G

#### Alkalinity
- **Result:** 24.4 mg/L  
- **LOQ/CL:** 10.0  
- **DL:** 3.10  
- **Units:** mg/L  
- **Allowable Limits:**  
- **Date Analyzed:** 07/20/16 18:33

### Batch Information

- **Analytical Batch:** WTI4486  
- **Analytical Method:** SM21 2320B  
- **Analyst:** ACF  
- **Analytical Date/Time:** 07/20/16 18:33  
- **Container ID:** 1163988005-C

#### Ammonia-N
- **Result:** 0.0500 mg/L  
- **LOQ/CL:** 0.100  
- **DL:** 0.0310  
- **Units:** mg/L  
- **Allowable Limits:**  
- **Date Analyzed:** 07/20/16 13:20

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Print Date: 08/05/2016 4:16:24PM

J flagging is activated
## Results of Willow 03 Rep

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<tbody>
<tr>
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<td>0.00310</td>
<td>mg/L</td>
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### Batch Information

- **Prep Batch**: WXX11567
- **Prep Method**: METHOD
- **Prep Date/Time**: 07/20/16 12:30
- **Prep Initial Wt./Vol.**: 6 mL
- **Prep Extract Vol**: 6 mL

- **Prep Batch**: WXX11570
- **Prep Method**: SM21 4500P-B,E
- **Prep Date/Time**: 07/26/16 14:30
- **Prep Initial Wt./Vol.**: 25 mL
- **Prep Extract Vol**: 25 mL

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**Total Phosphorus**

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<th>LOQ/CL</th>
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<th>Units</th>
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<tr>
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<td>0.00310</td>
<td>mg/L</td>
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### Batch Information

- **Prep Batch**: WXX11567
- **Prep Method**: METHOD
- **Prep Date/Time**: 07/20/16 12:30
- **Prep Initial Wt./Vol.**: 6 mL
- **Prep Extract Vol**: 6 mL

- **Prep Batch**: WXX11570
- **Prep Method**: SM21 4500P-B,E
- **Prep Date/Time**: 07/26/16 14:30
- **Prep Initial Wt./Vol.**: 25 mL
- **Prep Extract Vol**: 25 mL

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**Total Phosphorus**

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<th>Units</th>
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### Batch Information

- **Prep Batch**: WXX11567
- **Prep Method**: METHOD
- **Prep Date/Time**: 07/20/16 12:30
- **Prep Initial Wt./Vol.**: 6 mL
- **Prep Extract Vol**: 6 mL

- **Prep Batch**: WXX11570
- **Prep Method**: SM21 4500P-B,E
- **Prep Date/Time**: 07/26/16 14:30
- **Prep Initial Wt./Vol.**: 25 mL
- **Prep Extract Vol**: 25 mL

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**Total Phosphorus**

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### Method Blank

**Blank ID:** MB for HBN 1739627 [MXX/29985]  
**Matrix:** Water (Surface, Eff., Ground)  
**Blank Lab ID:** 1337792

**QC for Samples:**  
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

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**Results by EP200.8**

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<td>Antimony</td>
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Blank ID: MB for HBN 1739627 [MXX/29985]
Blank Lab ID: 1337792

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
- 1163988001
- 1163988002
- 1163988003
- 1163988004
- 1163988005

## Results by EP200.8

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| Prep Date/Time     | 7/21/2016  11:05:47AM |    |    |       |
| Prep Initial Wt./Vol.: | 20 mL |        |    |       |
| Prep Extract Vol.  | 50 mL    |        |    |       |

| Analytical Batch   | MMS9463 |        |    |       |
| Analytical Method  | EP200.8 |        |    |       |
| Instrument         | Perkin Elmer NexIon P5 |        |    |       |
| Analyst            | VDL     |        |    |       |
| Analytical Date/Time | 7/26/2016  4:38:29PM |        |    |       |

| Prep Batch         | MXX29985 |        |    |       |
| Prep Method        | E200.2   |        |    |       |
| Prep Date/Time     | 7/21/2016  11:05:47AM |    |    |       |
| Prep Initial Wt./Vol.: | 20 mL |        |    |       |
| Prep Extract Vol.  | 50 mL    |        |    |       |
### Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1163988 [MXX29985]  
**Blank Spike Lab ID:** 1337793  
**Date Analyzed:** 07/23/2016 18:17  
**Matrix:** Water (Surface, Eff., Ground)  
**QC for Samples:** 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by EP200.8

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Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [MXX29985]
Blank Spike Lab ID: 1337793
Date Analyzed: 07/26/2016 16:41

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by EP200.8

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Batch Information

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Analytical Method: EP200.8
Instrument: Perkin Elmer Nexion P5
Analyst: VDL

Prep Batch: MXX29985
Prep Method: E200.2
Prep Date/Time: 07/21/2016 11:05
Spike Init Wt./Vol.: 1000 ug/L
Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:

Analytical Batch: MMS9463
Analytical Method: EP200.8
Instrument: Perkin Elmer Nexion P5
Analyst: VDL

Prep Batch: MXX29985
Prep Method: E200.2
Prep Date/Time: 07/21/2016 11:05
Spike Init Wt./Vol.: 400 ug/L
Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:
Matrix Spike Summary

Original Sample ID: 1337794
MS Sample ID: 1337795 MS
MSD Sample ID:
Analysis Date: 07/23/2016 18:20
Analysis Date: 07/23/2016 18:29
Analysis Date:
Matrix: Drinking Water
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

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### Matrix Spike Summary

- **Original Sample ID:** 1337794
- **Analysis Date:** 07/26/2016 16:44
- **MS Sample ID:** 1337795
- **Matrix: Drinking Water**
- **MSD Sample ID:**
- **Analysis Date:** 07/26/2016 16:47
- **QC for Samples:** 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by EP200.8

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Analysis Date: 07/23/2016 19:05

MS Sample ID: 1338414 MS  
Analysis Date: 07/23/2016 19:08

Matrix: Drinking Water

QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

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</tr>
<tr>
<td>Silicon</td>
<td>4140</td>
<td>10000</td>
<td>95</td>
<td></td>
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<td></td>
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<tr>
<td>Silver</td>
<td>0.500U</td>
<td>100</td>
<td>104</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Sodium</td>
<td>5150</td>
<td>10000</td>
<td>96</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>Thallium</td>
<td>0.500U</td>
<td>10.0</td>
<td>99</td>
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<tr>
<td>Tin</td>
<td>0.500U</td>
<td>100</td>
<td>99.6</td>
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<tr>
<td>Titanium</td>
<td>12.5U</td>
<td>100</td>
<td>99</td>
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<tr>
<td>Zinc</td>
<td>1060</td>
<td>1000</td>
<td>95</td>
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</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** MMS9461
- **Analytical Method:** EP200.8
- **Instrument:** Perkin Elmer NexIon P5
- **Analyst:** VDL
- **Analytical Date/Time:** 7/23/2016 7:08:29PM
- **Prep Batch:** MXX29985
- **Prep Method:** DW Digest for Metals on ICP-MS
- **Prep Date/Time:** 7/21/2016 11:05:47AM
- **Prep Initial Wt./Vol.:** 20.00mL
- **Prep Extract Vol.:** 50.00mL
### Method Blank

Blank ID: MB for HBN 1740564 [MXX/30034]
Blank Lab ID: 1340479

QC for Samples:
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by EP200.8

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/L</td>
</tr>
<tr>
<td>Vanadium</td>
<td>10.0U</td>
<td>20.0</td>
<td>6.20</td>
<td>ug/L</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.50U</td>
<td>5.00</td>
<td>2.50</td>
<td>ug/L</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: MMS9478
- Analytical Method: EP200.8
- Instrument: Perkin Elmer Nexion P5
- Analyst: VDL
- Analytical Date/Time: 8/3/2016 6:42:18PM

- Prep Batch: MXX30034
- Prep Method: E200.2
- Prep Date/Time: 7/29/2016 9:34:55AM
- Prep Initial Wt./Vol.: 20 mL
- Prep Extract Vol.: 50 mL
Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [MXX30034]
Blank Spike Lab ID: 1340480
Date Analyzed: 08/03/2016 18:45

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by EP200.8

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>1000</td>
<td>1110</td>
<td>111</td>
<td>(85-115)</td>
</tr>
<tr>
<td>Vanadium</td>
<td>200</td>
<td>220</td>
<td>110</td>
<td>(85-115)</td>
</tr>
<tr>
<td>Zinc</td>
<td>1000</td>
<td>1140</td>
<td>114</td>
<td>(85-115)</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: MMS9478
Analytical Method: EP200.8
Instrument: Perkin Elmer NexIon P5
Analyst: VDL

Prep Batch: MXX30034
Prep Method: E200.2
Prep Date/Time: 07/29/2016 09:34
Spike Init Wt./Vol.: 1000 ug/L
Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:
Matrix Spike Summary

Original Sample ID: 1340481  Analysis Date: 08/02/2016  19:09
MS Sample ID:  1340482 MS  Analysis Date: 08/02/2016  19:12
MSD Sample ID:  Matrix: Drinking Water

QC for Samples:  1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by EP200.8

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>35.7</td>
<td>1000</td>
<td>1010</td>
<td>98</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Vanadium</td>
<td>10.0U</td>
<td>200</td>
<td>198</td>
<td>99</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>579</td>
<td>1000</td>
<td>1540</td>
<td>96</td>
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</tr>
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</table>

Batch Information

Analytical Batch: MMS9475  Prep Batch: MXX30034
Analytical Method: EP200.8  Prep Method: DW Digest for Metals on ICP-MS
Instrument: Perkin Elmer NexIon P5  Prep Date/Time: 7/29/2016   9:34:55AM
Analyst: VDL  Prep Initial Wt./Vol.: 20.00mL
Analytical Date/Time: 8/2/2016   7:12:53PM  Prep Extract Vol: 50.00mL

Print Date: 08/05/2016  4:16:32PM
### Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nickel</td>
<td>1.00U</td>
<td>1000</td>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>70-130</td>
</tr>
<tr>
<td>Vanadium</td>
<td>10.0U</td>
<td>200</td>
<td>215</td>
<td></td>
<td></td>
<td>108</td>
<td></td>
<td>70-130</td>
</tr>
<tr>
<td>Zinc</td>
<td>30.9</td>
<td>1000</td>
<td>1140</td>
<td></td>
<td></td>
<td>110</td>
<td></td>
<td>70-130</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** MMS9475
- **Analytical Method:** EP200.8
- **Instrument:** Perkin Elmer NexIon P5
- **Prep Batch:** MXX30034
- **Prep Method:** DW Digest for Metals on ICP-MS
- **Prep Date/Time:** 7/29/2016  9:34:55AM
- **Prep Initial Wt./Vol.:** 20.00mL
- **Prep Extract Vol.:** 50.00mL
- **Prep Extract Vol.:** 50.00mL

- **Prep Date/Time:** 8/2/2016  7:51:45PM
**Method Blank**

Blank ID: MB for HBN 1740911 [MXX/30051]  
Matrix: Water (Surface, Eff., Ground)  
Blank Lab ID: 1341736  
QC for Samples:  
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

**Results by EP245.1**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: MCV5727  
- Analytical Method: EP245.1  
- Instrument: PSA Millennium mercury AA  
- Analyst: NEG  
- Analytical Date/Time: 8/1/2016 7:06:26PM  
- Prep Batch: MXX30051  
- Prep Method: METHOD  
- Prep Date/Time: 8/1/2016 3:20:00PM  
- Prep Initial Wt./Vol.: 25 mL  
- Prep Extract Vol.: 50 mL

Print Date: 08/05/2016 4:16:33PM
## Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [MXX30051]
Blank Spike Lab ID: 1341737
Date Analyzed: 08/01/2016 19:09
Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>4</td>
<td>4.04</td>
<td>101</td>
<td>(85-115)</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: MCV5727
- Analytical Method: EP245.1
- Instrument: PSA Millennium mercury AA
- Analyst: NEG
- Prep Batch: MXX30051
- Prep Method: METHOD
- Prep Date/Time: 08/01/2016 15:20
- Spike Init Wt./Vol.: 4 ug/L
- Extract Vol: 50 mL
- Dupe Init Wt./Vol.: Extract Vol:
Matrix Spike Summary

Original Sample ID: 1164201001
MS Sample ID: 1341738 MS
MSD Sample ID: 
Analysis Date: 08/01/2016 19:27
Analysis Date: 08/01/2016 19:30
Analysis Date: 
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix Spike (ug/L)</th>
<th>Spike Duplicate (ug/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>Sample</td>
<td>Spike</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.200U</td>
<td>8.00</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: MCV5727
Analytical Method: EP245.1
Instrument: PSA Millennium mercury AA
Analyst: NEG
Analytical Date/Time: 8/1/2016 7:30:00PM

Prep Batch: MXX30051
Prep Method: Digestion Mercury 245.1 (W)
Prep Date/Time: 8/1/2016 3:20:00PM
Prep Initial Wt./Vol.: 25.00mL
Prep Extract Vol: 50.00mL

Print Date: 08/05/2016 4:16:35PM
### Matrix Spike Summary

| Original Sample ID: | 1168319004 | Analysis Date: | 08/01/2016 19:56 |
| MS Sample ID:      | 1341739 MS  |               | 08/01/2016 19:59 |
| MSD Sample ID:     |             |               |                  |

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix Spike (ug/L)</th>
<th>Spike Duplicate (ug/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample Spike Result Rec (%)</td>
<td>Spike Result Rec (%)</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.100U 8.00 7.92 99</td>
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</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch**: MCV5727
- **Analytical Method**: EP245.1
- **Instrument**: PSA Millennium mercury AA
- **Analyst**: NEG
- **Analytical Date/Time**: 8/1/2016 7:59:20PM

- **Prep Batch**: MXX30051
- **Prep Method**: Digestion Mercury 245.1 (W)
- **Prep Date/Time**: 8/1/2016 3:20:00PM
- **Prep Initial Wt./Vol.**: 25.00mL
- **Prep Extract Vol**: 50.00mL
### Method Blank

Blank ID: MB for HBN 1739830 [WTC/2614]  
Blank Lab ID: 1338580  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>0.250U</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WTC2614
- Analytical Method: SM 5310B
- Instrument: TOC Analyzer
- Analyst: VDL
- Analytical Date/Time: 7/21/2016 10:11:03AM
**Method Blank**

Blank ID: MB for HBN 1739830 [WTC/2614]  
Blank Lab ID: 1338714  
Matrix: Water (Surface, Eff., Ground)

QC for Samples:  
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

**Results by SM 5310B**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>0.250U</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WTC2614  
- Analytical Method: SM 5310B  
- Instrument: TOC Analyzer  
- Analyst: VDL  
- Analytical Date/Time: 7/21/2016 4:29:30PM
### Blank Spike Summary

- **Blank Spike ID:** LCS for HBN 1163988 [WTC2614]
- **Blank Spike Lab ID:** 1338578
- **Date Analyzed:** 07/21/2016 09:57
- **Matrix:** Water (Surface, Eff., Ground)
- **QC for Samples:** 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>75</td>
<td>78.0</td>
<td>104</td>
<td>(80-120)</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WTC2614
- **Analytical Method:** SM 5310B
- **Instrument:** TOC Analyzer
- **Analyst:** VDL
- **Prep Batch:**
- **Prep Method:**
- **Prep Date/Time:**
- **Spike Init Wt./Vol.:** 75 mg/L
- **Extract Vol.:** 30 mL
- **Dupe Init Wt./Vol.:**
- **Extract Vol.:**
### Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [WTC2614]
Blank Spike Lab ID: 1338713
Date Analyzed: 07/21/2016 16:16
Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>75</td>
<td>77.2</td>
<td>103</td>
<td>(80-120)</td>
</tr>
</tbody>
</table>

### Batch Information

Analytical Batch: WTC2614
Analytical Method: SM 5310B
Instrument: TOC Analyzer
Analyst: VDL
Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 75 mg/L
Extract Vol: 30 mL
Dupe Init Wt./Vol.: Extract Vol:
Matrix Spike Summary

Original Sample ID: 1168242013
MS Sample ID: 1338581 MS
MSD Sample ID: 1338582 MSD
Analysis Date: 07/21/2016 10:26
Analysis Date: 07/21/2016 10:41
Analysis Date: 07/21/2016 10:55
Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix Spike (mg/L)</th>
<th>Spike Duplicate (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample</td>
<td>Spike</td>
</tr>
<tr>
<td>Total Organic Carbon</td>
<td>1.60</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WTC2614
Analytical Method: SM 5310B
Instrument: TOC Analyzer
Analyst: VDL
Analytical Date/Time: 7/21/2016 10:41:41AM

Prep Batch: 
Prep Method: 
Prep Date/Time: 
Prep Initial Wt./Vol.: 30.00mL
Prep Extract Vol: 30.00mL
### Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>Analysis Date: 07/21/2016 16:44</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Sample ID</td>
<td>1338668</td>
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</tr>
<tr>
<td>MS Sample ID</td>
<td>1338671 MS</td>
<td>Analysis Date: 07/21/2016 16:58</td>
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<tr>
<td>MSD Sample ID</td>
<td>1338672 MSD</td>
<td>Analysis Date: 07/21/2016 17:11</td>
</tr>
<tr>
<td>Matrix:</td>
<td>Drinking Water</td>
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</tr>
<tr>
<td>QC for Samples</td>
<td>1163988001, 1163988002, 1163988003, 1163988004, 1163988005</td>
<td></td>
</tr>
</tbody>
</table>

### Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>2.22</td>
<td>10.0</td>
<td>12.6</td>
<td>103</td>
<td>10.0</td>
<td>12.6</td>
<td>104</td>
<td>75-125</td>
<td>0.32</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WTC2614
- **Analytical Method:** SM 5310B
- **Instrument:** TOC Analyzer
- **Analyst:** VDL
- **Prep Batch:**
- **Prep Method:**
- **Prep Date/Time:**
- **Prep Initial Wt./Vol.:** 30.00mL
- **Prep Extract Vol:** 30.00mL

---

Print Date: 08/05/2016 4:16:38PM
### Method Blank

Blank ID: MB for HBN 1739833 [WTI/4486]  
Matrix: Water (Surface, Eff., Ground)  
Blank Lab ID: 1338591  
QC for Samples:  
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM21 2320B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>5.00U</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WTI4486
- Analytical Method: SM21 2320B
- Instrument: Titration
- Analyst: ACF
- Analytical Date/Time: 7/20/2016 4:37:09PM
### Method Blank

Blank ID: MB for HBN 1739833 [WTI/4486]  
Blank Lab ID: 1338595  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM21 2320B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>5.00U</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WTI4486  
- Analytical Method: SM21 2320B  
- Instrument: Titration  
- Analyst: ACF  
- Analytical Date/Time: 7/20/2016 7:46:43PM
### Duplicate Sample Summary

**Original Sample ID:** 1168280001  
**Analysis Date:** 07/20/2016 20:08  
**Duplicate Sample ID:** 1338593  
**Matrix:** Water (Surface, Eff., Ground)  
**QC for Samples:** 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM21 2320B

<table>
<thead>
<tr>
<th>NAME</th>
<th>Original</th>
<th>Duplicate</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>ND</td>
<td>5.00U</td>
<td>mg/L</td>
<td>0.00</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WTI4486  
- **Analytical Method:** SM21 2320B  
- **Instrument:** Titration  
- **Analyst:** ACF
### Duplicate Sample Summary

Original Sample ID: 1163963001  
Duplicate Sample ID: 1338597  
Analysis Date: 07/20/2016 16:59  
Matrix: Drinking Water

### QC for Samples:

<table>
<thead>
<tr>
<th>NAME</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>mg/L</td>
<td>0.27</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Results by SM21 2320B

<table>
<thead>
<tr>
<th>NAME</th>
<th>Original</th>
<th>Duplicate</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>106</td>
<td>105</td>
<td>mg/L</td>
<td>0.27</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WTI4486
- Analytical Method: SM21 2320B
- Instrument: Titration
- Analyst: ACF
### Duplicate Sample Summary

<table>
<thead>
<tr>
<th>Original Sample ID:</th>
<th>1163942001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duplicate Sample ID:</td>
<td>1338598</td>
</tr>
<tr>
<td>Analysis Date:</td>
<td>07/20/2016 17:12</td>
</tr>
<tr>
<td>Matrix:</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>QC for Samples:</td>
<td>1163988001, 1163988002, 1163988003, 1163988004, 1163988005</td>
</tr>
</tbody>
</table>

### Results by SM21 2320B

<table>
<thead>
<tr>
<th>NAME</th>
<th>Original</th>
<th>Duplicate</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>12.3</td>
<td>12.6</td>
<td>mg/L</td>
<td>2.40</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WTI4486
- Analytical Method: SM21 2320B
- Instrument: Titration
- Analyst: ACF
Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [WTI4486]
Blank Spike Lab ID: 1338592
Date Analyzed: 07/20/2016 16:43

Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by SM21 2320B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>250</td>
<td>253</td>
<td>101</td>
<td>(85-115 )</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WTI4486
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: ACF

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 250 mg/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol: 

