Sediment Transport Submittal

DRAFT

Lower Eklutna Sediment Study

The Conservation Fund

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1 Introduction

Eklutna Inc., in partnership with The Conservation Fund, is proposing to deconstruct the lower Eklutna River dam, near the Native Village of Eklutna, Alaska. The Eklutna River flows from the Eklutna Glacier in the Chugach Mountains into Cook Inlet’s Knik Arm. The Eklutna River mouth is approximately 25 miles northeast of Anchorage. The lower Eklutna River dam stands approximately 70 feet tall and 100 feet wide within in a steep-walled canyon approximately 7 miles downstream of Eklutna Lake. The concrete dam was initially constructed in 1929 but has been functionally obsolete since it was abandoned in the 1950s.

The purpose of the project is to remove the functionally obsolete lower Eklutna River dam, which will restore some natural stream function currently inhibited by the dam’s presence. A large volume of sediment has accumulated behind the dam since maintenance was discontinued after abandonment.

Deconstructing the dam will require excavating portions of the sediment plug to access the upstream face of the dam, and relocating the excavated sediment downstream. The remaining sediment will be left in the channel and transported downstream by natural river functions. Demolition of the dam will unavoidably impact jurisdictional wetlands and other waters of the United States and anadromous fish habitat downstream of the lower Eklutna River dam. This study was completed in an effort to understand and inform regulatory agency staff of the potential affects of the project by evaluating existing and predicted sediment transport trends of the Eklutna River.

1.1 Report Purpose

The purpose of this report is to identify sediment trends for the “no action” and proposed Lower Eklutna Dam removal conditions. To help define these trends a field visit was completed by HDR water resources staff, basic bed mobility computations were completed for representative bed material, and a numerical sediment transport model was completed. This report documents and discusses the investigations and analyses completed.

Limited historical data was available for Eklutna River and hydrologic, geotechnical, and physical assumptions were made for sediment modeling so calibration of the model was not possible. Because a calibrated sediment model was not achievable, numerous sensitivity analyses were completed to help identify impacts from assumptions. Additionally, sediment trends were evaluated based on comparison to “no-action” sediment model results to identify changes in future conditions with removal of the Lower Eklutna Dam.

The study reach is an approximate 7.8 mile reach of the Lower Eklutna River that extends from approximately 3.9 miles upstream of the Lower Eklutna Dam to the confluence of the Knik Arm of Cook Inlet (see Figure 1). The lower 2 miles of the Eklutna River is a historic alluvial fan that is crossed by 3 bridges; Alaska Railroad Corporation (ARRC) Bridge, the Glenn Highway Bridge and the Old Glenn Highway Bridge. The upstream 5.8 miles of the Lower Eklutna River is located in a difficult to access steep-walled canyon.

An upper dam exists on the Eklutna River approximately 7.8 miles upstream of the Lower Eklutna Dam. The Upper Eklutna Dam was originally completed in 1955 and re-built after the 1964 Alaska earthquake. Water diverted by the upper Eklutna Dam is conveyed to a hydroelectric power plant and to the Anchorage Water/Wastewater Utility Eklutna Water Treatment Plant. Water demand for
the diversions all but eliminates flows over the Upper Eklutna Dam except in very extreme flow events when the dam at Eklutna Lake overtops. Since 1964 the Upper Eklutna Dam has only overtopped 8 times (USACE 2011).

The Upper Eklutna Dam effectively captures and diverts all flows from the upstream associated watershed, which reduces volume of flows conveyed into Eklutna River and reduces peak discharges. Reduction in peak flows and volumes into Eklutna River has altered the channel-forming flows and sediment transport characteristics for the system. However, the Eklutna River geomorphology appears to have reached equilibrium since construction of the upper dam.

Thunderbird Creek confluences with the Eklutna River approximately 1.1 miles downstream of the Lower Eklutna Dam and drains a larger watershed than the reduced Eklutna watershed (i.e the area of the watershed below the Eklutna Lake Dam). The Eklutna watershed without the area upstream of the Upper Eklutna Dam is approximately 18.2 square miles and the Thunderbird Creek watershed is approximately 30.6 square miles. Figure 1 illustrates the Lower Eklutna Study Reach.