Print Date: 08/05/2016 4:16:41PM
Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [WTI4486]
Blank Spike Lab ID: 1338596
Date Analyzed: 07/20/2016 19:53
Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

Results by SM21 2320B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>250</td>
<td>240</td>
<td>96</td>
<td>(85-115)</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WTI4486
Analytical Method: SM21 2320B
Instrument: Titrination
Analyst: ACF

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 250 mg/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:
**Method Blank**

Blank ID: MB for HBN 1739709 [WXX/11560]  
Blank Lab ID: 1338205  
Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

**Results by EPA 300.0**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>mg/L</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Batch Information**

Analytical Batch: WIC5554  
Analytical Method: EPA 300.0  
Instrument: Metrohm 733 DX2  
Analyst: ACF  
Analytical Date/Time: 7/19/2016 2:01:07PM  
Prep Batch: WXX11560  
Prep Method: METHOD  
Prep Date/Time: 7/19/2016 11:55:00AM  
Prep Initial Wt./Vol.: 10 mL  
Prep Extract Vol: 10 mL
## Blank Spike Summary

Blank Spike ID: LCS for HBN 1163988 [WXX11560]  
Blank Spike Lab ID: 1338206  
Date Analyzed: 07/19/2016 14:23  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

## Results by EPA 300.0

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>5</td>
<td>5.10</td>
<td>102</td>
<td>(90-110)</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>5</td>
<td>5.09</td>
<td>102</td>
<td>(90-110)</td>
</tr>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>10</td>
<td>10.2</td>
<td>102</td>
<td>(90-110)</td>
</tr>
</tbody>
</table>

## Batch Information

Analytical Batch: WIC5554  
Analytical Method: EPA 300.0  
Instrument: Metrohm 733 DX2  
Analyst: ACF  
Prep Batch: WXX11560  
Prep Method: METHOD  
Prep Date/Time: 07/19/2016 11:55  
Spike Init Wt./Vol.: 5 mg/L  
Extract Vol: 10 mL  
Dupe Init Wt./Vol.: Extract Vol:
### Matrix Spike Summary

Original Sample ID: 1163988001  
MS Sample ID: 1338207 MS  
MSD Sample ID: 1338208 MSD  
Analysis Date: 07/19/2016 14:45  
Analysis Date: 07/19/2016 15:07  
Analysis Date: 07/19/2016 15:30  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by EPA 300.0

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Matrix Spike (mg/L)</th>
<th>Spike Duplicate (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample</td>
<td>Spike</td>
</tr>
<tr>
<td>Nitrate-N</td>
<td>0.100U</td>
<td>5.00</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.100U</td>
<td>5.00</td>
</tr>
</tbody>
</table>

### Batch Information

Analytical Batch: WIC5554  
Analytical Method: EPA 300.0  
Instrument: Metrohm 733 DX2  
Analyst: ACF  
Analytical Date/Time: 7/19/2016 3:07:57PM  
Prep Batch: WXX11560  
Prep Method: EPA 300.0 Extraction Waters/Liquids  
Prep Date/Time: 7/19/2016 11:55:00AM  
Prep Initial Wt./Vol.: 10.00mL  
Prep Extract Vol: 10.00mL
## Method Blank

Blank ID: MB for HBN 1740025 [WXX/11567]
Blank Lab ID: 1339183

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

## Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

## Batch Information

- **Analytical Batch:** WDA3818
- **Analytical Method:** SM21 4500-NH3 G
- **Instrument:** Discrete Analyzer 2
- **Analyst:** NEG
- **Analytical Date/Time:** 7/20/2016 12:56:39PM
- **Prep Batch:** WXX11567
- **Prep Method:** METHOD
- **Prep Date/Time:** 7/20/2016 12:30:00PM
- **Prep Initial Wt./Vol.:** 6 mL
- **Prep Extract Vol.:** 6 mL
### Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1163988 [WXX11567]
**Blank Spike Lab ID:** 1339184
**Date Analyzed:** 07/20/2016 12:58
**QC for Samples:** 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

**Spike Duplicate ID:** LCSD for HBN 1163988 [WXX11567]
**Spike Duplicate Lab ID:** 1339185
**Matrix:** Water (Surface, Eff., Ground)

### Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/L)</th>
<th>Spike Duplicate (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spike</td>
<td>Result</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>1</td>
<td>0.931</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WDA3818
- **Analytical Method:** SM21 4500-NH3 G
- **Instrument:** Discrete Analyzer 2
- **Analyst:** NEG

- **Prep Batch:** WXX11567
- **Prep Method:** METHOD
- **Prep Date/Time:** 07/20/2016 12:30
- **Spike Init Wt./Vol.:** 1 mg/L  
  **Extract Vol.:** 6 mL
- **Dupe Init Wt./Vol.:** 1 mg/L  
  **Extract Vol.:** 6 mL
### Matrix Spike Summary

- Original Sample ID: 1163955001
- MS Sample ID: 1339186 MS
- MSD Sample ID: 1339187 MSD
- Analysis Date: 07/20/2016 14:06
- Analysis Date: 07/20/2016 14:08
- Analysis Date: 07/20/2016 14:09
- Matrix: Water (Surface, Eff., Ground)
- QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005

### Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>34.9</td>
<td>1.00</td>
<td>35.2</td>
<td>28</td>
<td>1.00</td>
<td>35.7</td>
<td>75</td>
<td>75-125</td>
<td>1.30</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WDA3818
- Analytical Method: SM21 4500-NH3 G
- Instrument: Discrete Analyzer 2
- Analyst: NEG
- Analytical Date/Time: 7/20/2016 2:08:19PM

- Prep Batch: WXX11567
- Prep Method: Ammonia by SM21 4500F prep (W)
- Prep Date/Time: 7/20/2016 12:30:00PM
- Prep Initial Wt./Vol.: 6.00mL
- Prep Extract Vol: 6.00mL

Print Date: 08/05/2016 4:16:49PM
## Method Blank

Blank ID: MB for HBN 1740223 [WXX/11570]
Blank Lab ID: 1339718
Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1163988001, 1163988002, 1163988003, 1163988004, 1163988005

## Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.00580J</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

## Batch Information

Analytical Batch: WDA3826
Analytical Method: SM21 4500P-B,E
Instrument: Discrete Analyzer 2
Analyst: NEG
Analytical Date/Time: 7/28/2016 12:46:00PM

Prep Batch: WXX11570
Prep Method: SM21 4500P-B,E
Prep Date/Time: 7/26/2016 2:30:00PM
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL
### Blank Spike Summary

<table>
<thead>
<tr>
<th>Blank Spike ID: LCS for HBN 1163988 [WXX11570]</th>
<th>Spike Duplicate ID: LCSD for HBN 1163988 [WXX11570]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blank Spike Lab ID: 1339719</td>
<td>Spike Duplicate Lab ID: 1339720</td>
</tr>
<tr>
<td>Date Analyzed: 07/28/2016 12:47</td>
<td>Matrix: Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>QC for Samples: 1163988001, 1163988002, 1163988003, 1163988004, 1163988005</td>
<td></td>
</tr>
</tbody>
</table>

### Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/L)</th>
<th>Spike Duplicate (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spike</td>
<td>Result</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>0.2</td>
<td>0.218</td>
</tr>
</tbody>
</table>

### Batch Information

<table>
<thead>
<tr>
<th>Analytical Batch: WDA3826</th>
<th>Prep Batch: WXX11570</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instrument: Discrete Analyzer 2</td>
<td>Prep Date/Time: 07/26/2016 14:30</td>
</tr>
<tr>
<td>Analyst: NEG</td>
<td>Spike Init Wt./Vol.: 0.2 mg/L Extract Vol: 25 mL</td>
</tr>
</tbody>
</table>

| Dupe Init Wt./Vol.: 0.2 mg/L Extract Vol: 25 mL |
## Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>1.60</td>
<td>0.200</td>
<td>1.82</td>
<td>112</td>
<td>0.200</td>
<td>1.84</td>
<td>121</td>
<td>75-125</td>
<td>0.98</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WDA3826
- **Analytical Method:** SM21 4500P-B,E
- **Instrument:** Discrete Analyzer 2
- **Analytical Date/Time:** 7/28/2016 1:46 PM

- **Prep Batch:** WXX11570
- **Prep Method:** Total Phosphorus (W) Ext.
- **Prep Date/Time:** 7/26/2016 2:30 PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol.:** 25.00mL
<table>
<thead>
<tr>
<th>Sample Identification</th>
<th>Date/Time</th>
<th>Matrix Code</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>01 Willow 01</td>
<td>09:40</td>
<td>G</td>
<td>XXXX</td>
</tr>
<tr>
<td>02 Willow 02</td>
<td>10:49</td>
<td></td>
<td>XXXX</td>
</tr>
<tr>
<td>03 Willow 03</td>
<td>11:28</td>
<td>5</td>
<td>XXXX</td>
</tr>
<tr>
<td>04 Willow 04</td>
<td>12:53</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Willow 03Rep</td>
<td>11:42</td>
<td>5</td>
<td>XXXX</td>
</tr>
</tbody>
</table>

Section 4

DOD Project? Yes/No: No
Data Deliverable Requirements: Level 2 EDD

Section 5

Relinquished By: (1) Laura Eldred
Date: 7/18/14
Time: 15:19
Received By: [Signature]

Relinquished By: (2) [Signature]

Relinquished By: (3) [Signature]

Relinquished By: (4) [Signature]

Requested Turnaround Time and/or Special Instructions:

Temp Blank °C: 43.6 #286

(See attached Sample Receipt Form)

http://www.sgs.com/terms-and-conditions

Hand delivered

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557

F083-Kit_Request_and_COC_Templates-Blank
Revised 2013-03-24
## Review Criteria

<table>
<thead>
<tr>
<th>Y/N (yes/no)</th>
<th>Exceptions Noted below</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>(If &gt;6°C, were samples collected &lt;8 hours ago?)</em>&lt;br&gt;Y</td>
<td><strong>Exemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</strong>&lt;br&gt;Y</td>
</tr>
<tr>
<td><em>Temperature blank compliant</em> (i.e., 0-6 °C after CF)?&lt;br&gt;Y</td>
<td><em>Temperature blank compliant</em> (i.e., 0-6 °C after CF)?&lt;br&gt;Y</td>
</tr>
<tr>
<td>*If &lt;0°C, were sample containers ice free?&lt;br&gt;Y</td>
<td>If &lt;0°C, were sample containers ice free?&lt;br&gt;Y</td>
</tr>
<tr>
<td>Did samples match COC** (i.e., sample IDs, dates/times collected)?&lt;br&gt;Y</td>
<td>**Exemption permitted for metals (e.g., 200.8/6020A).&lt;br&gt;Y</td>
</tr>
</tbody>
</table>

### Notes:
- Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.

Additional notes (if applicable):

**Note to Client:** Any “no” answer above indicates non-compliance with standard procedures and may impact data quality.
<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1163988001-A</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988001-B</td>
<td>HNO3 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988001-C</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988001-D</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988001-E</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988001-F</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988001-G</td>
<td>HCL to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-A</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-B</td>
<td>HNO3 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-C</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-D</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-E</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-F</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988002-G</td>
<td>HCL to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-A</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-B</td>
<td>HNO3 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-C</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-D</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-E</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-F</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988003-G</td>
<td>HCL to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988004-A</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988004-B</td>
<td>HNO3 to pH &lt; 2</td>
<td>OK</td>
</tr>
<tr>
<td>1163988004-C</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1163988004-D</td>
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<td>1163988004-E</td>
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<td>1163988004-F</td>
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<td>HCL to pH &lt; 2</td>
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<tr>
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<td>1163988005-B</td>
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<tr>
<td>1163988005-D</td>
<td>No Preservative Required</td>
<td>OK</td>
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<tr>
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<td>1163988005-F</td>
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</tbody>
</table>
**Container Condition Glossary**

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates that an inappropriate container was submitted.

**OK** - The container was received at an acceptable pH for the analysis requested.

**BU** - The container was received with headspace greater than 6mm.

**DM** - The container was received damaged.

**FR** - The container was received frozen and not usable for Bacteria or BOD analyses.

**PA** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

**PH** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
Labotary Report of Analysis

To: ADEC-Air & Water Quality
   1700 E. Bogard Rd Bldg B, Suite 103
   Wasilla, AK 99654

Report Number: 1165628
Client Project: Willow Creek

Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Forest Taylor
Project Manager
Forest.Taylor@sgs.com

Print Date: 10/13/2016 3:36:14PM
Refer to sample receipt form for information on sample condition.

**1165611001MS (1354427) MS**
4500NO3-F - Nitrate/Nitrite - MS recovery is outside of QC criteria. Refer to LCS for accuracy requirements.

**1165611001MSD (1354428) MSD**
4500NO3-F - Nitrate/Nitrite - MSD recovery is outside of QC criteria. Refer to LCS for accuracy requirements.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.*
Laboratory Qualifiers

Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

* The analyte has exceeded allowable regulatory or control limits.
! Surrogate out of control limits.
B Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB Closing Continuing Calibration Verification
CL Control Limit
D The analyte concentration is the result of a dilution.
DF Dilution Factor
DL Detection Limit (i.e., maximum method detection limit)
E The analyte result is above the calibrated range.
F Indicates value that is greater than or equal to the DL
GT Greater Than
IB Instrument Blank
ICV Initial Calibration Verification
J The quantitation is an estimation.
JL The analyte was positively identified, but the quantitation is a low estimation.
LCS(D) Laboratory Control Spike (Duplicate)
LOD Limit of Detection (i.e., 1/2 of the LOQ)
LOQ Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT Less Than
M A matrix effect was present.
MB Method Blank
MS(D) Matrix Spike (Duplicate)
ND Indicates the analyte is not detected.
Q QC parameter out of acceptance range.
R Rejected
RPD Relative Percent Difference
U Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.
### Sample Summary

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Collected</th>
<th>Received</th>
<th>Matrix</th>
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<tbody>
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<td>Willow01</td>
<td>1165628001</td>
<td>09/21/2016</td>
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<td>Willow02</td>
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<td>09/21/2016</td>
<td>09/21/2016</td>
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<td>1165628005</td>
<td>09/21/2016</td>
<td>09/21/2016</td>
<td>Water (Surface, Eff., Ground)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
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<tr>
<td>SM21 2320B</td>
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<tr>
<td>SM21 4500-NH3 G</td>
<td>Ammonia-N (W) SM21 4500-NH3 G</td>
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<td>SM21 2340B</td>
<td>Dissolved Hardness as CaCO3 ICP-MS</td>
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<td>SM 5310B</td>
<td>Dissolved Organic Carbon</td>
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<td>SM21 4500NO3-F</td>
<td>Flow Injection Analysis</td>
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<td>EP245.1</td>
<td>Mercury EPA 245.1 DISSOLVED</td>
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<td>EP200.8</td>
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<td>SM21 4500P-B,E</td>
<td>Total Phosphorus (W)</td>
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Detectable Results Summary

### Dissolved Metals by ICP/MS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
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<tbody>
<tr>
<td>Aluminum</td>
<td>61.7</td>
<td>ug/L</td>
</tr>
<tr>
<td>Arsenic</td>
<td>1.54J</td>
<td>ug/L</td>
</tr>
<tr>
<td>Barium</td>
<td>13.9</td>
<td>ug/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>8850</td>
<td>ug/L</td>
</tr>
<tr>
<td>Copper</td>
<td>0.645J</td>
<td>ug/L</td>
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<tr>
<td>Hardness as CaCO3</td>
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<td>Iron</td>
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<td>Magnesium</td>
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<td>Manganese</td>
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</tr>
<tr>
<td>Total Phosphorus</td>
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### Waters Department

### Dissolved Metals by ICP/MS

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<th>Units</th>
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<td>Copper</td>
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<td>Nitrate-N</td>
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<td>Total Organic Carbon,Dissolved</td>
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<td>Total Phosphorus</td>
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## Detectable Results Summary

### Client Sample ID: Willow03
### Lab Sample ID: 1165628003

<table>
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<td>Copper</td>
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<td>Hardness as CaCO3</td>
<td>25.1</td>
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<tr>
<td>Titanium</td>
<td>3.27J</td>
<td>ug/L</td>
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<td>A kalinity</td>
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<td>mg/L</td>
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<td>Total Organic Carbon,Dissolved</td>
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### Waters Department

### Client Sample ID: Willow04
### Lab Sample ID: 1165628004

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<td>Copper</td>
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<td>26.2</td>
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<td>Total Phosphorus</td>
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Client Sample ID: Willow03 rep
Lab Sample ID: 1165628005

<table>
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<td>6990</td>
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<td>Manganese</td>
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<tr>
<td>Total Phosphorus</td>
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</table>
Results of Willow01

Client Sample ID: Willow01
Client Project ID: Willow Creek
Lab Sample ID: 1165628001
Lab Project ID: 1165628
Collection Date: 09/21/16 10:18
Received Date: 09/21/16 16:16
Matrix: Water (Surface, Eff., Ground)

Results by Dissolved Metals

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
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</tbody>
</table>

Batch Information

- Analytical Batch: MCV5741
- Analytical Method: EP245.1
- Analyst: NEG
- Analytical Date/Time: 09/30/16 13:22
- Container ID: 1165628001-G

- Prep Batch: MXX30242
- Prep Method: METHOD
- Prep Date/Time: 09/29/16 14:56
- Prep Initial Wt./Vol.: 25 mL
- Prep Extract Vol: 50 mL

Print Date: 10/13/2016 3:36:32PM
J flagging is activated
## Results by Dissolved Metals by ICP/MS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
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<tbody>
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<td>Arsenic</td>
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<tr>
<td>Copper</td>
<td>0.645 J</td>
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<tr>
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## Batch Information

- **Analytical Batch:** MMS9551
- **Analytical Method:** EP200.8
- **Analyst:** ACF
- **Analytical Date/Time:** 09/27/16 17:24
- **Container ID:** 1165628001-G

- **Prep Batch:** MXX30227
- **Prep Method:** E200.2
- **Prep Date/Time:** 09/27/16 09:52
- **Prep Initial Wt./Vol.:** 20 mL
- **Prep Extract Vol:** 50 mL

## Hardness as CaCO3

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<th>LOQ/CL</th>
<th>DL</th>
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<th>Date Analyzed</th>
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**Print Date:** 10/13/2016 3:36:32PM

J flagging is activated
# Results of Willow01

**Client Sample ID:** Willow01  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628001  
**Lab Project ID:** 1165628

**Collection Date:** 09/21/16 10:18  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

## Results by Dissolved Metals by ICP/MS

### Batch Information

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<tr>
<td>SM21 2340B</td>
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<th>Prep Date/Time</th>
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<tr>
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<tr>
<th>Container ID</th>
<th>Prep Extract Vol:</th>
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<td>50 mL</td>
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Print Date: 10/13/2016 3:36:32PM  
J flagging is activated
### Results of Willow01

Client Sample ID: Willow01  
Client Project ID: Willow Creek  
Lab Sample ID: 1165628001  
Lab Project ID: 1165628  
Collection Date: 09/21/16 10:18  
Received Date: 09/21/16 16:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

#### Results by Waters Department

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**Batch Information**
- Analytical Batch: WTC2634  
- Analytical Method: SM 5310B  
- Analyst: VDL  
- Analytical Date/Time: 09/27/16 18:29  
- Container ID: 1165628001-F

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<td>Alkalinity</td>
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**Batch Information**
- Analytical Batch: WTI4519  
- Analytical Method: SM21 2320B  
- Analyst: KBE  
- Analytical Date/Time: 09/23/16 20:33  
- Container ID: 1165628001-A

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<tr>
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**Batch Information**
- Analytical Batch: WDA3863  
- Prep Batch: WXX11639  
- Prep Method: METHOD  
- Prep Date/Time: 09/29/16 13:00  
- Prep Initial Wt./Vol.: 6 mL  
- Prep Extract Vol: 6 mL

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<th>DL</th>
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<th>Limits</th>
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<td>0.0300</td>
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J flagging is activated
Results of Willow01

Client Sample ID: Willow01
Client Project ID: Willow Creek
Lab Sample ID: 1165628001
Lab Project ID: 1165628

Collection Date: 09/21/16 10:18
Received Date: 09/21/16 16:16
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Waters Department

Batch Information
Analytical Batch: WFI2505
Analytical Method: SM21 4500NO3-F
Analyst: KBE
Analytical Date/Time: 09/21/16 17:39
Container ID: 1165628001-A

Parameter | Result | LOQ/CL | DL | Units | DF | Allowable Limits | Date Analyzed
--- | --- | --- | --- | --- | --- | --- | ---
Total Phosphorus | 0.0169 | 0.0100 | 0.00310 | mg/L | 1 | | 10/12/16 17:44

Batch Information
Analytical Batch: WDA3870
Analytical Method: SM21 4500P-B,E
Analyst: NEG
Analytical Date/Time: 10/12/16 17:44
Container ID: 1165628001-D

Prep Batch: WXX11653
Prep Method: SM21 4500P-B,E
Prep Date/Time: 10/07/16 16:15
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 25 mL

Print Date: 10/13/2016 3:36:32PM

J flagging is activated
### Results of Willow02

Client Sample ID: **Willow02**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1165628002  
Lab Project ID: 1165628  

Collection Date: 09/21/16 11:12  
Received Date: 09/21/16 16:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Dissolved Metals

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<tbody>
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### Batch Information

- **Analytical Batch**: MCV5741  
- **Analytical Method**: EP245.1  
- **Analyst**: NEG  
- **Analytical Date/Time**: 09/30/16 13:25  
- **Container ID**: 1165628002-G  

- **Prep Batch**: MXX30242  
- **Prep Method**: METHOD  
- **Prep Date/Time**: 09/29/16 14:56  
- **Prep Initial Wt./Vol.**: 25 mL  
- **Prep Extract Vol.**: 50 mL
### Results by Dissolved Metals by ICP/MS

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### Batch Information

- **Analytical Batch:** MMS9551
- **Analytical Method:** EP200.8
- **Prep Batch:** MXX30227
- **Prep Method:** E200.2
- **Prep Date/Time:** 09/27/16 09:52
- **Prep Initial Wt./Vol.:** 20 mL
- **Prep Extract Vol:** 50 mL
- **Analytical Date/Time:** 09/27/16 17:27
- **Container ID:** 1165628002-G

### Hardness as CaCO3

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<tr>
<th>Parameter</th>
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## Results of Willow02

**Client Sample ID:** Willow02  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628002  
**Lab Project ID:** 1165628  
**Collection Date:** 09/21/16 11:12  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

## Results by Dissolved Metals by ICP/MS

### Batch Information

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<td>Analytical Method</td>
<td>SM21 2340B</td>
</tr>
<tr>
<td>Analyst</td>
<td>ACF</td>
</tr>
<tr>
<td>Analytical Date/Time</td>
<td>09/27/16 17:27</td>
</tr>
<tr>
<td>Container ID</td>
<td>1165628002-G</td>
</tr>
<tr>
<td>Prep Batch</td>
<td>MXX30227</td>
</tr>
<tr>
<td>Prep Method</td>
<td>E200.2</td>
</tr>
<tr>
<td>Prep Date/Time</td>
<td>09/27/16 09:52</td>
</tr>
<tr>
<td>Prep Initial Wt./Vol.</td>
<td>20 mL</td>
</tr>
<tr>
<td>Prep Extract Vol.</td>
<td>50 mL</td>
</tr>
</tbody>
</table>

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J flagging is activated
### Results of Willow02

- **Client Sample ID:** Willow02
- **Client Project ID:** Willow Creek
- **Lab Sample ID:** 1165628002
- **Lab Project ID:** 1165628
- **Collection Date:** 09/21/16 11:12
- **Received Date:** 09/21/16 16:16
- **Matrix:** Water (Surface, Eff., Ground)
- **Solids (%):**
- **Location:**

### Results by Waters Department

#### Parameter: Total Organic Carbon, Dissolved

<table>
<thead>
<tr>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.61</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>09/27/16 18:42</td>
</tr>
</tbody>
</table>

**Batch Information**

- **Analytical Batch:** WTC2634
- **Analytical Method:** SM 5310B
- **Analyst:** VDL
- **Analytical Date/Time:** 09/27/16 18:42
- **Container ID:** 1165628002-F

#### Parameter: Alkalinity

<table>
<thead>
<tr>
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<th>LOQ/CL</th>
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<th>Units</th>
<th>DF</th>
<th>Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.6</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>09/23/16 20:39</td>
</tr>
</tbody>
</table>

**Batch Information**

- **Analytical Batch:** WTI4519
- **Analytical Method:** SM21 2320B
- **Analyst:** KBE
- **Analytical Date/Time:** 09/23/16 20:39
- **Container ID:** 1165628002-A

#### Parameter: Ammonia-N

<table>
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<tr>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>09/29/16 13:46</td>
</tr>
</tbody>
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**Batch Information**

- **Prep Batch:** WXX11639
- **Prep Method:** METHOD
- **Prep Date/Time:** 09/29/16 13:00
- **Prep Initial Wt./Vol.:** 6 mL
- **Prep Extract Vol:** 6 mL

#### Parameter: Nitrate-N

<table>
<thead>
<tr>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0308 J</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td></td>
<td>09/21/16 17:41</td>
</tr>
<tr>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td></td>
<td>09/21/16 17:41</td>
</tr>
</tbody>
</table>

**J flagging is activated**

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**Print Date:** 10/13/2016 3:36:32PM

**SGS North America Inc.**

200 West Potter Drive Anchorage, AK 95518

| 907.562.2343 | 907.561.5301 | www.us.sgs.com |

Member of SGS Group

16 of 65
### Results of Willow02

**Client Sample ID:** Willow02  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628002  
**Lab Project ID:** 1165628

**Collection Date:** 09/21/16 11:12  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

---

### Results by Waters Department

#### Batch Information

- **Analytical Batch:** WFI2505  
- **Analytical Method:** SM21 4500NO3-F  
- **Analyst:** KBE  
- **Analytical Date/Time:** 09/21/16 17:41  
- **Container ID:** 1165628002-A

#### Batch Information

- **Prep Batch:** WXX11653  
- **Prep Method:** SM21 4500P-B,E  
- **Prep Date/Time:** 10/07/16 16:15  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 25 mL

#### Batch Information

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.00770 J</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>10/12/16 17:45</td>
</tr>
</tbody>
</table>

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**Print Date:** 10/13/2016 3:36:32PM  
**J flagging is activated**
Results of Willow03

Client Sample ID: Willow03
Client Project ID: Willow Creek
Lab Sample ID: 1165628003
Lab Project ID: 1165628
Collection Date: 09/21/16 11:55
Received Date: 09/21/16 16:16
Matrix: Water (Surface, Eff., Ground)

Solids (%):

Location:

Results by Dissolved Metals

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<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
<td>1</td>
<td></td>
<td>09/30/16 13:28</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: MCV5741
Analytical Method: EP245.1
Analyst: NEG
Analytical Date/Time: 09/30/16 13:28
Container ID: 1165628003-G

Prep Batch: MXX30242
Prep Method: METHOD
Prep Date/Time: 09/29/16 14:56
Prep Initial Wt./Vol.: 25 mL
Prep Extract Vol: 50 mL
### Results of Willow03

- **Client Sample ID:** Willow03  
- **Client Project ID:** Willow Creek  
- **Lab Sample ID:** 1165628003  
- **Lab Project ID:** 1165628  
- **Collection Date:** 09/21/16 11:55  
- **Received Date:** 09/21/16 16:16  
- **Matrix:** Water (Surface, Eff., Ground)  
- **Solids (%):**  
- **Location:**  

### Results by Dissolved Metals by ICP/MS

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<thead>
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<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>80.8</td>
<td>20.0</td>
<td>6.20</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Arsenic</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Barium</td>
<td>10.2</td>
<td>3.00</td>
<td>0.940</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Beryllium</td>
<td>0.200 U</td>
<td>0.400</td>
<td>0.130</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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<tr>
<td>Cadmium</td>
<td>0.250 U</td>
<td>0.500</td>
<td>0.150</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Calcium</td>
<td>7240</td>
<td>500</td>
<td>150</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Chromium</td>
<td>1.00 U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Cobalt</td>
<td>2.00 U</td>
<td>4.00</td>
<td>1.20</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Copper</td>
<td>0.902 J</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
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<tr>
<td>Iron</td>
<td>275</td>
<td>250</td>
<td>78.0</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Lead</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.062</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1700</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Manganese</td>
<td>20.3</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
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</tr>
<tr>
<td>Molybdenum</td>
<td>1.00 U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Nickel</td>
<td>1.00 U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/L</td>
<td>1</td>
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</tr>
<tr>
<td>Phosphorus</td>
<td>100 U</td>
<td>200</td>
<td>62.0</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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<tr>
<td>Potassium</td>
<td>696</td>
<td>500</td>
<td>150</td>
<td>ug/L</td>
<td>1</td>
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<tr>
<td>Selenium</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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<tr>
<td>Silicon</td>
<td>4160</td>
<td>1000</td>
<td>310</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Silver</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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<tr>
<td>Sodium</td>
<td>4050</td>
<td>500</td>
<td>150</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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<tr>
<td>Thallium</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Tin</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Titanium</td>
<td>3.27 J</td>
<td>6.25</td>
<td>3.13</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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<tr>
<td>Vanadium</td>
<td>10.0 U</td>
<td>20.0</td>
<td>6.20</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
<tr>
<td>Zinc</td>
<td>2.50 U</td>
<td>5.00</td>
<td>2.50</td>
<td>ug/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** MMS9551  
- **Analytical Method:** EP200.8  
- **Analyst:** ACF  
- **Analytical Date/Time:** 09/27/16 17:30  
- **Container ID:** 1165628003-G  

- **Prep Batch:** MXX30227  
- **Prep Method:** E200.2  
- **Prep Date/Time:** 09/27/16 09:52  
- **Prep Initial Wt./Vol.:** 20 mL  
- **Prep Extract Vol:** 50 mL  

### Hardness as CaCO3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardness as CaCO3</td>
<td>25.1</td>
<td>5.00</td>
<td>5.00</td>
<td>mg/L</td>
<td>1</td>
<td>09/27/16 17:30</td>
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</tbody>
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**Print Date:** 10/13/2016 3:36:32PM

**J flagging is activated**
Results of Willow03

Client Sample ID: Willow03
Client Project ID: Willow Creek
Lab Sample ID: 1165628003
Lab Project ID: 1165628

Collection Date: 09/21/16 11:55
Received Date: 09/21/16 16:16
Matrix: Water (Surface, Eff., Ground)

Results by Dissolved Metals by ICP/MS

Batch Information
Analytical Batch: MMS9551
Analytical Method: SM21 2340B
Analyst: ACF
Analytical Date/Time: 09/27/16 17:30
Container ID: 1165628003-G

Prep Batch: MXX30227
Prep Method: E200.2
Prep Date/Time: 09/27/16 09:52
Prep Initial Wt./Vol.: 20 mL
Prep Extract Vol: 50 mL
### Results of Willow03

**Client Sample ID:** Willow03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628003  
**Lab Project ID:** 1165628

**Collection Date:** 09/21/16 11:55  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)

### Results by Waters Department

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon,Dissolved</td>
<td>2.26</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>09/27/16 18:56</td>
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</table>

**Batch Information**

- Analytical Batch: WTC2634  
- Analytical Method: SM 5310B  
- Analyst: VDL  
- Analytical Date/Time: 09/27/16 18:56  
- Container ID: 1165628003-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>24.4</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
<td>1</td>
<td></td>
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</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WTI4519  
- Analytical Method: SM21 2320B  
- Analyst: KBE  
- Analytical Date/Time: 09/23/16 20:45  
- Container ID: 1165628003-A

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>1</td>
<td></td>
<td>09/29/16 13:47</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WDA3863  
- Analytical Method: SM21 4500-NH3 G  
- Analyst: NEG  
- Analytical Date/Time: 09/29/16 13:47  
- Container ID: 1165628003-D

<table>
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<tr>
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<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
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<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td></td>
<td>09/21/16 17:43</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
<td>2</td>
<td></td>
<td>09/21/16 17:43</td>
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</tbody>
</table>

**Batch Information**

- Prep Batch: WXX11639  
- Prep Method: METHOD  
- Prep Date/Time: 09/29/16 13:00  
- Prep Initial Wt./Vol.: 6 mL  
- Prep Extract Vol: 6 mL

**J flagging is activated**

Print Date: 10/13/2016 3:36:32PM

J flagging is activated
### Results of Willow03

Client Sample ID: **Willow03**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1165628003  
Lab Project ID: 1165628  
Collection Date: 09/21/16 11:55  
Received Date: 09/21/16 16:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:

### Batch Information

- Analytical Batch: WFI2505  
- Analytical Method: SM21 4500NO3-F  
- Analyst: KBE  
- Analytical Date/Time: 09/21/16 17:43  
- Container ID: 1165628003-A

### Results by Waters Department

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>DL</th>
<th>Units</th>
<th>DF</th>
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<th>Date Analyzed</th>
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<tbody>
<tr>
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<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
<td>1</td>
<td>10.0100</td>
<td>10/12/16 17:49</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WDA3870  
- Analytical Method: SM21 4500P-B,E  
- Analyst: NEG  
- Analytical Date/Time: 10/12/16 17:49  
- Container ID: 1165628003-D

- Prep Batch: WXX11653  
- Prep Method: SM21 4500P-B,E  
- Prep Date/Time: 10/07/16 16:15  
- Prep Initial Wt./Vol.: 25 mL  
- Prep Extract Vol: 25 mL
### Results of Willow04

Client Sample ID: **Willow04**  
Client Project ID: **Willow Creek**  
Lab Sample ID: **1165628004**  
Lab Project ID: **1165628**

Collection Date: **09/21/16 13:55**  
Received Date: **09/21/16 16:16**  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Dissolved Metals

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
<td>1</td>
<td></td>
<td>09/30/16 13:42</td>
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**Batch Information**

- **Prep Batch**: MXX30243  
- **Prep Method**: METHOD  
- **Prep Date/Time**: 09/29/16 14:56  
- **Prep Initial Wt./Vol.**: 25 mL  
- **Prep Extract Vol**: 50 mL

- **Analytical Batch**: MCV5742  
- **Analytical Method**: EP245.1  
- **Analyst**: NEG  
- **Analytical Date/Time**: 09/30/16 13:42  
- **Container ID**: 1165628004-G
### Results by Dissolved Metals by ICP/MS

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<th>DL</th>
<th>Units</th>
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<th>Date Analyzed</th>
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<tr>
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<tr>
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### Batch Information

- **Analytical Batch**: MMS9551
- **Analytical Method**: EP200.8
- **Analyst**: ACF
- **Analytical Date/Time**: 09/27/16 17:33
- **Container ID**: 1165628004-G

- **Prep Batch**: MXX30227
- **Prep Method**: E200.2
- **Prep Initial Wt./Vol.**: 20 mL
- **Prep Extract Vol**: 50 mL
- **Prep Date/Time**: 09/27/16 09:52

### Parameter

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J flagging is activated
## Results of Willow04

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<td>Lab Sample ID:</td>
<td>1165628004</td>
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<tr>
<td>Lab Project ID:</td>
<td>1165628</td>
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</table>

| Collection Date: | 09/21/16 13:55 |
| Received Date:   | 09/21/16 16:16 |
| Matrix:          | Water (Surface, Eff., Ground) |
| Solids (%):      | |
| Location:        | |

## Results by Dissolved Metals by ICP/MS

### Batch Information

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<td>SM21 2340B</td>
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<td>Analyst:</td>
<td>ACF</td>
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<td>Analytical Date/Time:</td>
<td>09/27/16 17:33</td>
</tr>
<tr>
<td>Container ID:</td>
<td>1165628004-G</td>
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</tbody>
</table>

| Prep Batch:      | MXX30227 |
| Prep Method:     | E200.2 |
| Prep Date/Time:  | 09/27/16 09:52 |
| Prep Initial Wt./Vol.: | 20 mL |
| Prep Extract Vol:| 50 mL |

---

Print Date: 10/13/2016 3:36:32PM

J flagging is activated
## Results of Willow04

**Client Sample ID:** Willow04  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628004  
**Lab Project ID:** 1165628

### Collection and Received Dates
- **Collection Date:** 09/21/16 13:55
- **Received Date:** 09/21/16 16:16

### Matrix
- **Matrix:** Water (Surface, Eff., Ground)

### Solids (%):

### Date Analyzed

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<th>DF</th>
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### Batch Information
- **Analytical Batch:** WTC2634  
- **Analytical Method:** SM 5310B  
- **Analyst:** VDL  
- **Analytical Date/Time:** 09/27/16 19:09  
- **Container ID:** 1165628004-F

### Date Analyzed

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### Batch Information
- **Analytical Batch:** WTI4519  
- **Analytical Method:** SM21 2320B  
- **Analyst:** KBE  
- **Analytical Date/Time:** 09/23/16 20:52  
- **Container ID:** 1165628004-A

### Date Analyzed

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<th>DL</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>Ammonia-N</strong></td>
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### Batch Information
- **Prep Batch:** WXX11639  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 09/29/16 13:00  
- **Prep Initial Wt./Vol.:** 6 mL  
- **Prep Extract Vol:** 6 mL

### Batch Information
- **Prep Batch:** WXX11639  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 09/29/16 13:00  
- **Prep Initial Wt./Vol.:** 6 mL  
- **Prep Extract Vol:** 6 mL

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<td>0.0300</td>
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<td><strong>Nitrite-N</strong></td>
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<td>0.0300</td>
<td>mg/L</td>
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<td>09/21/16 17:45</td>
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</table>

### Date Analyzed

- **Print Date:** 10/13/2016 3:36:32PM

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SGS North America Inc.  
200 West Potter Drive Anchorage, AK 95518  
† 907.562.2343 † 907.561.5301  www.us.sgs.com

J flagging is activated
### Results of Willow04

- **Client Sample ID**: Willow04
- **Client Project ID**: Willow Creek
- **Lab Sample ID**: 1165628004
- **Lab Project ID**: 1165628
- **Collection Date**: 09/21/16 13:55
- **Received Date**: 09/21/16 16:16
- **Matrix**: Water (Surface, Eff., Ground)

### Results by Waters Department

#### Batch Information

- **Analytical Batch**: WFI2505
- **Analytical Method**: SM21 4500NO3-F
- **Analyst**: KBE
- **Analytical Date/Time**: 09/21/16 17:45
- **Container ID**: 1165628004-A

#### Batch Information

- **Prep Batch**: WXX11653
- **Prep Method**: SM21 4500P-B,E
- **Prep Date/Time**: 10/07/16 16:15
- **Prep Initial Wt./Vol.**: 25 mL
- **Prep Extract Vol.**: 25 mL

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Print Date: 10/13/2016 3:36:32PM

J flagging is activated
## Results of Willow03 rep

Client Sample ID: **Willow03 rep**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1165628005  
Lab Project ID: 1165628  

Collection Date: 09/21/16 11:57  
Received Date: 09/21/16 16:16  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Dissolved Metals

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### Batch Information

- **Analytical Batch:** MCV5742  
- **Analytical Method:** EP245.1  
- **Analyst:** NEG  
- **Analytical Date/Time:** 09/30/16 13:45  
- **Container ID:** 1165628005-G  
- **Prep Batch:** MXX30243  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 09/29/16 14:56  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL  

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Print Date: 10/13/2016 3:36:32PM  
J flagging is activated
### Results of Willow03 rep

**Client Sample ID:** Willow03 rep  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628005  
**Lab Project ID:** 1165628  
**Collection Date:** 09/21/16 11:57  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**

#### Results by Dissolved Metals by ICP/MS

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<tr>
<td>Potassium</td>
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<tr>
<td>Selenium</td>
<td>2.50 U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
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<tr>
<td>Silicon</td>
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<tr>
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<tr>
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</tr>
<tr>
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<td>1.00</td>
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**Batch Information**

- **Analytical Batch:** MMS9551  
- **Analytical Method:** EP200.8  
- **Analyst:** ACF  
- **Analytical Date/Time:** 09/27/16 17:36  
- **Container ID:** 1165628005-G

**Parameter**  
**Result Qual**  
**LOQ/CL**  
**DL**  
**Units**  
**DF**  
**Allowable Limits**  
**Date Analyzed**

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<th>DF</th>
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Print Date: 10/13/2016 3:36:32PM

J flagging is activated
### Results of Willow03 rep

**Client Sample ID:** Willow03 rep  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628005  
**Lab Project ID:** 1165628  
**Collection Date:** 09/21/16 11:57  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  
**Location:**  

### Results by Dissolved Metals by ICP/MS

#### Batch Information

- **Analytical Batch:** MMS9551  
- **Analytical Method:** SM21 2340B  
- **Analyst:** ACF  
- **Analytical Date/Time:** 09/27/16 17:36  
- **Container ID:** 1165628005-G  
- **Prep Batch:** MXX30227  
- **Prep Method:** E200.2  
- **Prep Date/Time:** 09/27/16 09:52  
- **Prep Initial Wt./Vol.:** 20 mL  
- **Prep Extract Vol:** 50 mL
## Results by Waters Department

### Total Organic Carbon, Dissolved

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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<td>Total Organic Carbon, Dissolved</td>
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### Batch Information

Analytical Batch: WTC2634
Analytical Method: SM 5310B
Analyst: VDL
Analytical Date/Time: 09/27/16 19:22
Container ID: 1165628005-F

### Alkalinity

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<td>Alkalinity</td>
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<td>110.0</td>
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### Batch Information

Analytical Batch: WTI4519
Analytical Method: SM21 2320B
Analyst: KBE
Analytical Date/Time: 09/23/16 20:59
Container ID: 1165628005-A

### Ammonia-N

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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
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<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500 U</td>
<td>0.100</td>
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<td>1</td>
<td>0.100</td>
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### Batch Information

Prep Batch: WXX11639
Prep Method: METHOD
Prep Date/Time: 09/29/16 13:00
Prep Initial Wt./Vol.: 6 mL
Prep Extract Vol: 6 mL

### Nitrate-N

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<th>Allowable Limits</th>
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</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
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<td>0.0300</td>
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### Nitrite-N