1.2 Findings

The model predicted the fate of sediment plug sand-size sediments (0.2 mm), fine gravels (4.2 mm) and coarse gravels (38 mm) under the no action alternative, and under the 1-year and 10-year precipitation events after the dam is removed. Additionally, a high-flow event scenario has been modeled to estimate conditions at the DOT&PF and ARRC bridges. These findings are summarized below, and a more complete explanation along with model-predicted streambed profiles are included in section 3.4. Appendix A and Appendix B include detailed exhibits and bed mobility calculations of the sediment transport model.

Sediment Characterization

Sediment characterization was performed on July 14, 2015 by Shannon & Wilson and included sediment gradation and laboratory chemical analysis. Sediment samples were collected from hand-excavated test pits of less than 2 feet in depth from several locations within the active channel.

The physical properties were tested as inputs to the sediment transport model, and further discussion is provided in Section 2.3. Chemical properties were collected to determine the presence of contaminants in the sediment. DRO/RRO were detected in some of the test pits, and detectable concentrations of six RCRA metals (arsenic, barium, chromium, lead, mercury and silver) were found in each of the three analytical samples.

Chromium concentrations within the sediment plug ranged from 44-66 mg/kg, which is above the NOAA Screening Quick Reference Table Threshold effects level of 37.3. Additional chromium sampling was conducted upstream of the sediment plug and those concentrations ranged from 34.9-78.9 mg/kg. The additional testing suggests that the source of chromium is a characteristic of the Eklutna River canyon geology and not from introduced sources.

Additional analytes included GRO, VOCs, SVOCs, PCBs and pesticides were tested but not detected. Shannon & Wilson’s full report is included in Appendix C.
Sediment Transport Model Results

No Action

The “no-action” sediment transport model results indicate fairly little change in Eklutna River streambed elevations upstream of the Lower Eklutna Dam. Sediment modeling indicates erosion downstream of the Eklutna dam to the confluence with Thunderbird Creek. From approximately the Thunderbird Creek confluence to the Old Glenn Highway Bridge, deposition is predicted in the model. Deposition in this reach was caused by the expansion of the Eklutna River from the mouth of the canyon onto the alluvial fan. The contraction of the flows through the Old Glenn Highway Bridge causes downstream erosion and the confinement of flows to low flow braided channels. Sediment trends downstream of the Railroad Bridge are slightly erosional.

Fine Gravel Plug

The fine gravel plug sediment transport model indicates the thalweg elevation through the sediment plug returns to a natural slope within approximately one year. When compared to the “no-action” model results the fine gravel model illustrates fairly similar behavior. The fine gravel model does exhibit a reduction in erosion downstream of the Lower Eklutna Dam with some minor deposition. Long term erosion predicted around the bridges is also reduced in the fine gravel model. This is likely a result of the increased sediment load coming downstream. Some deposition of material is observed in the alluvial fan downstream of the ARRC Bridge.

Sand Plug

Sand plug sediment model results are similar to the fine gravel results. The 1 year simulation results show that the sediment plug erodes to a more natural slope. Long term erosion is observed downstream of the Lower Eklutna Dam as the sediment plug is composed of finer material and does not deposit as readily as the fine gravel. The long term erosion predicted under the bridges is limited by the sand sediment plug model. Minor long term deposition is predicted on the alluvial fan downstream of the ARRC Bridge. Similar to the fine gravel model the 1-year simulation results should be considered in identifying the predicted impacts from dam removal.

Coarse Gravel Plug

The coarse gravel plug model has sediment behaviors that diverge from those observed in the fine gravel and sand plug models. The coarse gravel plug takes longer to return to a more natural slope through the Lower Eklutna Dam reach, even with the peak 10-year event in the first year of the simulation. This is due to the much larger grain size material. Additionally, because of the limited amount of sediment conveyed out of the sediment plug downstream the erosion under the bridges is similar to that observed in the “no-action” model. The long term erosion downstream of the Lower Eklutna Dam is reduced from the “no-action” model as the larger material that is conveyed from the sediment plug deposits here and is more flow resistant.

100-Year High Flow Event

The sediment transport model included a worst-case scenario of the 100-year event assuming overtopping of the upper Eklutna Lake dam. Previous studies have estimated these flows at approximately 1,200 cfs through the canyon, and sediment transport model results indicate erosion/deposition patterns similar to those of the ten-year events. The 100-year analysis behaves
as expected with increased sediment loads through the system. No increased deposition was predicted beneath the bridges when compared to the smaller flow events, however, less scour was observed in isolated areas.