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<tbody>
<tr>
<td>Nitrite-N</td>
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<td>0.0300</td>
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<td>0.0300</td>
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### Results of Willow03 rep

**Client Sample ID:** Willow03 rep  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1165628005  
**Lab Project ID:** 1165628  

**Collection Date:** 09/21/16 11:57  
**Received Date:** 09/21/16 16:16  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**  

**Location:**

---

#### Results by Waters Department

**Batch Information**

- **Analytical Batch:** WFI2505  
- **Analytical Method:** SM21 4500NO3-F  
- **Analyst:** KBE  
- **Analytical Date/Time:** 09/21/16 17:46  
- **Container ID:** 1165628005-A

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<th>DF</th>
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<tr>
<td>Total Phosphorus</td>
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<td>10.0100</td>
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#### Batch Information

- **Prep Batch:** WXX11653  
- **Prep Method:** SM21 4500P-B,E  
- **Prep Date/Time:** 10/07/16 16:15  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 25 mL  

- **Analytical Batch:** WDA3870  
- **Analytical Method:** SM21 4500P-B,E  
- **Analyst:** NEG  
- **Analytical Date/Time:** 10/12/16 17:51  
- **Container ID:** 1165628005-D  

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Print Date: 10/13/2016 3:36:32PM  
J flagging is activated
## Results by EP200.8

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<th>Results</th>
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<th>Units</th>
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<tr>
<td>Aluminum</td>
<td>10.0U</td>
<td>20.0</td>
<td>6.20</td>
<td>ug/L</td>
</tr>
<tr>
<td>Antimony</td>
<td>0.500U</td>
<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
</tr>
<tr>
<td>Arsenic</td>
<td>2.50U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/L</td>
</tr>
<tr>
<td>Barium</td>
<td>1.50U</td>
<td>3.00</td>
<td>0.940</td>
<td>ug/L</td>
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<tr>
<td>Beryllium</td>
<td>0.200U</td>
<td>0.400</td>
<td>0.130</td>
<td>ug/L</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.250U</td>
<td>0.500</td>
<td>0.150</td>
<td>ug/L</td>
</tr>
<tr>
<td>Calcium</td>
<td>250U</td>
<td>500</td>
<td>150</td>
<td>ug/L</td>
</tr>
<tr>
<td>Chromium</td>
<td>1.00U</td>
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<td>Cobalt</td>
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<td>ug/L</td>
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<tr>
<td>Copper</td>
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<td>1.00</td>
<td>0.310</td>
<td>ug/L</td>
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</tr>
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<td>2.00</td>
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<td>Nickel</td>
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<td>ug/L</td>
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<td>Silver</td>
<td>0.500U</td>
<td>1.00</td>
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<td>Sodium</td>
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## Batch Information

- Analytical Batch: MMS9551
- Analytical Method: EP200.8
- Instrument: Perkin Elmer NexIon P5
- Analyst: ACF
- Analytical Date/Time: 9/27/2016 4:33:32PM

- Prep Batch: MXX30227
- Prep Method: E200.2
- Prep Date/Time: 9/27/2016 9:52:01AM
- Prep Initial Wt./Vol.: 20 mL
- Prep Extract Vol: 50 mL
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1165628 [MXX30227]
Blank Spike Lab ID: 1354580
Date Analyzed: 09/27/2016 16:36

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by EP200.8

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<th>Rec (%)</th>
<th>CL</th>
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<td>(85-115)</td>
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<td>963</td>
<td>96</td>
<td>(85-115)</td>
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<tr>
<td>Arsenic</td>
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<td>936</td>
<td>94</td>
<td>(85-115)</td>
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<tr>
<td>Barium</td>
<td>1000</td>
<td>991</td>
<td>99</td>
<td>(85-115)</td>
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<td>Beryllium</td>
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**Batch Information**

Analytical Batch: MMS9551
Analytical Method: EP200.8
Instrument: Perkin Elmer NexIon P5
Analyst: ACF

Prep Batch: MXX30227
Prep Method: E200.2
Prep Date/Time: 09/27/2016 09:52

Dupe Init Wt./Vol.: 1000 ug/L Extract Vol: 50 mL

Print Date: 10/13/2016 3:37:29PM

SGS North America Inc.

200 West Potter Drive Anchorage, AK 95518
t 907.562.2343 f 907.561.5301 www.us.sgs.com

Member of SGS Group
### Matrix Spike Summary

<table>
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<th>Spike</th>
<th>Result</th>
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<td>101</td>
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<td>Titanium</td>
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### Batch Information

- **Analytical Batch**: MMS9551
- **Analytical Method**: EP200.8
- **Instrument**: Perkin Elmer Nexion P5
- **Analyst**: ACF
- **Analytical Date/Time**: 9/27/2016 5:21:35PM

- **Prep Batch**: MXX30227
- **Prep Method**: DW Digest for Metals on ICP-MS
- **Prep Date/Time**: 9/27/2016 9:52:01AM
- **Prep Initial Wt./Vol.**: 20.00mL
- **Prep Extract Vol.**: 50.00mL

Print Date: 10/13/2016 3:37:33PM

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## Method Blank

Blank ID: MB for HBN 1744341 [MXX/30242]  
Blank Lab ID: 1355768  
QC for Samples: 1165628001, 1165628002, 1165628003

Matrix: Water (Surface, Eff., Ground)

## Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
</tr>
</tbody>
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## Batch Information

- **Analytical Batch:** MCV5741  
- **Analytical Method:** EP245.1  
- **Instrument:** PSA Millennium mercury AA  
- **Analyst:** NEG  
- **Analytical Date/Time:** 9/30/2016 12:06:54PM  
- **Prep Batch:** MXX30242  
- **Prep Method:** METHOD  
- **Prep Date/Time:** 9/29/2016 2:56:00PM  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol:** 50 mL
### Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [MXX30242]
Blank Spike Lab ID: 1355769
Date Analyzed: 09/30/2016 12:15

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628001, 1165628002, 1165628003

### Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>4</td>
<td>4.51</td>
<td>113</td>
<td>(85-115)</td>
</tr>
</tbody>
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### Batch Information

Analytical Batch: MCV5741
Analytical Method: EP245.1
Instrument: PSA Millennium mercury AA
Analyst: NEG

Prep Batch: MXX30242
Prep Method: METHOD
Prep Date/Time: 09/29/2016 14:56
Splice Init Wt./Vol.: 4 ug/L  Extract Vol: 50 mL
Dupe Init Wt./Vol.:  Extract Vol:  

Print Date: 10/13/2016 3:37:50PM
### Matrix Spike Summary

- **Original Sample ID:** 1165635001
- **MS Sample ID:** 1355770 MS
- **MSD Sample ID:**
- **Analysis Date:** 09/30/2016 12:18
- **Analysis Date:** 09/30/2016 12:23
- **Analysis Date:**
- **Matrix:** Water (Surface, Eff., Ground)
- **QC for Samples:** 1165628001, 1165628002, 1165628003

### Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike (ug/L)</th>
<th>Result (ug/L)</th>
<th>Rec (%)</th>
<th>Spike (ug/L)</th>
<th>Result (ug/L)</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>8.00</td>
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<td>124</td>
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</table>

### Batch Information

- **Analytical Batch:** MCV5741
- **Analytical Method:** EP245.1
- **Instrument:** PSA Millennium mercury AA
- **Analyst:** NEG
- **Analytical Date/Time:** 9/30/2016 12:23:22PM

- **Prep Batch:** MXX30242
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 9/29/2016 2:56:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
Matrix Spike Summary

Original Sample ID: 1165724002  Analysis Date: 09/30/2016 13:04
MS Sample ID: 1355771 MS  Analysis Date: 09/30/2016 13:07
MSD Sample ID:  Analysis Date:  
QC for Samples: 1165628001, 1165628002, 1165628003  Matrix: Water (Surface, Eff., Ground)

Results by EP245.1

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
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<td>Mercury</td>
<td>0.100U</td>
<td>8.00</td>
<td>9.78</td>
<td>122</td>
<td></td>
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<td></td>
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Batch Information

Analytical Batch: MCV5741  Prep Batch: MXX30242
Instrument: PSA Millennium mercury AA  Prep Date/Time: 9/29/2016 2:56:00PM
Analyst: NEG  Prep Initial Wt./Vol.: 25.00mL
Analytical Date/Time: 9/30/2016 1:07:18PM  Prep Extract Vol: 50.00mL
**Method Blank**

Blank ID: MB for HBN 1744344 [MXX/30243]  
Blank Lab ID: 1355784  
Matrix: Water (Surface, Eff., Ground)

QC for Samples:  
1165628004, 1165628005

**Results by EP245.1**

<table>
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<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
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<td>Mercury</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0620</td>
<td>ug/L</td>
</tr>
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**Batch Information**

- Analytical Batch: MCV5742  
- Analytical Method: EP245.1  
- Instrument: PSA Millennium mercury AA  
- Analyst: NEG  
- Analytical Date/Time: 9/30/2016 1:36:52PM

  - Prep Batch: MXX30243  
  - Prep Method: METHOD  
  - Prep Date/Time: 9/29/2016 2:56:00PM  
  - Prep Initial Wt./Vol.: 25 mL  
  - Prep Extract Vol: 50 mL
Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [MXX30243]
Blank Spike Lab ID: 1355785
Date Analyzed: 09/30/2016 13:39

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628004, 1165628005

Results by EP245.1

Blank Spike Summary

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<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
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<tbody>
<tr>
<td>Mercury</td>
<td>4</td>
<td>4.43</td>
<td>111</td>
<td>(85-115)</td>
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Batch Information

Analytical Batch: MCV5742
Analytical Method: EP245.1
Instrument: PSA Millennium mercury AA
Analyst: NEG

Prep Batch: MXX30243
Prep Method: METHOD
Prep Date/Time: 09/29/2016 14:56
Spike Init Wt./Vol.: 4 ug/L
Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:
# Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
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<tr>
<td>Mercury</td>
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<td>9.87</td>
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<td>70-130</td>
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## Batch Information

- Analytical Batch: MCV5742
- Analytical Method: EP245.1
- Instrument: PSA Millennium mercury AA
- Analyst: NEG
- Analytical Date/Time: 9/30/2016 1:51:34PM

- Prep Batch: MXX30243
- Prep Method: Digestion Mercury 245.1 (W)
- Prep Date/Time: 9/29/2016 2:56:00PM
- Prep Initial Wt./Vol.: 25.00mL
- Prep Extract Vol: 50.00mL
### Matrix Spike Summary

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<tr>
<th>Original Sample ID:</th>
<th>MS Sample ID:</th>
<th>MSD Sample ID:</th>
<th>Analysis Date:</th>
<th>Analysis Date:</th>
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<th>Matrix:</th>
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<td>09/30/2016 14:26</td>
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<td>QC for Samples:</td>
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<td>1165628004, 1165628005</td>
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### Results by EP245.1

<table>
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<tr>
<th>Parameter</th>
<th>Matrix Spike (ug/L)</th>
<th>Spike Duplicate (ug/L)</th>
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<tbody>
<tr>
<td></td>
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<td>Spike</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.200U</td>
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### Batch Information

- **Prep Batch:** MXX30243
- **Prep Method:** Digestion Mercury 245.1 (W)
- **Prep Date/Time:** 9/29/2016 2:56:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
- **Prep Method:** EP245.1
- **Prep Date/Time:** 9/29/2016 2:29:42PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol:** 50.00mL
- **Instrument:** PSA Millennium mercury AA
- **Analyst:** NEG
- **Analytical Date/Time:** 9/30/2016 2:29:42PM
- **Analytical Batch:** MCV5742

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Member of SGS Group
**Method Blank**

Blank ID: MB for HBN 1744044 (WFI/2505)
Blank Lab ID: 1354451

QC for Samples:

**Matrix: Water (Surface, Eff., Ground)**

Results by **SM21 4500NO3-F**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.030</td>
<td>mg/L</td>
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<tr>
<td>Nitrite-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.030</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.030</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WFI2505
- Analytical Method: SM21 4500NO3-F
- Instrument: Astoria segmented flow
- Analyst: KBE
- Analytical Date/Time: 9/21/2016 3:25:43PM

Print Date: 10/13/2016 3:38:08PM
### Method Blank

Blank ID: MB for HBN 1744044 (WFI/2505)  
Blank Lab ID: 1354457

Matrix: Water (Surface, Eff., Ground)

QC for Samples:
1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by SM21 4500NO3-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
</tr>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0300</td>
<td>mg/L</td>
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</tbody>
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### Batch Information

- Analytical Batch: WFI2505
- Analytical Method: SM21 4500NO3-F
- Instrument: Astoria segmented flow
- Analyst: KBE
- Analytical Date/Time: 9/21/2016 4:11:13PM

Print Date: 10/13/2016 3:38:08PM
Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [WFI2505]
Blank Spike Lab ID: 1354449
Date Analyzed: 09/21/2016 15:23

Matrix: Water (Surface, Eff., Ground)

QC for Samples:

Results by SM21 4500NO3-F

<table>
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<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>2.5</td>
<td>2.51</td>
<td>100</td>
<td>(70-130)</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>2.5</td>
<td>2.52</td>
<td>101</td>
<td>(90-110)</td>
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<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>5</td>
<td>5.03</td>
<td>101</td>
<td>(90-110)</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WFI2505
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: KBE

Prep Batch:
Prep Method:
Prep Date/Time:
Spike Init Wt./Vol.: 2.5 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: Extract Vol:
Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [WFI2505]
Blank Spike Lab ID: 1354455
Date Analyzed: 09/21/2016 16:09
Matrix: Water (Surface, Eff., Ground)
QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

Results by SM21 4500NO3-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>2.5</td>
<td>2.56</td>
<td>102</td>
<td>(70-130)</td>
</tr>
<tr>
<td>Nitrite-N</td>
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<td>2.54</td>
<td>102</td>
<td>(90-110)</td>
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<td>Total Nitrate/Nitrite-N</td>
<td>5</td>
<td>5.10</td>
<td>102</td>
<td>(90-110)</td>
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Batch Information

Analytical Batch: WFI2505
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: KBE
Prep Batch: 
Prep Method: 
Prep Date/Time: 
Spike Init Wt./Vol.: 2.5 mg/L Extract Vol: 5 mL
Dupe Init Wt./Vol.: Extract Vol: 

Print Date: 10/13/2016 3:38:15PM
Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>0.100U</td>
<td>5.00</td>
<td>4.95</td>
<td>99</td>
<td>5.00</td>
<td>5.02</td>
<td>100</td>
<td>90-110</td>
<td>1.40</td>
<td>(&lt; 25 )</td>
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Results by SM21 4500NO3-F

Matrix Spike Summary

QC for Samples:

Analysis Date: 09/21/2016 14:55
Analysis Date: 09/21/2016 14:57
Analysis Date: 09/21/2016 14:59
Matrix: Drinking Water

Results by SM21 4500NO3-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
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<tbody>
<tr>
<td>Total Nitrate/Nitrite-N</td>
<td>0.100U</td>
<td>5.00</td>
<td>4.95</td>
<td>99</td>
<td>5.00</td>
<td>5.02</td>
<td>100</td>
<td>90-110</td>
<td>1.40</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

Batch Information

Prep Initial Wt./Vol.: 5.00mL
Prep Extract Vol: 5.00mL
Prep Date/Time:
Prep Method:
Prep Batch:
Instrument: Astoria segmented flow
Analyst: KBE
Analytical Date/Time: 9/21/2016 2:57:43PM

Prep Date/Time: 5.00mL
Prep Method:
Prep Batch:
Analytical Method: SM21 4500NO3-F
Instrument: Astoria segmented flow
Analyst: KBE
Analytical Date/Time: 9/21/2016 2:57:43PM

Print Date: 10/13/2016 3:38:24PM

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Member of SGS Group
### Matrix Spike Summary

**Original Sample ID:** 1165611001  
**MS Sample ID:** 1354427 MS  
**MSD Sample ID:** 1354428 MSD  
**Analysis Date:** 09/21/2016 15:41  
**Analysis Date:** 09/21/2016 15:43  
**Analysis Date:** 09/21/2016 15:44  
**Matrix:** Drinking Water

**QC for Samples:** 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by SM21 4500NO3-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Matrix Spike (mg/L)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.100U</td>
<td>2.50</td>
<td>2.50</td>
<td>2.38</td>
<td>135</td>
<td>2.50</td>
<td>2.93</td>
<td>117</td>
<td>70-130</td>
<td>14.10</td>
<td>(&lt; 25 )</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.100U</td>
<td>2.50</td>
<td>2.50</td>
<td>2.52</td>
<td>101</td>
<td>2.50</td>
<td>2.84</td>
<td>113</td>
<td>90-110</td>
<td>11.90</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WF12505  
- **Analytical Method:** SM21 4500NO3-F  
- **Instrument:** Astoria segmented flow  
- **Analyst:** KBE  
- **Analytical Date/Time:** 9/21/2016 3:43:13PM

- **Prep Batch:**  
- **Prep Method:**  
- **Prep Date/Time:**  
- **Prep Initial Wt./Vol.:** 5.00mL  
- **Prep Extract Vol:** 5.00mL

---

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Member of SGS Group
### Matrix Spike Summary

<table>
<thead>
<tr>
<th>Original Sample ID</th>
<th>Analysis Date: 09/21/2016 17:46</th>
</tr>
</thead>
<tbody>
<tr>
<td>MS Sample ID</td>
<td>Analysis Date: 09/21/2016 17:48</td>
</tr>
<tr>
<td>MSD Sample ID</td>
<td>Analysis Date: 09/21/2016 17:50</td>
</tr>
</tbody>
</table>

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by SM21 4500NO3-F

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrate-N</td>
<td>0.0500U</td>
<td>2.50</td>
<td>2.68</td>
<td>107</td>
<td>2.50</td>
<td>2.51</td>
<td>101</td>
<td>70-130</td>
<td>6.40</td>
<td>(&lt; 25 )</td>
</tr>
<tr>
<td>Nitrite-N</td>
<td>0.0500U</td>
<td>2.50</td>
<td>2.62</td>
<td>105</td>
<td>2.50</td>
<td>2.82</td>
<td>113</td>
<td>90-110</td>
<td>7.50</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WF2505
- **Analytical Method:** SM21 4500NO3-F
- **Instrument:** Astoria segmented flow
- **Analyst:** KBE
- **Analytical Date/Time:** 9/21/2016 5:48:33PM

- **Prep Batch:**
- **Prep Method:**
- **Prep Date/Time:**
- **Prep Initial Wt./Vol.:** 5.00mL
- **Prep Extract Vol:** 5.00mL

Print Date: 10/13/2016 3:38:24PM
Method Blank

Blank ID: MB for HBN 1744220 [WTC/2634]  
Blank Lab ID: 1355205  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1165628001, 1165628002, 1165628003, 1165628004, 1165628005

Results by SM 5310B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>0.370J</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WTC2634  
Analytical Method: SM 5310B  
Instrument: TOC Analyzer  
Analyst: VDL  
Analytical Date/Time: 9/27/2016 3:10:30PM
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1165628 [WTC2634]  
Blank Spike Lab ID: 1355203  
Date Analyzed: 09/27/2016 14:55  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

**Results by SM 5310B**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>75</td>
<td>79.6</td>
<td>106</td>
<td>(80-120)</td>
</tr>
</tbody>
</table>

**Batch Information**

Analytical Batch: WTC2634  
Analytical Method: SM 5310B  
Instrument: TOC Analyzer  
Analyst: VDL  
Prep Batch:  
Prep Method:  
Prep Date/Time:  
Spike Init Wt./Vol.: 75 mg/L Extract Vol: 30 mL  
Dupe Init Wt./Vol.: Extract Vol:
Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Original Sample ID</th>
<th>Analysis Date: 09/27/2016 15:25</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MS Sample ID: 1355211 MS</td>
<td>Analysis Date: 09/27/2016 15:41</td>
</tr>
<tr>
<td></td>
<td>MSD Sample ID: 1355212 MSD</td>
<td>Analysis Date: 09/27/2016 15:54</td>
</tr>
<tr>
<td>QC for Samples:</td>
<td>1165628001, 1165628002, 1165628003, 1165628004, 1165628005</td>
<td></td>
</tr>
</tbody>
</table>

Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Organic Carbon</td>
<td>1.82</td>
<td>10.0</td>
<td>12.5</td>
<td>10.0</td>
<td>12.9</td>
<td>111</td>
<td>75-125</td>
<td>3.10</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

Batch Information

- Analytical Batch: WTC2634
- Analytical Method: SM 5310B
- Instrument: TOC Analyzer
- Analyst: VDL
- Analytical Date/Time: 9/27/2016 3:41:08PM

- Prep Batch:
- Prep Method:
- Prep Date/Time:
- Prep Initial Wt./Vol.: 30.00mL
- Prep Extract Vol: 30.00mL
**Method Blank**

Blank ID: MB for HBN 1744066 [WTI/4519]  
Blank Lab ID: 1354542  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1165628001, 1165628002, 1165628003, 1165628004, 1165628005

**Results by SM2 2320B**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>5.00U</td>
<td>10.0</td>
<td>3.10</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WTI4519  
- Analytical Method: SM21 2320B  
- Instrument: Titration  
- Analyst: KBE  
- Analytical Date/Time: 9/23/2016 10:17:47PM
**Duplicate Sample Summary**

Original Sample ID: 1165651001  
Duplicate Sample ID: 1354544  
Analysis Date: 09/23/2016 22:43  
Matrix: Water (Surface, Eff., Ground)

QC for Samples:  
1165628001, 1165628002, 1165628003, 1165628004, 1165628005

**Results by SM21 2320B**

<table>
<thead>
<tr>
<th>NAME</th>
<th>Original</th>
<th>Duplicate</th>
<th>Units</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>79.2</td>
<td>77.6</td>
<td>mg/L</td>
<td>2.10</td>
<td>(&lt; 25 )</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: WTI4519  
- Analytical Method: SM21 2320B  
- Instrument: Titration  
- Analyst: KBE
Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [WTI4519]
Blank Spike Lab ID: 1354543
Date Analyzed: 09/23/2016 22:26

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

Results by SM21 2320B

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkalinity</td>
<td>250</td>
<td>242</td>
<td>97</td>
<td>(85-115)</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WTI4519
Analytical Method: SM21 2320B
Instrument: Titration
Analyst: KBE

Prep Batch: 
Prep Method: 
Prep Date/Time: 
Spike Init Wt./Vol.: 250 mg/L Extract Vol: 50 mL
Dupe Init Wt./Vol.: Extract Vol:
### Method Blank

Blank ID: MB for HBN 1744270 [WXX/11639]  
Blank Lab ID: 1355449  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: WDA3863
- Analytical Method: SM21 4500-NH3 G
- Instrument: Discrete Analyzer 2
- Analyst: NEG
- Analytical Date/Time: 9/29/2016 1:19:26PM

Prep Batch: WXX11639  
Prep Method: METHOD  
Prep Date/Time: 9/29/2016 1:00:00PM  
Prep Initial Wt./Vol.: 6 mL  
Prep Extract Vol: 6 mL
Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [WXX11639]
Blank Spike Lab ID: 1355450
Date Analyzed: 09/29/2016 13:21
QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

Spike Duplicate ID: LCSD for HBN 1165628 [WXX11639]
Spike Duplicate Lab ID: 1355451
Matrix: Water (Surface, Eff., Ground)

Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/L)</th>
<th>Spike Duplicate (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spike</td>
<td>Result</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WDA3863
Analytical Method: SM21 4500-NH3 G
Instrument: Discrete Analyzer 2
Analyst: NEG

Prep Batch: WXX11639
Prep Method: METHOD
Prep Date/Time: 09/29/2016 13:00
Spike Init Wt./Vol.: 1 mg/L, Extract Vol.: 6 mL
Dupe Init Wt./Vol.: 1 mg/L, Extract Vol.: 6 mL
### Matrix Spike Summary

Original Sample ID: 1165622001  Analysis Date: 09/29/2016 13:31
MS Sample ID: 1355452 MS  Analysis Date: 09/29/2016 13:32
MSD Sample ID: 1355453 MSD  Analysis Date: 09/29/2016 13:34
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by SM21 4500-NH3 G

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia-N</td>
<td>0.0893J</td>
<td>1.00</td>
<td>1.06</td>
<td>97</td>
<td>1.00</td>
<td>1.02</td>
<td>93</td>
<td>75-125</td>
<td>3.60</td>
<td>(&lt;25)</td>
</tr>
</tbody>
</table>

### Batch Information

- **Prep Batch:** WXX11639
- **Prep Method:** Ammonia by SM21 4500F prep (W)
- **Prep Initial Wt./Vol.:** 6.00mL
- **Prep Extract Vol:** 6.00mL
- **Prep Date/Time:** 9/29/2016 1:00:00PM
- **Prep Initial Wt./Vol.:** 6.00mL
- **Prep Extract Vol:** 6.00mL
- **Prep Initial Wt./Vol.:** 6.00mL
- **Prep Extract Vol:** 6.00mL

- **Analytical Batch:** WDA3863
- **Analytical Method:** SM21 4500-NH3 G
- **Instrument:** Discrete Analyzer 2
- **Analyst:** NEG
- **Analytical Date/Time:** 9/29/2016 1:32:47PM

Print Date: 10/13/2016 3:38:56PM

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### Method Blank

**Blank ID:** MB for HBN 1745619 [WXX/11653]  
**Blank Lab ID:** 1358671  
**Matrix:** Water (Surface, Eff., Ground)  
**QC for Samples:**  
1165628001, 1165628002, 1165628003, 1165628004, 1165628005

### Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.00810J</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** WDA3870  
- **Analytical Method:** SM21 4500P-B,E  
- **Instrument:** Discrete Analyzer 3  
- **Analyst:** NEG  
- **Analytical Date/Time:** 10/12/2016 6:43:34PM  
- **Prep Batch:** WXX11653  
- **Prep Method:** SM21 4500P-B,E  
- **Prep Date/Time:** 10/7/2016 4:15:00PM  
- **Prep Initial Wt./Vol.:** 25 mL  
- **Prep Extract Vol.:** 25 mL
Blank Spike Summary

Blank Spike ID: LCS for HBN 1165628 [WXX11653]
Blank Spike Lab ID: 1358672
Date Analyzed: 10/12/2016 17:35

Spike Duplicate ID: LCSD for HBN 1165628 [WXX11653]
Spike Duplicate Lab ID: 1358673
Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1165628001, 1165628002, 1165628003, 1165628004, 1165628005

Results by SM21 4500P-B,E

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/L)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike Duplicate (mg/L)</th>
<th>Result</th>
<th>Rec (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.2</td>
<td>0.204</td>
<td>102</td>
<td></td>
<td>0.216</td>
<td>108</td>
<td>5.50</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: WDA3870
Analytical Method: SM21 4500P-B,E
Instrument: Discrete Analyzer 3
Analyst: NEG

Prep Batch: WXX11653
Prep Method: SM21 4500P-B,E
Prep Date/Time: 10/07/2016 16:15
Spike Init Wt./Vol.: 0.2 mg/L Extract Vol: 25 mL
Dupe Init Wt./Vol.: 0.2 mg/L Extract Vol: 25 mL
Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Phosphorus</td>
<td>0.114</td>
<td>0.200</td>
<td>0.31</td>
<td>98</td>
<td>0.200</td>
<td>0.307</td>
<td>97</td>
<td>75-125</td>
<td>0.97</td>
<td>(&lt; 25)</td>
</tr>
</tbody>
</table>

Batch Information

- **Analytical Batch:** WDA3870
- **Analytical Method:** SM21 4500P-B,E
- **Instrument:** Discrete Analyzer 3
- **Analyst:** NEG
- **Analytical Date/Time:** 10/12/2016 5:39:16PM

- **Prep Batch:** WXX11653
- **Prep Method:** Total Phosphorus (W) Ext.
- **Prep Date/Time:** 10/7/2016 4:15:00PM
- **Prep Initial Wt./Vol.:** 25.00mL
- **Prep Extract Vol.:** 25.00mL
**SGS North America Inc.**

**CHAIN OF CUSTODY RECORD**

**CLIENT:** ADEC Water Quality

**CONTACT:** Laura Elder

**PHONE NO:** 376-1855

**PROJECT:** Willow Creek

**REPORTS TO:**

**E-MAIL:** Laura.Elder@alaska.gov

**INVOICE TO:**

**P.O. #:** CT #160002051

---

### Section 3

<table>
<thead>
<tr>
<th>Sample Identification</th>
<th>Date/Time</th>
<th>Matrix Code</th>
<th>Preservative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow 01</td>
<td>9/21/16</td>
<td>G</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>Willow 02</td>
<td>11/12</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Willow 03</td>
<td>11/30</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Willow 04</td>
<td>11/57</td>
<td>G</td>
<td></td>
</tr>
<tr>
<td>Willow 05</td>
<td>11/57</td>
<td>G</td>
<td></td>
</tr>
</tbody>
</table>

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### Section 4

**DOD Project:** Yes  
**Data Deliverable Requirements:** Level 2

**Cooler ID:**

**Requested Turnaround Time and/or Special Instructions:**

**Temp Blank °C:** 19 # D3

**Chain of Custody Seal:** (Circle) intact

---

**Reinforced By:**

**Date:** 9/21/16  
**Time:** 2:20

---

**Reinforced By:**

**Date:** 9/21/16  
**Time:** 16:16

---

**Received For Laboratory By:**

**Date:** 9/21/16  
**Time:** 16:16

---

**Hand Delivered**

---

**200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301  
5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557  
http://www.sgs.com/terms-and-conditions  
F083-Kit_Request_and_COC_Templates-Blank  
Opened 10-03-15 9:14
<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1165628001-A</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1165628005-A</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1165628001-B</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1165628005-B</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1165628001-C</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1165628005-C</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1165628001-D</td>
<td>H2SO4 to pH &lt; 2</td>
<td>OK</td>
<td>1165628005-D</td>
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Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. If you have any questions regarding this report, or if we can be of any other assistance, please contact your SGS Project Manager at 907-562-2343. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company’s findings at the time of its intervention only and within the limits of Client’s instructions, if any. The Company’s sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

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- The analyte has exceeded allowable regulatory or control limits.
- Surrogate out of control limits.
- Indicates the analyte is found in a blank associated with the sample.
- Continuing Calibration Verification
- Closing Continuing Calibration Verification
- Control Limit
- The analyte concentration is the result of a dilution.
- Dilution Factor
- Detection Limit (i.e., maximum method detection limit)
- The analyte result is above the calibrated range.
- Indicates value that is greater than or equal to the DL
- Greater Than
- Initial Calibration Verification
- The quantitation is an estimation.
- The analyte was positively identified, but the quantitation is a low estimation.
- Laboratory Control Spike (Duplicate)
- Limit of Detection (i.e., 1/2 of the LOQ)
- Limit of Quantitation (i.e., reporting or practical quantitation limit)
- Less Than
- A matrix effect was present.
- Method Blank
- Matrix Spike (Duplicate)
- Indicates the analyte is not detected.
- QC parameter out of acceptance range.
- Rejected
- Relative Percent Difference
- Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content.
All DRO/RRO analyses are integrated per SOP.
Client Name: ADEC-Air & Water Quality
Project Name/#: Willow Creek
Client Sample ID: Willow 02
Matrix: Water (Surface, Eff., Ground)

Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ</th>
<th>Units</th>
<th>Method</th>
<th>Container ID</th>
<th>Allowable Limits</th>
<th>Prep Date</th>
<th>Analysis Date</th>
<th>Init</th>
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<tr>
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<td>14</td>
<td>1.00</td>
<td>col/100mL</td>
<td>SM21 9222D</td>
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<td>07/19/16</td>
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Sample Remarks:

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<th>Results</th>
<th>LOQ</th>
<th>Units</th>
<th>Method</th>
<th>Container ID</th>
<th>Allowable Limits</th>
<th>Prep Date</th>
<th>Analysis Date</th>
<th>Init</th>
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</thead>
</table>
| Microbiology Laboratory
Fecal Coliform   | 25      | 1.00| col/100mL  | SM21 9222D | A            |                  | 07/19/16  | ACF           |      |
Sample Remarks:

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<th>Results</th>
<th>LOQ</th>
<th>Units</th>
<th>Method</th>
<th>Container ID</th>
<th>Allowable Limits</th>
<th>Prep Date</th>
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<td>ACF</td>
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<tr>
<td>Parameter</td>
<td>Results</td>
<td>LOQ</td>
<td>Units</td>
<td>Method</td>
<td>Container ID</td>
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<td>Analysis Date</td>
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<td>A</td>
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<tr>
<td>RESERVED for lab use</td>
<td>SAMPLE IDENTIFICATION</td>
<td>DATE mm/dd/yy</td>
<td>TIME HH:MM</td>
<td>MATRIX/MATRIX CODE</td>
<td>CONTAINERS</td>
<td>Type</td>
<td>COLOR</td>
<td>APPEARANCE</td>
<td>DESCRIPTION</td>
</tr>
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<tr>
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</tbody>
</table>

**Section 4**

- DOD Project? Yes No: No
- Data Deliverable Requirements: Level 2

**Section 5**

- Relinquished By: (1) [Signature] Date: 07/19/16 Time: 09:14
- Relinquished By: (2) Date: 07/19/16 Time: 09:14
- Relinquished By: (3) Date: 07/19/16 Time: 11:15
- Relinquished By: (4) Date: 07/19/16 Time: 11:15

**Special Instructions:** Send results as soon as available please.
### Review Criteria

<table>
<thead>
<tr>
<th>Y/N (yes/no)</th>
<th>Exceptions Noted below</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Y</strong></td>
<td>exemption permitted if sampler hand carries/delivers.</td>
</tr>
<tr>
<td></td>
<td>Were Custody Seals intact? Note # &amp; location</td>
</tr>
<tr>
<td></td>
<td>COC accompanied samples? <strong>Y</strong></td>
</tr>
<tr>
<td><strong>Y</strong></td>
<td><strong>exemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</strong></td>
</tr>
<tr>
<td></td>
<td>Temperature blank compliant* (i.e., 0-6 °C after CF)?</td>
</tr>
<tr>
<td></td>
<td>*If &gt;6°C, were samples collected &lt;8 hours ago? <strong>Y</strong> Chilled</td>
</tr>
<tr>
<td></td>
<td>If &lt;0°C, were sample containers ice free?</td>
</tr>
</tbody>
</table>

If samples received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled".

Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.

<table>
<thead>
<tr>
<th>Y</th>
<th>Note: Refer to form F-083 &quot;Sample Guide&quot; for hold times.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were samples received within hold time? <strong>Y</strong></td>
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</tr>
<tr>
<td>Do samples match COC** (i.e., sample IDs, dates/times collected)? <strong>Y</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Note:</strong> If times differ &lt;1hr, record details &amp; login per COC.</td>
<td></td>
</tr>
<tr>
<td>Were analyses requested unambiguous? <strong>Y</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** If times differ <1hr, record details & login per COC.

<table>
<thead>
<tr>
<th><strong>Y</strong></th>
<th>***Exemption permitted for metals (e.g. 200.8/6020A).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were proper containers (type/mass/volume/preservative***used)? <strong>Y</strong></td>
<td></td>
</tr>
</tbody>
</table>

**IF APPLICABLE**

| Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples? |
| Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)? |
| Were all soil VOAs field extracted with MeOH+BFB? |

**Note to Client:** Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.

**Additional notes (if applicable):**
## Sample Containers and Preservatives

<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1164005001-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
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<td>Na2S2O3 for Chlorine Redu</td>
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7/19/2016
Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,

SGS North America Inc.

Forest Taylor
Project Manager
Forest.Taylor@sgs.com
Case Narrative

SGS Client: ADEC-Air & Water Quality
SGS Project: 1164146
Project Name/Site: Willow Creek
Project Contact: Laura Eldred

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.
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CCCV/CVC/CVCA/CVCB Closing Continuing Calibration Verification
CL Control Limit
D The analyte concentration is the result of a dilution.
DF Dilution Factor
DL Detection Limit (i.e., maximum method detection limit)
E The analyte result is above the calibrated range.
F Indicates value that is greater than or equal to the DL
GT Greater Than
IB Instrument Blank
ICV Initial Calibration Verification
J The quantitation is an estimation.
JL The analyte was positively identified, but the quantitation is a low estimation.
LCS(D) Laboratory Control Spike (Duplicate)
LOD Limit of Detection (i.e., 1/2 of the LOQ)
LOQ Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT Less Than
M A matrix effect was present.
MB Method Blank
MS(D) Matrix Spike (Duplicate)
ND Indicates the analyte is not detected.
Q QC parameter out of acceptance range.
R Rejected
RPD Relative Percent Difference
U Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.
<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Collected</th>
<th>Received</th>
<th>Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow 02</td>
<td>1164146001</td>
<td>07/25/2016</td>
<td>07/25/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03</td>
<td>1164146002</td>
<td>07/25/2016</td>
<td>07/25/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03 Rep</td>
<td>1164146003</td>
<td>07/25/2016</td>
<td>07/25/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 04</td>
<td>1164146004</td>
<td>07/25/2016</td>
<td>07/25/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM21 9222D</td>
<td>Fecal Coliform (MF)</td>
</tr>
<tr>
<td>Client Sample ID: Willow 02</td>
<td>Lab Sample ID: 1164146001</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td>Microbiology Laboratory</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Client Sample ID: Willow 03</td>
<td>Lab Sample ID: 1164146002</td>
</tr>
<tr>
<td>Microbiology Laboratory</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Client Sample ID: Willow 03 Rep</td>
<td>Lab Sample ID: 1164146003</td>
</tr>
<tr>
<td>Microbiology Laboratory</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Client Sample ID: Willow 04</td>
<td>Lab Sample ID: 1164146004</td>
</tr>
<tr>
<td>Microbiology Laboratory</td>
<td>Fecal Coliform</td>
</tr>
</tbody>
</table>
Results of Willow 02

Client Sample ID: Willow 02
Client Project ID: Willow Creek
Lab Sample ID: 1164146001
Lab Project ID: 1164146

Collection Date: 07/25/16 07:25
Received Date: 07/25/16 11:18
Matrix: Water (Surface, Eff., Ground)
Solids (%): Location:

Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>59</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td>11.00</td>
<td>07/25/16 13:10</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: BTF14999
Analytical Method: SM21 9222D
Analyst: K.W
Analytical Date/Time: 07/25/16 13:10
Container ID: 1164146001-A

Print Date: 07/28/2016 12:29:01PM

J flagging is activated
**Results of Willow 03**

Client Sample ID:  Willow 03  
Client Project ID:  Willow Creek  
Lab Sample ID:  1164146002  
Lab Project ID:  1164146  
Collection Date:  07/25/16 07:58  
Received Date:  07/25/16 11:18  
Matrix:  Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

**Results by Microbiology Laboratory**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>20</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>07/25/16 13:10</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch:  BTF14999  
- Analytical Method:  SM21 9222D  
- Analyst:  K.W  
- Analytical Date/Time:  07/25/16 13:10  
- Container ID:  1164146002-A  

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**Print Date:** 07/28/2016 12:29:01PM  
**J flagging is activated**
Results of **Willow 03 Rep**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>30</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
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<td>07/25/16 13:10</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: BTF14999
- Analytical Method: SM21 9222D
- Analyst: K.W
- Analytical Date/Time: 07/25/16 13:10
- Container ID: 1164146003-A

---

Client Sample ID: Willow 03 Rep
Client Project ID: Willow Creek
Lab Sample ID: 1164146003
Lab Project ID: 1164146

Collection Date: 07/25/16 07:58
Received Date: 07/25/16 11:18
Matrix: Water (Surface, Eff., Ground)
Solids (%): Location:
### Results of Willow 04

Client Sample ID: **Willow 04**  
Client Project ID: **Willow Creek**  
Lab Sample ID: 1164146004  
Lab Project ID: 1164146  
Collection Date: 07/25/16 08:45  
Received Date: 07/25/16 11:18  
Matrix: Water (Surface, Eff., Ground)

### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>47</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>07/25/16 13:10</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: BTF 14999
- Analytical Method: SM21 9222D
- Analyst: K.W
- Analytical Date/Time: 07/25/16 13:10
- Container ID: 1164146004-A
Method Blank

Blank ID: MB for HBN 1740226 [BTF/14999]  
Blank Lab ID: 1339731  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1164146001, 1164146002, 1164146003, 1164146004

Results by SM21 9222D

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>1.00U</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
</tr>
</tbody>
</table>

Batch Information

- Analytical Batch: BTF14999
- Analytical Method: SM21 9222D
- Instrument:  
- Analyst: K.W
- Analytical Date/Time: 7/25/2016 1:10:00PM
<table>
<thead>
<tr>
<th>RESERVED for lab use</th>
<th>SAMPLE IDENTIFICATION</th>
<th>DATE mm/dd/yy</th>
<th>TIME HH:MM</th>
<th>MATRIX/MATRIX CODE</th>
<th>REMARKS/LOC ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Willow 02</td>
<td>7/25/4</td>
<td>07:25</td>
<td>W</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Willow 03</td>
<td>07:58</td>
<td></td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Willow 03 Rep</td>
<td>07:58</td>
<td></td>
<td>Multi Incremental Soils</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Willow 04</td>
<td>08:45</td>
<td></td>
<td>XXXX 9222 D</td>
<td></td>
</tr>
</tbody>
</table>

Section 4

DOD Project? Yes [x] No

Data Deliverable Requirements:

Level 2

Cooler ID: 

Requested Turnaround Time and/or Special Instructions:

Send results ASAP p12

Temp Blank °C: 58 #200

Chain of Custody Seal: (circle)

INTEGRAL BROKEN ABSENT

(See attached Sample Receipt Form)

http://www.sgs.com/terms-and-conditions

(See attached Sample Receipt Form)
### e-SAMPLE RECEIPT FORM

**1164146**

<table>
<thead>
<tr>
<th>Review Criteria</th>
<th>Y/N (yes/no)</th>
<th>Exceptions Noted below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were Custody Seals intact? Note # &amp; location</td>
<td>Y</td>
<td>Y: exemption permitted if sampler hand carries/delivers.</td>
</tr>
<tr>
<td>COC accompanied samples?</td>
<td>Y</td>
<td>Absent</td>
</tr>
</tbody>
</table>

**If samples received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled".**

**Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.**

<table>
<thead>
<tr>
<th>Temperature blank compliant* (i.e., 0–6 °C after CF)?</th>
<th>Y</th>
<th>Y: <strong>exemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooler ID:</td>
<td>@ 5.8 °C</td>
<td>Therm ID: 200</td>
</tr>
<tr>
<td>Cooler ID:</td>
<td>@</td>
<td>°C Therm ID:</td>
</tr>
<tr>
<td>Cooler ID:</td>
<td>@</td>
<td>°C Therm ID:</td>
</tr>
<tr>
<td>Cooler ID:</td>
<td>@</td>
<td>°C Therm ID:</td>
</tr>
<tr>
<td>Cooler ID:</td>
<td>@</td>
<td>°C Therm ID:</td>
</tr>
</tbody>
</table>

*If >6°C, were samples collected <8 hours ago? Y

If <0°C, were sample containers ice free? Y

**Note: Refer to form F-083 "Sample Guide" for hold times.**

| Were samples received within hold time?                                       | Y            |                                                                                           |
| Do samples match COC** (i.e., sample IDs, dates/times collected)?             | Y            | **Note: If times differ <1hr, record details & login per COC.**                           |
| Were analyses requested unambiguous?                                          | Y            |                                                                                           |
| Were proper containers (type/mass/volume/preservative***used)?               | Y            | Y: ***Exemption permitted for metals (e.g. 200.8/6020A).                                   |
| IF APPLICABLE                                                                |              |                                                                                           |
| Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?                 | Y            |                                                                                           |
| Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?                  | Y            |                                                                                           |
| Were all soil VOAs field extracted with MeOH+BFB?                             | Y            |                                                                                           |

**Note to Client:** Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.

**Additional notes (if applicable):**

Requested to be called if hit over 20 occurs.