**Figure 1:** Lower Eklutna River Study Reach
2  Site Visit

2.1  Site Visit Purpose
A visit to the project study area was conducted by the hydraulics team on July 14, 2015. The purpose of the site visit was to orient the team to the project study area, confirm or deny assumptions regarding flow paths, investigate sediment sources, help identify sediment sample locations, complete pebble counts, identify sediment trends, and define other features or conditions that might influence a sediment transport analysis.

2.2  Field Observations
The Eklutna River, upstream of the Old Glenn Highway Bridge, is confined in a steep bedrock canyon and generally transports sediment through the reach. Approximately 1.5 miles downstream of the lower reservoir the Eklutna River exits the canyon and the channel transitions to an alluvial system with sands, gravels, and cobbles deposited on the banks. Old Glenn Highway Bridge is at the approximate location of the upstream end of the alluvial system.

The sediment accumulated behind the lower reservoir (sediment plug) was determined to extend approximately 0.6 miles upstream of the lower dam. The approximate sediment plug volume is 230,000 cubic yards. By comparison, annual average gravel accumulation was estimated to be 300,000 cubic yards from studies during operation of the Lower Eklutna Dam completed through 1948. Lower Eklutna Dam has completely filled in and is most likely transporting all bed material over the sediment plug and is no longer aggrading.

Since construction of the Upper Eklutna Dam, it appears that channel-forming flows have been significantly reduced and have created a meandering stream between the steep canyon walls. Gravel bars are present throughout the Eklutna River in the vicinity of the lower reservoir as the low flow channel meanders along the canyon bottom. Gravel bars likely existed through this reach before construction of the Upper Eklutna Dam, but are mobilized less frequently since completion of the dam. Pool riffle reaches are also present upstream of the influence of the lower reservoir. Figure 2 presents a photograph of the low flow channel meandering upstream of the influence of the lower reservoir with gravel/cobble bars.
Figure 2: Channel Upstream Lower Eklutna Dam

In the downstream two miles of the Eklutna River, the channel transitions into an alluvial fan crossed by three bridges; the Old Glenn Highway Bridge, the Glenn Highway Bridge, and the Alaska Railroad Corporation (ARRC) Bridge. There are no other known water intakes or other critical structures located in the alluvial fan. Figure 1 above illustrates the location of the three major bridges.

Prior to construction of the bridges, alluvium deposited in the form of a fan from the mouth of the Eklutna River canyon to the confluence with the Knik Arm of Cook Inlet. The uninhibited alluvial fan flows carried significant amounts of sediment and created a system of channels that avulsed and migrated across the fan depositing material. Survey data illustrates sediment accumulation across the valley at a 1.2% slope extending to the Knik Arm, which is similar to the slope of the Lower Eklutna River in the canyon.

Construction of the Eklutna River Dams changed the hydrology and sediment load into the fan. The existing bridges keep the Eklutna River from migrating across the alluvial fan and channelize flows under the crossings. Currently the Eklutna River is fairly channelized from the canyon mouth to Glenn Highway Bridge. Downstream of the Glen Highway Bridge the Eklutna River transitions to a braided system until it reaches the ARRC Bridge where it becomes channelized again; downstream of the ARRC Bridge, the flows fan out and join the Knik Arm. The existing conveyance channels from the canyon mouth to the Knik Arm have a slope of 1.2%. Because of the regulated nature of the watershed, flows are primarily confined to the channelized features and maintain similar sediment capacity to that of the canyon until out of bank flow occurs.
Eklutna bed material was fairly consistent from upstream of the lower reservoir to the ARRC Bridge. Generally, the bed composed of sands, gravels, and cobbles with an approximate cobble size armor layer. Figure 3 presents a photograph of the armor layer observed in the reach between the Glenn Highway Bridge and the ARRC Bridge. The armor layer is removed in a portion of this photograph to expose the underlying sand and gravel material.

**Figure 3:** Armored Bed between Glenn Highway and ARRC Bridges

In the reach upstream of the lower reservoir some silt deposits were observed in areas influenced by the milder slope of the sediment plug. Figure 4 illustrates a patch of silt observed in the sediment plug. There was no silty deposition areas observed upstream of the sediment plug behind the lower reservoir. There were signs of some silty deposits downstream of the Eklutna River canyon mouth; however, the low flow channels still exhibited gravel/cobble bed material with gravel/cobble bars.
Figure 4: Deposited Silt behind Lower Eklutna Dam