Requested that results be reported as soon as possible.
## Sample Containers and Preservatives

<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1164146001-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164146002-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164146003-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164146004-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
</tbody>
</table>

### Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates than an inappropriate container was submitted.

- **OK** - The container was received at an acceptable pH for the analysis requested.
- **BU** - The container was received with headspace greater than 6mm.
- **DM** - The container was received damaged.
- **FR** - The container was received frozen and not usable for Bacteria or BOD analyses.
- **PA** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
- **PH** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Forest Taylor                                 Date
Project Manager
Forest.Taylor@sgs.com

Print Date: 07/28/2016 12:30:26PM
Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.
Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

- *: The analyte has exceeded allowable regulatory or control limits.
- ![Surrogate out of control limits.](image)
- B: Indicates the analyte is found in a blank associated with the sample.
- CCV/CVA/CVB: Continuing Calibration Verification
- CCCV/CVC/CVCA/CVCB: Closing Continuing Calibration Verification
- CL: Control Limit
- D: The analyte concentration is the result of a dilution.
- DF: Dilution Factor
- DL: Detection Limit (i.e., maximum method detection limit)
- E: The analyte result is above the calibrated range.
- F: Indicates value that is greater than or equal to the DL
- GT: Greater Than
- IB: Instrument Blank
- ICV: Initial Calibration Verification
- J: The quantitation is an estimation.
- JL: The analyte was positively identified, but the quantitation is a low estimation.
- LCS(D): Laboratory Control Spike (Duplicate)
- LOD: Limit of Detection (i.e., 1/2 of the LOQ)
- LOQ: Limit of Quantitation (i.e., reporting or practical quantitation limit)
- LT: Less Than
- M: A matrix effect was present.
- MB: Method Blank
- MS(D): Matrix Spike (Duplicate)
- ND: Indicates the analyte is not detected.
- Q: QC parameter out of acceptance range.
- R: Rejected
- RPD: Relative Percent Difference
- U: Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.
<table>
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<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Collected</th>
<th>Received</th>
<th>Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow Creek 02</td>
<td>1164170001</td>
<td>07/26/2016</td>
<td>07/26/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow Creek 03</td>
<td>1164170002</td>
<td>07/26/2016</td>
<td>07/26/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow Creek 03 Rep</td>
<td>1164170003</td>
<td>07/26/2016</td>
<td>07/26/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow Creek 04</td>
<td>1164170004</td>
<td>07/26/2016</td>
<td>07/26/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM21 9222D</td>
<td>Fecal Coliform (MF)</td>
</tr>
<tr>
<td>Client Sample ID:</td>
<td>Willow Creek 02</td>
</tr>
<tr>
<td>------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Lab Sample ID:</td>
<td>1164170001</td>
</tr>
<tr>
<td><strong>Microbiology Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Result</td>
<td>44 col/100mL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>Willow Creek 03</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Sample ID:</td>
<td>1164170002</td>
</tr>
<tr>
<td><strong>Microbiology Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Result</td>
<td>61 col/100mL</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>Willow Creek 03 Rep</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Sample ID:</td>
<td>1164170003</td>
</tr>
<tr>
<td><strong>Microbiology Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Result</td>
<td>78 col/100mL</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>Willow Creek 04</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Sample ID:</td>
<td>1164170004</td>
</tr>
<tr>
<td><strong>Microbiology Laboratory</strong></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Fecal Coliform</td>
</tr>
<tr>
<td>Result</td>
<td>87 col/100mL</td>
</tr>
</tbody>
</table>
## Results of Willow Creek 02

Client Sample ID: Willow Creek 02  
Client Project ID: Willow Creek  
Lab Sample ID: 1164170001  
Lab Project ID: 1164170  
Collection Date: 07/26/16 07:35  
Received Date: 07/26/16 11:30  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>44</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td>11.00</td>
<td>07/26/16 12:24</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: BTF15000  
- Analytical Method: SM21 9222D  
- Analyst: K.W  
- Analytical Date/Time: 07/26/16 12:24  
- Container ID: 1164170001-A
Results of **Willow Creek 03**

Client Sample ID:  **Willow Creek 03**  
Client Project ID:  **Willow Creek**  
Lab Sample ID:  1164170002  
Lab Project ID:  1164170

Collection Date:  07/26/16 08:07  
Received Date:  07/26/16 11:30  
Matrix:  Water (Surface, Eff., Ground)

Results by **Microbiology Laboratory**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>61</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>07/26/16 12:24</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch:  BTF15000
- Analytical Method:  SM21 9222D
- Analyst:  K.W
- Analytical Date/Time:  07/26/16 12:24
- Container ID:  1164170002-A

J flagging is activated
### Results of Willow Creek 03 Rep

**Client Sample ID:** Willow Creek 03 Rep  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1164170003  
**Lab Project ID:** 1164170  
**Collection Date:** 07/26/16 08:07  
**Received Date:** 07/26/16 11:30  
**Matrix:** Water (Surface, Eff., Ground)

### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Fecal Coliform</td>
<td>78</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>07/26/16 12:24</td>
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</table>

### Batch Information

- **Analytical Batch:** BTF15000  
- **Analytical Method:** SM21 9222D  
- **Analyst:** K.W  
- **Analytical Date/Time:** 07/26/16 12:24  
- **Container ID:** 1164170003-A
### Results of Willow Creek 04

Client Sample ID: Willow Creek 04  
Client Project ID: Willow Creek  
Lab Sample ID: 1164170004  
Lab Project ID: 1164170  
Collection Date: 07/26/16 08:54  
Received Date: 07/26/16 11:30  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
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<tr>
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<td>col/100mL</td>
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<td>07/26/16 12:24</td>
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</tbody>
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### Batch Information

- Analytical Batch: BTF15000  
- Analytical Method: SM21 9222D  
- Analyst: K.W  
- Analytical Date/Time: 07/26/16 12:24  
- Container ID: 1164170004-A
## Method Blank

Blank ID: MB for HBN 1740334 [BTF/15000]  
Blank Lab ID: 1340035  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1164170001, 1164170002, 1164170003, 1164170004

## Results by SM21 9222D

<table>
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<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
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<tbody>
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<td>Fecal Coliform</td>
<td>1.00U</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
</tr>
</tbody>
</table>

## Batch Information

- **Analytical Batch**: BTF15000  
- **Analytical Method**: SM21 9222D  
- **Instrument**:  
- **Analyst**: K.W  
- **Analytical Date/Time**: 7/26/2016 12:24:00PM

Print Date: 07/28/2016 12:30:34PM
**SGS North America Inc.**  
CHAIN OF CUSTODY RECORD

**CLIENT:** ADEC - Willow Creek

**CONTACT:** Laura Eldred  
**PHONE NO:** 376-1855

**PROJECT NAME:** Willow Creek  
**REPORTS TO:** laura.eldred@alaska.gov

<table>
<thead>
<tr>
<th>RESERVED for lab use</th>
<th>SAMPLE IDENTIFICATION</th>
<th>DATE mm/dd/yy</th>
<th>TIME HH:MM</th>
<th>MATRIX/MATRIX CODE</th>
<th>REMARKS/LOC ID</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>Willow 02</td>
<td>7/26/16</td>
<td>09:35</td>
<td>3</td>
<td>G</td>
</tr>
<tr>
<td>1</td>
<td>Willow 03</td>
<td>7/26/16</td>
<td>08:07</td>
<td>3</td>
<td>G</td>
</tr>
<tr>
<td>2</td>
<td>Willow 03 Rep</td>
<td>7/26/16</td>
<td>08:07</td>
<td>3</td>
<td>G</td>
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<tr>
<td>3</td>
<td>Willow 04</td>
<td>7/26/16</td>
<td>08:54</td>
<td>3</td>
<td>G</td>
</tr>
</tbody>
</table>

**Section 4**  
**DOD Project?** No  
**Data Deliverable Requirements:** Level 2

**Cooler ID:**  
**Requested Turnaround Time and/or Special Instructions:**  
Send results as soon as available

**Temp Blank °C:** 6  
**Chain of Custody Seal:** (Circle)  
INTACT  BROKEN  ABSENT

**Section 5**

(See attached Sample Receipt Form)  
[ ] 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301  
[ ] 5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557  
http://www.sgs.com/terms-and-conditions  
F083-Kit_Request_and_COC_Templates-Blank  
Revised 2013-03-24
### Review Criteria

<table>
<thead>
<tr>
<th>Y/N (yes/no)</th>
<th>Exceptions Noted below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>exemption permitted if sampler hand carries/delivers.</td>
</tr>
<tr>
<td></td>
<td>Were Custody Seals intact? Note # &amp; location</td>
</tr>
<tr>
<td></td>
<td>COC accompanied samples?</td>
</tr>
<tr>
<td>Y</td>
<td>N jakiexemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</td>
</tr>
<tr>
<td>Y</td>
<td>Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?</td>
</tr>
<tr>
<td>Y</td>
<td>Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?</td>
</tr>
<tr>
<td>Y</td>
<td>Were all soil VOAs field extracted with MeOH+BFB?</td>
</tr>
<tr>
<td>Y</td>
<td>Were analyses requested unambiguous?</td>
</tr>
<tr>
<td>Y</td>
<td>Were proper containers (type/mass/volume/preservative***used)?</td>
</tr>
<tr>
<td></td>
<td>***Exemption permitted for metals (e.g. 200.8/6020A).</td>
</tr>
<tr>
<td></td>
<td>Were samples received within hold time?</td>
</tr>
<tr>
<td>Y</td>
<td>Do samples match COC** (i.e., sample IDs, dates/times collected)?</td>
</tr>
<tr>
<td></td>
<td>**Note: If times differ &lt;1hr, record details &amp; login per COC.</td>
</tr>
<tr>
<td>Y</td>
<td>Were Custody Seals intact? Note # &amp; location Absent</td>
</tr>
<tr>
<td>Y</td>
<td>Y Y Y Y exemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</td>
</tr>
<tr>
<td>Y</td>
<td>Temperature blank compliant* (i.e., 0-6 °C after CF)?</td>
</tr>
<tr>
<td>Y</td>
<td>If &lt;0°C, were sample containers ice free?</td>
</tr>
<tr>
<td>Y</td>
<td>If samples received without a temperature blank, the &quot;cooler temperature&quot; will be documented in lieu of the temperature blank &amp; &quot;COOLER TEMP&quot; will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note &quot;ambient&quot; or &quot;chilled&quot;.</td>
</tr>
<tr>
<td>Y</td>
<td>Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.</td>
</tr>
<tr>
<td>Y</td>
<td>Note: Refer to form F-083 &quot;Sample Guide&quot; for hold times.</td>
</tr>
<tr>
<td>Y</td>
<td>Were samples collected &lt;8 hours ago?</td>
</tr>
<tr>
<td>Y</td>
<td>N Y exemption permitted if sampler hand carries/delivers.</td>
</tr>
<tr>
<td>Y</td>
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<tr>
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<tr>
<td></td>
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</tr>
<tr>
<td></td>
<td>***Exemption permitted for metals (e.g. 200.8/6020A).</td>
</tr>
</tbody>
</table>

#### IF APPLICABLE

- Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples? Y
- Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)? Y
- Were all soil VOAs field extracted with MeOH+BFB? Y

**Note to Client:** Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.

**Additional notes (if applicable):**
## Sample Containers and Preservatives

<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
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</thead>
<tbody>
<tr>
<td>1164170001-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164170002-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164170003-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164170004-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
</tbody>
</table>

### Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates that an inappropriate container was submitted.

- **OK**: The container was received at an acceptable pH for the analysis requested.
- **BU**: The container was received with headspace greater than 6mm.
- **DM**: The container was received damaged.
- **FR**: The container was received frozen and not usable for Bacteria or BOD analyses.
- **PA**: The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
- **PH**: The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.

7/26/2016
Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,
SGS North America Inc.

Forest Taylor
Project Manager
Forest.Taylor@sgs.com
Case Narrative

SGS Client: ADEC-Air & Water Quality
SGS Project: 1164541
Project Name/Site: Willow Creek
Project Contact: Laura Eldred

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.
Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Quality Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

* The analyte has exceeded allowable regulatory or control limits.
! Surrogate out of control limits.
B Indicates the analyte is found in a blank associated with the sample.
CCV/CVA/CVB Continuing Calibration Verification
CCCV/CVC/CVCA/CVCB Closing Continuing Calibration Verification
CL Control Limit
D The analyte concentration is the result of a dilution.
DF Dilution Factor
DL Detection Limit (i.e., maximum method detection limit)
E The analyte result is above the calibrated range.
F Indicates value that is greater than or equal to the DL
GT Greater Than
IB Instrument Blank
ICV Initial Calibration Verification
J The quantitation is an estimation.
JL The analyte was positively identified, but the quantitation is a low estimation.
LCS(D) Laboratory Control Spike (Duplicate)
LOD Limit of Detection (i.e., 1/2 of the LOQ)
LOQ Limit of Quantitation (i.e., reporting or practical quantitation limit)
LT Less Than
M A matrix effect was present.
MB Method Blank
MS(D) Matrix Spike (Duplicate)
ND Indicates the analyte is not detected.
Q QC parameter out of acceptance range.
R Rejected
RPD Relative Percent Difference
U Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content.
All DRO/RRO analyses are integrated per SOP.
<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Collected</th>
<th>Received</th>
<th>Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow 02</td>
<td>1164541001</td>
<td>08/08/2016</td>
<td>08/08/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03</td>
<td>1164541002</td>
<td>08/08/2016</td>
<td>08/08/2016</td>
<td>Water (Surface, Eff., Ground)</td>
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<td>Willow 03 Rep</td>
<td>1164541003</td>
<td>08/08/2016</td>
<td>08/08/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 04</td>
<td>1164541004</td>
<td>08/08/2016</td>
<td>08/08/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Method</th>
<th>Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM21 9222D</td>
<td>Fecal Coliform (MF)</td>
</tr>
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</table>
## Detectable Results Summary

<table>
<thead>
<tr>
<th>Client Sample ID: Willow 02</th>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
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<tbody>
<tr>
<td>Lab Sample ID: 1164541001</td>
<td>Fecal Coliform</td>
<td>57</td>
<td>col/100mL</td>
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</table>

<table>
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<th>Client Sample ID: Willow 03</th>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
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<tbody>
<tr>
<td>Lab Sample ID: 1164541002</td>
<td>Fecal Coliform</td>
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<td>col/100mL</td>
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</table>

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<th>Client Sample ID: Willow 03 Rep</th>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
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<tr>
<td>Lab Sample ID: 1164541003</td>
<td>Fecal Coliform</td>
<td>101</td>
<td>col/100mL</td>
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</table>

<table>
<thead>
<tr>
<th>Client Sample ID: Willow 04</th>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
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</thead>
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<tr>
<td>Lab Sample ID: 1164541004</td>
<td>Fecal Coliform</td>
<td>118</td>
<td>col/100mL</td>
</tr>
</tbody>
</table>
### Results of Willow 02

- **Client Sample ID:** Willow 02
- **Client Project ID:** Willow Creek
- **Lab Sample ID:** 1164541001
- **Lab Project ID:** 1164541

**Collection Date:** 08/08/16 07:57  
**Received Date:** 08/08/16 12:14  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):** Location:

---

### Results by Microbiology Laboratory

#### Parameter | Result Qual | LOQ/CL | DL | Units | DF | Allowable Limits | Date Analyzed
---|---|---|---|---|---|---|---
Fecal Coliform | 57 | 1.00 | 1.00 | col/100mL | 1 | | 08/08/16 13:20

---

### Batch Information

- **Analytical Batch:** BTF15032
- **Analytical Method:** SM21 9222D
- **Analyst:** K.W
- **Analytical Date/Time:** 08/08/16 13:20
- **Container ID:** 1164541001-A

---

SGS North America Inc.  
200 West Potter Drive Anchorage, AK 95518  
t 907.562.2343 f 907.561.5301  
www.us.sgs.com  
Member of SGS Group
**Results of Willow 03**

Client Sample ID: Willow 03  
Client Project ID: Willow Creek  
Lab Sample ID: 1164541002  
Lab Project ID: 1164541

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
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<tbody>
<tr>
<td>Fecal Coliform</td>
<td>86</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>08/08/16 13:20</td>
</tr>
</tbody>
</table>

**Batch Information**

Analytical Batch: BTF15032  
Analytical Method: SM21 9222D  
Analyst: K.W  
Analytical Date/Time: 08/08/16 13:20  
Container ID: 1164541002-A

---

J flagging is activated
## Results of Willow 03 Rep

Client Sample ID: Willow 03 Rep  
Client Project ID: Willow Creek  
Lab Sample ID: 1164541003  
Lab Project ID: 1164541  
Collection Date: 08/08/16 08:34  
Received Date: 08/08/16 12:14  
Matrix: Water (Surface, Eff., Ground)  
Solids (%):  
Location:  

## Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>101</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td>Allowable Limits</td>
<td>08/08/16 13:20</td>
</tr>
</tbody>
</table>

## Batch Information

- Analytical Batch: BTF15032
- Analytical Method: SM21 9222D
- Analyst: K.W
- Analytical Date/Time: 08/08/16 13:20
- Container ID: 1164541003-A

*J flagging is activated*
### Results of Willow 04

- **Client Sample ID:** Willow 04
- **Client Project ID:** Willow Creek
- **Lab Sample ID:** 1164541004
- **Lab Project ID:** 1164541

**Collection Date:** 08/08/16 09:28  
**Received Date:** 08/08/16 12:14  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):**

#### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>118</td>
<td>2.00</td>
<td>2.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>08/08/16 13:20</td>
</tr>
</tbody>
</table>

#### Batch Information

- **Analytical Batch:** BTF15032
- **Analytical Method:** SM21 9222D
- **Analyst:** K.W
- **Analytical Date/Time:** 08/08/16 13:20
- **Container ID:** 1164541004-A
### Method Blank

Blank ID: MB for HBN 1741345 [BTF/15032]  
Matrix: Water (Surface, Eff., Ground)  
Blank Lab ID: 1343836  
QC for Samples:  
1164541001, 1164541002, 1164541003, 1164541004

### Results by SM21 9222D

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>1.00U</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: BTF15032  
- Analytical Method: SM21 9222D  
- Instrument:  
- Analyst: K.W  
- Analytical Date/Time: 8/8/2016 1:20:00PM
**SGS North America Inc.**
**CHAIN OF CUSTODY RECORD**

**CLIENT:** ADEC Water Quality

**CONTACT:** Laura Eldred
**PHONE NO.:** 376-1855

**PROJECT:** Willow Creek
**PERMIT #:** [REDACTED]

**REPORTS TO:** laura.eldred@alaska.gov

**INVOICE TO:** per contract
**QUOTE #:** CT 18000 1859

**P.O. #:** [REDACTED]

---

### Section 3

<table>
<thead>
<tr>
<th>Type</th>
<th>Code</th>
<th>Remarks/LOC ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1</td>
<td>[REDACTED]</td>
</tr>
</tbody>
</table>

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### Section 2

<table>
<thead>
<tr>
<th>SAMPLE IDENTIFICATION</th>
<th>DATE mm/dd/yy</th>
<th>TIME HH:MM</th>
<th>MATRIX/MATRIX CODE</th>
<th>Preservative</th>
</tr>
</thead>
<tbody>
<tr>
<td>WA Willow 02</td>
<td>8/8/14</td>
<td>8:45</td>
<td>3</td>
<td>1 C</td>
</tr>
<tr>
<td>WA Willow 03</td>
<td>8/8/14</td>
<td>8:34</td>
<td>3</td>
<td>1 C</td>
</tr>
<tr>
<td>WA Willow 03 Rep</td>
<td>8/8/14</td>
<td>8:34</td>
<td>3</td>
<td>1 C</td>
</tr>
<tr>
<td>WA Willow 04</td>
<td>8/8/14</td>
<td>9:28</td>
<td>3</td>
<td>1 C</td>
</tr>
</tbody>
</table>

---

### Section 4

**DOD Project:** No
**Data Deliverable Requirements:** Level 2

**Requested Turnaround Time and/or Special Instructions:** Send results ASAP please

**Temp Blank °C:** Chilled
**Chain of Custody Seal:** [Circle]

---

**Reinforced By:** Laura Eldred
**Date:** 8/8/14
**Time:** 9:55
**Received By:** Cathy J. Miller

---

**Recommended Turnaround Time and/or Special Instructions:** [See attached Sample Receipt Form]

---

[See attached Sample Receipt Form]

---

**http://www.sgs.com/terms-and-conditions**
<table>
<thead>
<tr>
<th>Review Criteria</th>
<th>Y/N (yes/no)</th>
<th>Exceptions Noted below</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were Custody Seals intact? Note # &amp; location</td>
<td>Y</td>
<td>exemption permitted if sampler hand carries/delivers. **exemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</td>
</tr>
<tr>
<td>COC accompanied samples?</td>
<td></td>
<td>ABSENT</td>
</tr>
<tr>
<td><strong>If &gt;6°C, were samples collected &lt;8 hours ago?</strong></td>
<td>Y</td>
<td>Chilled</td>
</tr>
<tr>
<td>If &lt;0°C, were sample containers ice free?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>If samples received without a temperature blank, the “cooler temperature” will be documented in lieu of the temperature blank &amp; “COOLER TEMP” will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note “ambient” or “chilled”.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note: Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were samples received within hold time?</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Do samples match COC** (i.e., sample IDs, dates/times collected)?</td>
<td>Y</td>
<td>**Note: If times differ &lt;1hr, record details &amp; login per COC.</td>
</tr>
<tr>
<td>Were analyses requested unambiguous?</td>
<td>Y</td>
<td></td>
</tr>
<tr>
<td>Were proper containers (type/mass/volume/preservative***) used?</td>
<td></td>
<td>***Exemption permitted for metals (e.g. 200.8/6020A).</td>
</tr>
<tr>
<td><strong>IF APPLICABLE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were Trip Blanks (i.e., VOAAs, LL-Hg) in cooler with samples?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Were all soil VOAs field extracted with MeOH+BFB?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Note to Client: Any “no” answer above indicates non-compliance with standard procedures and may impact data quality.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Additional notes (if applicable):
## Sample Containers and Preservatives

<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1164541001-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164541002-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164541003-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164541004-A</td>
<td>Na2S2O3 for Chlorine Redu</td>
<td>OK</td>
</tr>
</tbody>
</table>

### Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates that an inappropriate container was submitted.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
<td>The container was received at an acceptable pH for the analysis requested.</td>
</tr>
<tr>
<td>BU</td>
<td>The container was received with headspace greater than 6mm.</td>
</tr>
<tr>
<td>DM</td>
<td>The container was received damaged.</td>
</tr>
<tr>
<td>FR</td>
<td>The container was received frozen and not usable for Bacteria or BOD analyses.</td>
</tr>
<tr>
<td>PA</td>
<td>The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.</td>
</tr>
<tr>
<td>PH</td>
<td>The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.</td>
</tr>
</tbody>
</table>

8/8/2016
Dear Laura Eldred,

Enclosed are the results of the analytical services performed under the referenced project for the received samples and associated QC as applicable. The samples are certified to meet the requirements of the National Environmental Laboratory Accreditation Conference Standards. Copies of this report and supporting data will be retained in our files for a period of ten years in the event they are required for future reference. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. Any samples submitted to our laboratory will be retained for a maximum of fourteen (14) days from the date of this report unless other archiving requirements were included in the quote.

If there are any questions about the report or services performed during this project, please call Forest at (907) 562-2343. We will be happy to answer any questions or concerns which you may have.

Thank you for using SGS North America Inc. for your analytical services. We look forward to working with you again on any additional analytical needs.

Sincerely,

SGS North America Inc.

Forest Taylor                                 Date
Project Manager
Forest.Taylor@sgs.com
Case Narrative

SGS Client: ADEC-Air & Water Quality
SGS Project: 1164313
Project Name/Site: Willow Creek
Project Contact: Laura Eldred

Refer to sample receipt form for information on sample condition.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.
Enclosed are the analytical results associated with the above work order. All results are intended to be used in their entirety and SGS is not responsible for use of less than the complete report. This document is issued by the Company under its General Conditions of Service accessible at <http://www.sgs.com/en/Terms-and-Conditions.aspx>. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.

Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. Any unauthorized alteration, forgery or falsification of the context or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.

SGS maintains a formal Quality Assurance/Qaulity Control (QA/QC) program. A copy of our Quality Assurance Plan (QAP), which outlines this program, is available at your request. The laboratory certification numbers are AK00971 (DW Chemistry & Microbiology) & UST-005 (CS) for ADEC and 2944.01 for DOD ELAP/ISO17025 (RCRA methods: 1020B, 1311, 3010A, 3050B, 3520C, 3550C, 5030B, 5035A, 6020A, 7470A, 7471B, 8021B, 8082A, 8260B, 8270D, 8270D-SIM, 9040C, 9045D, 9056A, 9060A, AK101 and AK102/103). Except as specifically noted, all statements and data in this report are in conformance to the provisions set forth by the SGS QAP and, when applicable, other regulatory authorities.

The following descriptors or qualifiers may be found in your report:

- The analyte has exceeded allowable regulatory or control limits.
- Surrogate out of control limits.
- Indicates the analyte is found in a blank associated with the sample.
- Continuing Calibration Verification
- Closing Continuing Calibration Verification
- Control Limit
- The analyte concentration is the result of a dilution.
- Dilution Factor
- Detection Limit (i.e., maximum method detection limit)
- The analyte result is above the calibrated range.
- Indicates value that is greater than or equal to the DL
- Greater Than
- Instrument Blank
- Initial Calibration Verification
- The quantitation is an estimation.
- The analyte was positively identified, but the quantitation is a low estimation.
- Laboratory Control Spike (Duplicate)
- Limit of Detection (i.e., 1/2 of the LOQ)
- Limit of Quantitation (i.e., reporting or practical quantitation limit)
- Less Than
- A matrix effect was present.
- Method Blank
- Matrix Spike (Duplicate)
- Indicates the analyte is not detected.
- Rejected
- Relative Percent Difference
- Indicates the analyte was analyzed for but not detected.

Note: Sample summaries which include a result for "Total Solids" have already been adjusted for moisture content. All DRO/RRO analyses are integrated per SOP.
## Sample Summary

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Collected</th>
<th>Received</th>
<th>Matrix</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow 02</td>
<td>1164313001</td>
<td>08/01/2016</td>
<td>08/01/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03</td>
<td>1164313002</td>
<td>08/01/2016</td>
<td>08/01/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 03 Rep</td>
<td>1164313003</td>
<td>08/01/2016</td>
<td>08/01/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
<tr>
<td>Willow 04</td>
<td>1164313004</td>
<td>08/01/2016</td>
<td>08/01/2016</td>
<td>Water (Surface, Eff., Ground)</td>
</tr>
</tbody>
</table>

### Method Description

<table>
<thead>
<tr>
<th>Method</th>
<th>Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM21 9222D</td>
<td>Fecal Coliform (MF)</td>
</tr>
</tbody>
</table>
### Detectable Results Summary

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Parameter</th>
<th>Result</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow 02</td>
<td>1164313001</td>
<td>Fecal Coliform</td>
<td>25</td>
<td>col/100mL</td>
</tr>
<tr>
<td>Willow 03</td>
<td>1164313002</td>
<td>Fecal Coliform</td>
<td>23</td>
<td>col/100mL</td>
</tr>
<tr>
<td>Willow 03 Rep</td>
<td>1164313003</td>
<td>Fecal Coliform</td>
<td>15</td>
<td>col/100mL</td>
</tr>
<tr>
<td>Willow 04</td>
<td>1164313004</td>
<td>Fecal Coliform</td>
<td>25</td>
<td>col/100mL</td>
</tr>
</tbody>
</table>

---

**Microbiology Laboratory**

Print Date: 08/04/2016 8:47:10AM

**Member of SGS Group**

SGS North America Inc.  200 West Potter Drive, Anchorage, AK 99518  
 t 907.562.2343 f 907.561.5301  www.us.sgs.com

Page 5 of 13
### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>25</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>08/01/16 13:02</td>
</tr>
</tbody>
</table>

**Batch Information**

- Analytical Batch: BTF15010
- Analytical Method: SM21 9222D
- Analyst: K.W
- Analytical Date/Time: 08/01/16 13:02
- Container ID: 1164313001-A

*Collection Date: 08/01/16 07:29*
*Received Date: 08/01/16 11:33*
*Matrix: Water (Surface, Eff., Ground)*
*Location:*

---

J flagging is activated
## Results of Willow 03

**Client Sample ID:** Willow 03  
**Client Project ID:** Willow Creek  
**Lab Sample ID:** 1164313002  
**Lab Project ID:** 1164313  
**Collection Date:** 08/01/16 07:58  
**Received Date:** 08/01/16 11:33  
**Matrix:** Water (Surface, Eff., Ground)  
**Solids (%):** Location: 

### Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>23</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td>08/01/16 13:02</td>
<td></td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** BTF15010  
- **Analytical Method:** SM21 9222D  
- **Analyst:** K.W  
- **Analytical Date/Time:** 08/01/16 13:02  
- **Container ID:** 1164313002-A  

---

**J flagging is activated**
Results of Willow 03 Rep

Client Sample ID: Willow 03 Rep
Client Project ID: Willow Creek
Lab Sample ID: 1164313003
Lab Project ID: 1164313

Collection Date: 08/01/16 07:58
Received Date: 08/01/16 11:33
Matrix: Water (Surface, Eff., Ground)
Solids (%):
Location:

Results by Microbiology Laboratory

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>15</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td></td>
<td>08/01/16 13:02</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: BTF15010
Analytical Method: SM21 9222D
Analyst: K.W
Analytical Date/Time: 08/01/16 13:02
Container ID: 1164313003-A

Print Date: 08/04/2016 8:47:11AM
J flagging is activated
## Results of Willow 04

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>25</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
<td>1</td>
<td>08/01/16 13:02</td>
</tr>
</tbody>
</table>

### Batch Information
- Analytical Batch: BTF15010
- Analytical Method: SM21 9222D
- Analyst: K.W
- Analytical Date/Time: 08/01/16 13:02
- Container ID: 1164313004-A

---

Print Date: 08/04/2016 8:47:11AM
### Method Blank

Blank ID: MB for HBN 1740878 [BTF/15010]  
Blank Lab ID: 1341590  
Matrix: Water (Surface, Eff., Ground)  
QC for Samples:  
1164313001, 1164313002, 1164313003, 1164313004

### Results by SM21 9222D

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fecal Coliform</td>
<td>1.00U</td>
<td>1.00</td>
<td>1.00</td>
<td>col/100mL</td>
</tr>
</tbody>
</table>

### Batch Information

- Analytical Batch: BTF15010  
- Analytical Method: SM21 9222D  
- Instrument:  
- Analyst: K.W  
- Analytical Date/Time: 8/1/2016 1:02:00PM
# Chain of Custody Record

**SGS North America Inc.**  
**CHAIN OF CUSTODY RECORD**

**CLIENT:** ADEC - Willow Creek  
**CONTACT:** Laura Eldred  
**PHONE NO:** 907-376-1855  
**PROJECT NAME:** Willow Creek  
**REPORTS TO:** Laura.eldred@alaska.gov  
**INVOICE TO:** Per NTP  
**QUOTE #:** P.O.: CT 16000 1889

## Section 3

### Preservative

<table>
<thead>
<tr>
<th>Sample Identification</th>
<th>Date</th>
<th>Time</th>
<th>Matrix/Matrixt Code</th>
<th>Remarks/Loc Id</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willow Creek</td>
<td>8/1/16</td>
<td>07:29</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Willow Creek</td>
<td>8/1/16</td>
<td>07:59</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Willow Creek Rep</td>
<td>8/1/16</td>
<td>07:59</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Willow Creek</td>
<td>8/1/16</td>
<td>07:49</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

**Type:**  
C = COMP  
G = GRAB  
M = Multi  
I = Incremental  
S = Soils

**Bacteria**  
Sm 9212 D

### Remarks/LOC ID

**Section 4**  
**DOD Project?** Yes  
**Data Deliverable Requirements:** Level 2

**Section 5**  
**Relinquished By:**  
(1)  
(2)  
(3)  
(4)

**Date:** 8/1/16  
**Time:** 09:09  
**Received By:**

**Date:**  
**Time:**  
**Received By:**

**Date:**  
**Time:**  
**Received For Laboratory By:**

**Cooler ID:**  
**Temp Blank °C:** 10° D11

**Requested Turnaround Time and/or Special Instructions:** Call with preliminary results ASAP

**Chain of Custody Seal:** (Circle)  
**INTACT**  
**BROKEN**  
**ABSENT**

(See attached Sample Receipt Form)

http://www.sgs.com/terms-and-conditions  
Hand Delivered  
F083-Kit_Request_and_COC_Templates-Blank

Revised 2013-03-24

---

200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301  
5500 Business Drive Wilmington, NC 28405 Tel: (910) 350-1903 Fax: (910) 350-1557
**Review Criteria**

<table>
<thead>
<tr>
<th>Y/N (yes/no)</th>
<th>Exceptions Noted below</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td>exemption permitted if sampler hand carries/delivers.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>✗</th>
<th>Were Custody Seals intact? Note # &amp; location</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td>COC accompanied samples?</td>
</tr>
<tr>
<td>✗</td>
<td>***exemption permitted if chilled &amp; collected &lt;8hrs ago or chilling not required (i.e., waste, oil)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>✗</th>
<th>Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td>Cooler ID: 1 @ 1.0 °C Therm ID: D11</td>
</tr>
<tr>
<td>✗</td>
<td>Cooler ID: 2 @ 1 °C Therm ID:</td>
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<td>✗</td>
<td>Cooler ID: 3 @ 2 °C Therm ID:</td>
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<tr>
<td>✗</td>
<td>Cooler ID: 4 @ 3 °C Therm ID:</td>
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</table>

<table>
<thead>
<tr>
<th>✗</th>
<th>*If &gt;6°C, were samples collected &lt;8 hours ago?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>✗</th>
<th>If &lt;0°C, were sample containers ice free?</th>
</tr>
</thead>
</table>

**Note:** Identify containers received at non-compliant temperature. Use form FS-0029 if more space is needed.

If samples received without a temperature blank, the "cooler temperature" will be documented in lieu of the temperature blank & "COOLER TEMP" will be noted to the right. In cases where neither a temp blank nor cooler temp can be obtained, note "ambient" or "chilled".

**Note:** Refer to form F-083 "Sample Guide" for hold times.

<table>
<thead>
<tr>
<th>✗</th>
<th>Were samples received within hold time?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>✗</th>
<th><strong>Do samples match COC</strong> (i.e., sample IDs, dates/times collected)?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td><strong>Note:</strong> If times differ &lt;1hr, record details &amp; login per COC.</td>
</tr>
<tr>
<td>✗</td>
<td>Were analyses requested unambiguous?</td>
</tr>
<tr>
<td>✗</td>
<td>***Exemption permitted for metals (e.g. 200.8/6020A).</td>
</tr>
</tbody>
</table>

**IF APPLICABLE**

<table>
<thead>
<tr>
<th>✗</th>
<th>Were Trip Blanks (i.e., VOAs, LL-Hg) in cooler with samples?</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗</td>
<td>Were all VOA vials free of headspace (i.e., bubbles ≤ 6mm)?</td>
</tr>
<tr>
<td>✗</td>
<td>Were all soil VOAs field extracted with MeOH+BFB?</td>
</tr>
</tbody>
</table>

**Note to Client:** Any "no" answer above indicates non-compliance with standard procedures and may impact data quality.

**Additional notes (if applicable):**

---

**Note:** If times differ <1hr, record details & login per COC.
## Sample Containers and Preservatives

<table>
<thead>
<tr>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
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</thead>
<tbody>
<tr>
<td>1164313001-A</td>
<td>Na₂S₂O₃ for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164313002-A</td>
<td>Na₂S₂O₃ for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164313003-A</td>
<td>Na₂S₂O₃ for Chlorine Redu</td>
<td>OK</td>
</tr>
<tr>
<td>1164313004-A</td>
<td>Na₂S₂O₃ for Chlorine Redu</td>
<td>OK</td>
</tr>
</tbody>
</table>

### Container Condition Glossary

Containers for bacteriological, low level mercury and VOA vials are not opened prior to analysis and will be assigned condition code OK unless evidence indicates that an inappropriate container was submitted.

- **OK** - The container was received at an acceptable pH for the analysis requested.
- **BU** - The container was received with headspace greater than 6mm.
- **DM** - The container was received damaged.
- **FR** - The container was received frozen and not usable for Bacteria or BOD analyses.
- **PA** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt and the container is now at the correct pH. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
- **PH** - The container was received outside of the acceptable pH for the analysis requested. Preservative was added upon receipt, but was insufficient to bring the container to the correct pH for the analysis requested. See the Sample Receipt Form for details on the amount and lot # of the preservative added.
**Preliminary Interpretation of Dog “Quantification” ID™ Results**
Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

**Submitter:** Alaska Dept. Environmental Conservation  
**Date Received:** July 27, 2016  
**Report Generated:** October 25, 2016

<table>
<thead>
<tr>
<th>SM #</th>
<th>Client #</th>
<th>Approximate Contribution of Dog Fecal Pollution in Water Sample</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-6J11001</td>
<td>Willow 03</td>
<td>Not Detected</td>
<td>Dog fecal biomarker not detected</td>
</tr>
<tr>
<td>SM-6J11002</td>
<td>Willow 04</td>
<td>Not Detected</td>
<td>Dog fecal biomarker not detected</td>
</tr>
<tr>
<td>SM-6J11003</td>
<td>Willow 04</td>
<td>Low Concentration</td>
<td>Low levels of Dog fecal biomarker</td>
</tr>
</tbody>
</table>

**Limitation of Damages – Repayment of Service Price**
It is agreed that in the event of breach of any warranty or breach of contract, or negligence of Source Molecular Corporation, as well as its agents or representatives, the liability of the company shall be limited to the repayment, to the purchaser (submitter), of the individual analysis price paid by him/her to Source Molecular Corp. The company shall not be liable for any damages, either direct or consequential. Source Molecular Corp. provides analytical services on a PRIME CONTRACT BASIS ONLY. Terms are available upon request. The sample(s) cited in this report may be used for research purposes after an archiving period of 3 months from the date of this report. Research includes, but is not limited to internal validation studies and peer-reviewed research publications. Anonymity of the sample(s), including the exact geographic location will be maintained by assigning an arbitrary internal reference. These anonymous samples will only be grouped by state / province of origin for research purposes. The client must contact Source Molecular in writing within 10 days from the date of this report if he/she does not wish for their submitted sample(s) to be used for any type of future research.
### Dog Bacteroidetes Quantification ID™
Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA

**Submitter:** Alaska Dept. Environmental Conservation  
**Date Received:** July 27, 2016  
**Report Generated:** October 25, 2016

<table>
<thead>
<tr>
<th>SM #</th>
<th>Client #</th>
<th>Analysis Requested</th>
<th>Marker Quantified (copies/100 ml)</th>
<th>DNA Analytical Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-6J11001</td>
<td>Willow 03</td>
<td>Dog Bacteroidetes ID</td>
<td>ND</td>
<td>Absent</td>
</tr>
<tr>
<td>SM-6J11002</td>
<td>Willow 04</td>
<td>Dog Bacteroidetes ID</td>
<td>ND</td>
<td>Absent</td>
</tr>
<tr>
<td>SM-6J11003</td>
<td>Willow 04</td>
<td>Dog Bacteroidetes ID</td>
<td>&lt;LOQ</td>
<td>Present</td>
</tr>
</tbody>
</table>

ND: Not Detected  
<LOQ: Detected below level of quantification
Negative Results
In sample(s) classified as negative, the dog-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have dog fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Positive Results
In sample(s) classified as positive, the dog-associated fecal gene biomarker(s) was detected in both test replicates suggesting that dog fecal contamination is present in the water sample(s). The biomarker(s) serve as an indicator of the targeted fecal pollution, but the presence of the biomarker does not signify conclusively the presence of that form of fecal pollution. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

<LOQ Results
In sample(s) classified as <LOQ, the dog-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with dog were present in the sample(s) but in low concentrations.