Upstream of the lower dam there was little sign of erosion of the low flow channel banks. At the mouth of the Eklutna River canyon more alluvial banks were observed with some erosion. Erosion of the alluvial banks was more prevalent in the downstream direction towards the ARRC Bridge as the low flow channel erodes through the braided channel and fan deposits. A report completed by the United States Army Corps of Engineers (USACE) titled *Eklutna River Aquatic Ecosystem Restoration Technical Report*, dated November 2011 indicates that there has been significant deposition in the reach from Glenn Highway Bridge to the ARRC Bridge. However, during the site visit in 2015 the areas of the deposited material were observed being eroded. Figure 5 presents a photograph of the bank erosion upstream of the ARRC Bridge. This photograph illustrates bank erosion of approximately 3 ft to 4 ft in the alluvium.
A number of sediment sources were observed in the Eklutna River canyon. Several rock slides and small canyon washes were observed along the river upstream of the Lower Eklutna Dam. The major source of sediment is thought to be generated from rock slides and washes. Figure 6 illustrates a typical rock slide in the canyon.
2.3 Sediment Samples

2.3.1 Sediment Grab Samples and Pebble Count

A total of five surficial sediment grab samples were collected for grain size analysis at various locations through the upstream end of the study reach. Additionally, a pebble count was conducted as a means of developing grain size distribution data for the larger bed material observed in the system that was predominant upstream of the sediment plug. Sediment samples were collected that were thought to be representative of the material transported by main channel flow and were taken at the surface of natural deposition areas. Each sediment sample was taken at a single location, typically along the channel bed. Sieve analyses were completed for each sediment sample to identify grain size distributions larger than the #200 sieve. The pebble count was completed along a typical armored sand/gravel bar upstream of the sediment plug. The data derived from these samples is used to define the bed material gradations used in the sediment transport model.

Figure 7 illustrates the grain size distributions of the five sediment samples based on the sieve analysis and the single pebble count. Figure 8 presents a summary map of the collection locations. In general, the bed material observed within the sediment plug was finer than the armored reach upstream, which is expected in the reservoir deposits. Finer reservoir deposits were expected from flatter slopes in the sediment plug (0.5%), allowing finer material to deposit. Additionally, reduced
peak discharges, caused by the Upper Eklutna Dam, will not transport the larger cobbles and gravels into the reservoir. Additional information for each sediment sample is discussed in the report Shannon & Wilson report dated September 2015.

It should be noted that samples S4 and S5 were intentionally taken in fine deposits in the sediment plug to classify fine material observed periodically. These fine deposits were not predominant in the sediment plug or observed in great concentrations upstream of the plug. Samples S1, S2, and S3 are more representative of the material observed in the sediment plug.

**Figure 7: Summary Field Grab Samples and Pebble Count**
Figure 8: Field Grab Samples and Pebble Count Collection Locations
3 Sediment Transport Modeling

3.1 HEC-RAS Sediment Transport Overview

The US Army Corps of Engineers (USACE) HEC-RAS version 4.1 one dimension (1D) hydraulic model was selected for modeling the sediment transport of the Lower Eklutna River focused study area. HEC-RAS version 4.1 uses a quasi-unsteady modeling approach for sediment transport analyses. This method approximates a varied hydrograph with multiple steady state analyses applied over short durations. Hydraulics from the multiple steady state analyses is then used within sediment transport functions to compute transport capacity of flows and adjust erodible limits of the channel. HEC-RAS sediment transport analyses quasi unsteady approaches are very stable, but do not capture impacts to hydraulics from hydrograph routing.

3.2 Modeling Inputs

3.2.1 Terrain

A triangulated irregular network (TIN) was created in ArcMap in order to define model elevation data. This DTM is based on a LiDAR survey flown in May 2015 for the Municipality of Anchorage. The LiDAR collection and post-processing was conducted by Merrick & Company. According to the associated LiDAR Mapping report, the targeted density of the point cloud was a minimum of two to four points per square meter. The vertical accuracy requirements of the data were 9.25cm in order to meet a one foot contour level of accuracy. The vertical datum is NAVD88. The raster mosaics provided to HDR were converted into a TIN for use with HEC-GeoRAS.

3.2.2 Hydrology

A hydrologic analysis was conducted for the Lower Eklutna reach in order to support the development of inflow hydrographs required for the sediment transport modeling effort. The HEC-RAS sediment transport analysis utilizes a quasi-unsteady flow regime, which requires a flow hydrograph as part of its flow input. This was accomplished through gage data analysis, basin comparison, and USGS regional regression equations.