Dog Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the dog-associated fecal genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "negative", "trace", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the water samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at sourcemolecular.com/tests

DNA Analytical Method Explanation
Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 95 °C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate. Absolute quantification was achieved by extrapolating target gene copy numbers from a standard curve generated from serial dilutions of known gene copy numbers.

For quality control purposes, a positive control consisting of Dog fecal DNA and a negative control consisting of PCR-grade water, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives. The accumulation of PCR product is detected and graphed in an amplification plot. If the fecal indicator organism is absent in the sample, this accumulation is not detected and the sample is considered negative. If accumulation of PCR product is detected, the sample is considered positive.
**Theory Explanation of Dog Bacteroidetes “Quantification” ID™**

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990’s it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*. Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals. Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in dog. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in dog. As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog *Bacteroidetes* gene biomarker is not present.

**References**

6. Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G. **Host
Submitter: Alaska Dept. Environmental Conservation  
Date Received: Various  
Report Generated: December 5, 2016

<table>
<thead>
<tr>
<th>SM #</th>
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<th>Date Collected</th>
<th>Date Received</th>
<th>Approximate Contribution of Dog Fecal Pollution in Water Sample</th>
<th>Comment</th>
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</thead>
<tbody>
<tr>
<td>SM-6K17001</td>
<td>Willow 03</td>
<td>8/8/2016</td>
<td>8/9/2016</td>
<td>Not Detected</td>
<td>Dog fecal biomarker not detected</td>
</tr>
<tr>
<td>SM-6K17002</td>
<td>Willow 04</td>
<td>7/26/2016</td>
<td>7/27/2016</td>
<td>Low Concentration</td>
<td>Low levels of dog fecal biomarker</td>
</tr>
</tbody>
</table>

Preliminary Interpretation of Dog “Quantification” ID™ Results  
Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology  

Limitation of Damages – Repayment of Service Price  
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Dog Bacteroidetes Quantification ID™
Detection and quantification of the fecal Dog gene biomarker for Dog fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

**Submitter:** Alaska Dept. Environmental Conservation  
**Date Received:** Various  
**Report Generated:** December 5, 2016

<table>
<thead>
<tr>
<th>SM #</th>
<th>Client #</th>
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<th>Marker Quantified (copies/100 ml)</th>
<th>DNA Analytical Results</th>
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</thead>
<tbody>
<tr>
<td>SM-6K17001</td>
<td>Willow 03</td>
<td>8/8/2016</td>
<td>8/9/2016</td>
<td>Dog Bacteroidetes ID</td>
<td>ND</td>
<td>Absent</td>
</tr>
<tr>
<td>SM-6K17002</td>
<td>Willow 04</td>
<td>7/26/2016</td>
<td>7/27/2016</td>
<td>Dog Bacteroidetes ID</td>
<td>&lt;LOQ</td>
<td>Present</td>
</tr>
</tbody>
</table>

ND: Not Detected  
<LOQ: Below level of quantification
Negative Results
In sample(s) classified as negative, the dog-associated fecal gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have dog fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

<LOQ Results
In sample(s) classified as <LOQ, the dog-associated fecal biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with dog were present in the sample(s) but in low concentrations.

Dog Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the dog-associated fecal genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "negative", "trace", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the water samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at sourcemolecular.com/tests

DNA Analytical Method Explanation
Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer’s protocol.

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Fecal Bacteroidetes are considered for several reasons an interesting alternative to more traditional indicator organisms such as E. coli and Enterococci. Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than E. coli and Enterococci. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Dog Bacteroidetes ID service is designed around the principle that fecal Bacteroidetes are found in large quantities in feces of warm-blooded animals. Furthermore, certain categories of Bacteroidetes have been shown to be predominately detected in dog. Within these Bacteroidetes, certain strains of the Bacteroides and Prevotella genus have been found in dog. As such, these bacterial strains can be used as indicators of dog fecal contamination.

One of the advantages of the Dog Bacteroidetes ID service is that the entire water is sampled and filtered for fecal Bacteroidetes. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the dog Bacteroidetes gene biomarker is not present.

References
6 Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G. Host
Submitter: Alaska Dept. Environmental Conservation  
Date Received: Various  
Report Generated: October 7, 2016

<table>
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<th>Date Received</th>
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<th>Species</th>
<th>DNA Analytical Results</th>
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<tbody>
<tr>
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<td>Willow 03</td>
<td>7/27/2016</td>
<td>Human Bacteroidetes ID</td>
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<td>Absent</td>
</tr>
<tr>
<td>SM-612002</td>
<td>Willow 04</td>
<td>7/20/2016</td>
<td>Human Bacteroidetes ID</td>
<td>Dorei</td>
<td>Absent</td>
</tr>
<tr>
<td>SM-612003</td>
<td>Willow 04</td>
<td>8/9/2016</td>
<td>Human Bacteroidetes ID</td>
<td>Dorei</td>
<td>Absent</td>
</tr>
</tbody>
</table>

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Laboratory Comments

Negative Results
In sample(s) classified as negative, the human-associated Bacteroidetes gene biomarker was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have human fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution. In order to strengthen the result, a negative sample should be analyzed further for human fecal contamination with other DNA analytical tests. A list of human fecal ID tests can be found at www.sourcemolecular.com/human.

Human Fecal Reference Samples
The client is encouraged to submit samples from the surrounding wastewater facilities and/or septic systems in order to gain a better understanding of the concentration of the human-associated fecal Bacteroidetes genetic marker as well as the concentration of the general fecal Bacteroidetes genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at www.sourcemolecular.com/tests

DNA Analytical Method Explanation

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing the sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 50°C for 2 min, 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate.

For quality control purposes, a positive control consisting of appropriate genomic DNA and a negative control consisting of PCR-grade water were run alongside the sample(s) to ensure a properly functioning reaction and to reveal any false negatives or false positives. The accumulation of PCR product is detected and graphed in an amplification plot. If the fecal indicator organism is absent in the sample, this accumulation is not detected and the sample is considered negative. If accumulation of PCR product is detected, the sample is considered positive.
Human Bacteroidetes ID™ Species: *B. dorei*

The Human Bacteroidetes ID™ Species: *B. dorei* service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.\(^1,2\) The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.\(^3\) The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world\(^1,3,4\) makes the Human Bacteroidetes ID™ Species: *B. dorei* service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.\(^5\) Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.\(^3,5,6,7,8\) Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.\(^3,6\) As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as

**Human Bacteroidetes ID™ Species:** *B. thetaiotaomicron*.

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\(^8\)Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., et al. *Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic
Horse Fecal Toolbox ID™
Detection of the fecal Horse gene biomarker for Horse fecal contamination by quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Alaska Dept. Environmental Conservation
Date Received: July 26, 2016
Date Reported: August 24, 2016

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<th>DNA Analytical Results</th>
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<td>Willow 02</td>
<td>Horse Bacteroidetes ID</td>
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Limitation of Damages – Repayment of Service Price
It is agreed that in the event of breach of any warranty or breach of contract, or negligence of Source Molecular Corporation, as well as its agents or representatives, the liability of the company shall be limited to the repayment, to the purchaser (submitter), of the individual analysis price paid by him/her to Source Molecular Corp. The company shall not be liable for any damages, either direct or consequential. Source Molecular Corp. provides analytical services on a PRIME CONTRACT BASIS ONLY. Terms are available upon request. The sample(s) cited in this report may be used for research purposes after an archiving period of 3 months from the date of this report. Research includes, but is not limited to internal validation studies and peer-reviewed research publications. Anonymity of the sample(s), including the exact geographic location will be maintained by assigning an arbitrary internal reference. These anonymous samples will only be grouped by state / province of origin for research purposes. The client must contact Source Molecular in writing within 10 days from the date of this report if he/she does not wish for their submitted sample(s) to be used for any type of future research.
Laboratory Comments

Negative Results
In sample(s) classified as negative, the horse-associated fecal gene biomarker was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have horse fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution.

Horse Fecal Reference Samples
The client is encouraged to submit fecal samples from suspected sources in the surrounding area in order to gain a better understanding of the concentration of the horse-associated fecal genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at sourcemolecular.com/tests.

DNA Analytical Method Explanation
Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1 min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer’s protocol.

Amplifications to detect the target gene biomarker were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20 ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate.

For quality control purposes, a positive control consisting of horse fecal DNA and a negative control consisting of PCR-grade water, were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives. The accumulation of PCR product is detected and graphed in an amplification plot. If the fecal indicator organism is absent in the sample, this accumulation is not detected and the sample is considered negative. If accumulation of PCR product is detected, the sample is considered positive.
Horse Bacteroidetes Theory Explanation

The phylum *Bacteroidetes* is composed of three large groups of bacteria with the best-known category being *Bacteroidaceae*. This family of gram-negative bacteria is found primarily in the intestinal tracts and mucous membranes of warm-blooded animals and is sometimes considered pathogenic.

Comprising *Bacteroidaceae* are the genus *Bacteroides* and *Prevotella*. The latter genus was originally classified within the former (i.e. *Bacteroides*), but since the 1990’s it has been classified in a separate genus because of new chemical and biochemical findings. *Bacteroides* and *Prevotella* are gram-negative, anaerobic, rod-shaped bacteria that inhabitant of the oral, respiratory, intestinal, and urogenital cavities of humans, animals, and insects. They are sometimes pathogenic.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*. Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*. Furthermore, these latter two organisms are facultative anaerobes and as such they can be problematic for monitoring purposes since it has been shown that they are able to proliferate in soil, sand and sediments.

The Horse Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals. Furthermore, certain categories of *Bacteroidetes* have been shown to be predominately detected in horses. Within these *Bacteroidetes*, certain strains of the *Bacteroides* and *Prevotella* genus have been found in horses. As such, these bacterial strains can be used as indicators of horse fecal contamination.

One of the advantages of the Horse Bacteroidetes ID™ service is that the entire water is sampled and filtered for fecal *Bacteroidetes*. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates off a petri dish. This is a particular advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method uses PCR DNA technology. PCR allows quantities of DNA to be amplified into large number of small copies of DNA sequences. This is accomplished with small pieces of DNA called primers that are complementary and specific to the genomes to be detected.

Through a heating process called thermal cycling, the double stranded DNA is denatured and inserted with complementary primers to create exact copies of the DNA fragment desired. This process is repeated rapidly many times ensuring an exponential progression in the number of copied DNA. If the primers are successful in finding a site on the DNA fragment that is specific to the genome to be studied, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve. The absence of an amplification curve would indicate that the horse *Bacteroidetes* gene biomarker is not present.

References

6. Dick, Linda K., Bernhard, Anne E., Brodeur, Timothy J., Santo Domingo, Jorge W., Simpson, Joyce M., Walters, Sarah P., Field, Katharine G.
### Preliminary Interpretation of Human Fecal Pollution ID™ Results

Detection and quantification of the fecal Human gene biomarker for Human fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology.

**Submitter:** Alaska Dept. Environmental Conservation  
**Date Received:** July 26, 2016  
**Report Generated:** August 24, 2016

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<td>2 Human fecal biomarkers not detected</td>
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<tr>
<td>SM-6H09008</td>
<td>Willow 03</td>
<td>Low Concentration</td>
<td>Low levels of 1 human fecal biomarker</td>
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**Limitation of Damages – Repayment of Service Price**

It is agreed that in the event of breach of any warranty or breach of contract, or negligence of Source Molecular Corporation, as well as its agents or representatives, the liability of the company shall be limited to the repayment, to the purchaser (submitter), of the individual analysis price paid by him/her to Source Molecular Corp. The company shall not be liable for any damages, either direct or consequential. Source Molecular Corp. provides analytical services on a PRIME CONTRACT BASIS ONLY. Terms are available upon request. The sample(s) cited in this report may be used for research purposes after an archiving period of 3 months from the date of this report. Research includes, but is not limited to internal validation studies and peer-reviewed research publications. Anonymity of the sample(s), including the exact geographic location will be maintained by assigning an arbitrary internal reference. These anonymous samples will only be grouped by state/province of origin for research purposes. The client must contact Source Molecular in writing within 10 days from the date of this report if he/she does not wish for their submitted sample(s) to be used for any type of future research.
Human Fecal Pollution ID™ Quantification
Detection and quantification of the fecal Human gene biomarker for Human fecal contamination by real-time quantitative Polymerase Chain Reaction (qPCR) DNA analytical technology

Submitter: Alaska Dept. Environmental Conservation

Date Received: July 26, 2016

Report Generated: August 24, 2016

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<td>Human Bacteroidetes ID 2</td>
<td>EPA</td>
<td>ND</td>
<td>Absent</td>
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</tbody>
</table>

ND: Not Detected

<LOQ: Detected below level of quantification
Negative Results
In sample(s) classified as negative, the human-associated Bacteroidetes gene biomarker(s) was either not detected in test replicates, one replicate was detected at a cycle threshold greater than 35 and the other was not, or one replicate was detected at a cycle threshold less than 35 and the other was not after repeated analysis. It is important to note that a negative result does not mean that the sample does not definitely have human fecal contamination. Only repeated sampling (both during wet and dry sampling events) will enable you to draw more definitive conclusions as to the contributor(s) of fecal pollution. In order to strengthen the result, a negative sample should be analyzed further for human fecal contamination with other DNA analytical tests. A list of human fecal ID tests can be found at www.sourcemolecular.com/human.

<LOQ Results
In sample(s) classified as <LOQ, the human-associated Bacteroidetes biomarker was detected in both test replicates but in quantities below the limit of quantification. This result indicates that fecal indicators associated with human were present in the sample(s) but in low concentrations.

Human Fecal Reference Samples
The client is encouraged to submit samples from the surrounding wastewater facilities and/or septic systems in order to gain a better understanding of the concentration of the human-associated fecal Bacteroidetes genetic marker as well as the concentration of the general fecal Bacteroidetes genetic marker in the geographic region of interest. A more precise interpretation would be available to the client with the submittal of such baseline samples.

Result Interpretations
Quantitative results are reported along with interpretations. Interpretations are given as "negative", "low concentration", "moderate concentration", or "high concentration" based on the concentration of the genetic markers found in the water samples.

Additional Testing
A portion of all samples has been frozen and will be archived for 3 months. The client is encouraged to perform additional tests on the sample(s) for other hosts suspected of contributing to the fecal contamination. A list of available tests can be found at www.sourcemolecular.com/tests

DNA Analytical Method Explanation
All reagents, chemicals and apparatuses were verified and inspected beforehand to ensure that no false negatives or positives could be generated. In that regard, positive and negative controls were run to attest the integrity of the analysis. All inspections and controls tested negative for possible extraneous contamitantes, including PCR inhibitors.

Each submitted water sample was filtered through 0.45 micron membrane filters. Each filter was placed in a separate, sterile 2ml disposable tube containing a unique mix of beads and lysis buffer. The sample was homogenized for 1min and the DNA extracted using the Generite DNA-EZ ST1 extraction kit (GeneRite, NJ), as per manufacturer's protocol.

Amplifications were run on an Applied Biosystems StepOnePlus real-time thermal cycler (Applied Biosystems, Foster City, CA) in a final reaction volume of 20ul containing sample extract, forward primer, reverse primer, probe and an optimized buffer. The following thermal cycling parameters were used: 50°C for 2 min, 95°C for 10 min and 40 cycles of 95°C for 15 s and 60°C for 1 min. All assays were run in duplicate. Absolute quantification was achieved by extrapolating genome copy numbers from standard curves generated from serial dilutions of Human specific and generic genomic DNA.

For quality control purposes, a positive control consisting of appropriate genomic DNA and a negative control consisting of PCR-grade water were run alongside the sample(s) to ensure a properly functioning reaction and reveal any false negatives or false positives.
Human Bacteroidetes ID™ Species: *B. dorei*

The Human Bacteroidetes ID™ Species: *B. dorei* service targets the species *Bacteroides dorei*. *B. dorei* is an anaerobe that is frequently shed from the gastrointestinal tract and isolated from human feces worldwide. It is a newly discovered species that is widely distributed in the USA.\(^1,2\) The human-associated marker DNA sequence is located on the 16S rRNA gene of *B. dorei*.\(^3\) The marker is the microbial source tracking (MST) marker of choice for detecting human fecal pollution due to its exceptional sensitivity and specificity. Internal validations have been conducted on hundreds of sewage, septage, human and animal host fecal samples collected from throughout the U.S and archived in the Source Molecular fecal bank. The marker has also been evaluated in both inland and coastal waters. A recent, comprehensive, multi-laboratory MST method evaluation study, exploring the performance of current MST methods, concluded the *B. dorei* qPCR assay to be the top performing human-associated assay amongst those tested. The success and consistency of this marker in numerous studies around the world\(^1,3,4\) makes the Human Bacteroidetes ID™ Species: *B. dorei* service the primary service for identifying human fecal pollution at Source Molecular.

Fecal *Bacteroidetes* are considered for several reasons an interesting alternative to more traditional indicator organisms such as *E. coli* and *Enterococci*.\(^5\) Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci*.

The Human Bacteroidetes ID™ service is designed around the principle that fecal *Bacteroidetes* are found in large quantities in feces of warm-blooded animals.\(^3,5,6,7,8\) Furthermore, certain strains of *Bacteroidetes* have been found to be associated with humans.\(^3,6\) As such, these bacterial strains can be used as indicators of human fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of small copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the unique *B. dorei* DNA sequence. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment desired. If the primers are successful in finding a site on the DNA fragment that is specific to the *B. dorei* DNA sequence, then billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by the qPCR software. The absence of an amplification curve indicates that the *B. dorei* gene biomarker is not detected in the water sample because it is either not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as

**Human Bacteroidetes ID™ Species: *B. stercoris***

**Human Bacteroidetes ID™ Species: *B. fragilis***, and

**Human Bacteroidetes ID™ Species: *B. thetaiotaomicron***.


\(^8\)Dick, L., Bernhard, A., Brodeur, T., Santo Domingo, J., *et al*. *Host Distributions of Uncultivated Fecal Bacteroidales Bacteria Reveal Genetic
Human Bacteroidetes ID™: EPA Developed Assay

The **Human Bacteroidetes ID™: EPA Developed Assay** service targets a functional gene biomarker in *Bacteroidales*-like anaerobic bacteria that is present in high concentrations in the human gut. The U.S. Environmental Protection Agency (U.S. EPA) was the first to target the biomarker using quantitative Polymerase Chain Reaction (qPCR) technology in order to detect ground and surface waters impacted by human fecal pollution. Since its development, the assay has been used successfully around the U.S. to identify fecal pollution originating from human sources, such as sewage and septage wastewaters.

The U.S. EPA Developed assay has been shown to be highly associated with human fecal pollution. It has successfully been validated in multiple nationwide studies using at least 300 individual reference fecal material from 22 different animal species known to commonly contaminate environmental waters. A reported 99.2% specificity to human fecal material makes this one of the leading assays to confirm the presence of fecal contamination that is of human origin. The *Bacteroidales*-like bacteria is widely distributed. It was detected in 100% of hundreds of sewage and human reference fecal samples collected from more than 20 human populations, making it highly sensitive. Internal validations have also been conducted on hundreds of wastewater, human and animal host fecal samples archived in the Source Molecular fecal bank.

Fecal anaerobic bacteria are considered for several reasons an interesting alternative to more traditional fecal indicator organisms such as *E. coli* and *Enterococci.* Since they are strict anaerobes, they are indicative of recent fecal contamination when found in water systems. This is a particularly strong reference point when trying to determine recent outbreaks in fecal pollution. They are also more abundant in feces of warm-blooded animals than *E. coli* and *Enterococci.*

The **Human Bacteroidetes ID™: EPA Developed Assay** service is designed around the principle that fecal *Bacteroidales*-like bacteria are found in large quantities in feces of warm-blooded animals. Furthermore, certain strains have been shown to be associated with humans. As such, these bacterial strains can be used as indicators of human fecal contamination. An advantage of the Human Bacteroidetes ID™ service is that the entire portion of water sampled is filtered to concentrate bacteria. As such, this method avoids the randomness effect of culturing and selecting bacterial isolates. This is an advantage for highly contaminated water systems with potential multiple sources of fecal contamination.

Accuracy of the results is possible because the method amplifies DNA into a large number of copies of the gene biomarker of interest. This is accomplished with small pieces of DNA called primers that are complementary and specific to the gene biomarker. Through a heating process called thermal cycling, the double stranded DNA is denatured, hybridized to the complementary primers and amplified to create many copies of the DNA fragment. If the primers are successful in finding a site on the DNA fragment that is specific to the human-associated biomarker, billions of copies of the DNA fragment will be available and detected in real-time. The accumulation of DNA product is plotted as an amplification curve by qPCR software. The absence of an amplification curve indicates that the gene biomarker is not detectable in the water sample either because it is not present or present at concentrations below the analytical detection limit.

To strengthen the validity of the results, additional tests targeting other high-ranking, human-associated *Bacteroidetes* species should be performed, such as

**Human Bacteroidetes ID™ Species:** *B. dorei,*
**Human Bacteroidetes ID™ Species:** *B. fragilis,* and
**Human Bacteroidetes ID™ Species:** *B. stercoris*

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