The two main tributary areas to the study reach are the remaining portions of the Eklutna River watershed (downstream of the Upper Eklutna Dam) and Thunderbird Creek, which joins Eklutna River upstream of the Old Glenn Highway Bridge. Both are primarily located within the steep Chugach Range and both are unglaciated. The hydrology of the study reach has been altered by the construction and operation of the Upper Eklutna reservoir, which effectively reduces the contributing area of the Lower Eklutna River. With no substantial outlet works leading into the lower Eklutna natural channel, it was the assumption of this study that the area’s tributary to the upper reservoir would not contribute flows to the study reach. Historically the upper reservoir has had minimal releases and supports this assumption. A contributing watershed to the Lower Eklutna Dam site was delineated for analysis and basin comparison. Similarly, the Thunderbird Creek watershed was delineated to the confluence with the Eklutna. See Figure 9 for watershed delineation. It should be noted that reduction in both peak and volume of flows in the Lower Eklutna River, from the upper Eklutna Dam, reduces the rate of erosion of the sediment plug.
3.2.2.1 USGS Gage Data

A review of available gage data for the Eklutna watershed was conducted. A number of gages, collecting various types of data, for various time periods, were found. Table 1 provides a summary of the local USGS gages and the shortcomings of each dataset as applicable to this study.
Unfortunately, no data record was found of sufficient value to develop the necessary event hydrographs for the sediment transport simulation. Gage 15280100, for example, included seven flow measurements for Lower Eklutna River over the span of 10 months in 2003 and 2004. Only gage 15280100 was upstream of the Thunderbird Creek confluence, all other gages included flows from Thunderbird Creek and did not provide a good estimate of discharge at the Lower Eklutna Dam. Gage 15280200 provided 15 minute discharge data below the Thunderbird Creek confluence for nearly 7.5 years. However, the short duration was not statistically significant and made it difficult to identify a typical flow year and to determine event frequencies for future reference. Additionally, these data do not capture Eklutna-only flows and an approximated flow split ratio between Eklutna and Thunderbird would need to be assumed. In general, the uncertainty involved with such short periods of record and watershed contribution seemed greater than the uncertainties of other methods of flow data development.

**Table 1: USGS Eklutna Gage Summary**

<table>
<thead>
<tr>
<th>USGS Gage Station</th>
<th>Period of Record and Details</th>
<th>Data Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>15277600 &amp; 15277800</td>
<td>Discharge: 1960-62' &amp; 1985-88'</td>
<td>Gage Located Upstream of Upper Reservoir</td>
</tr>
<tr>
<td>15280000</td>
<td>Gage Height: 1985-Present</td>
<td>No Discharge Data</td>
</tr>
<tr>
<td>15280100</td>
<td>Minimal Flow: 2003-04'</td>
<td>Upstream of Upper Reservoir</td>
</tr>
<tr>
<td>15280200</td>
<td>Field Discharge and Gage Height: 1981, 2002-08'</td>
<td>Insufficient Period of Record</td>
</tr>
<tr>
<td>15280000</td>
<td>Discharge: 1946-62'</td>
<td>Gage Located Upstream of Upper Reservoir</td>
</tr>
<tr>
<td>612643149213400</td>
<td>Water Quality: 1949 &amp; 1951</td>
<td>Insufficient Number of Data Points</td>
</tr>
<tr>
<td>612706149195000</td>
<td>Instantaneous Discharge- 2 days in 1981 Water Quality- 3 days, 1949 &amp; 1981</td>
<td>No Discharge Data</td>
</tr>
</tbody>
</table>

A wider search was conducted in order to find a discharge gage, in a similar basin setting, with a longer period of record. USGS Gage 15276000 Ship Creek was identified and selected for analysis. The Ship Creek watershed also drains western portions of the Chugach Range and is unglaciated. Although the contributing area to Gage 15276000 is almost twice as large as the combined Lower Eklutna and Thunderbird Creek drainages, it was determined to be the best available data source. See Figure 10 for a comparison of the two basins and location of pertinent USGS gaging stations. The location of the gage is upstream and not influenced by the urban areas of Anchorage. Table 2 provides a summary of the data used for analysis from the Ship Creek gage at the time of study.

**Table 2: USGS Gage 15276000 Ship Creek Summary**

<table>
<thead>
<tr>
<th>USGS Gage Station</th>
<th>Period of Record and Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>15276000</td>
<td>Mean Daily Flow: 1 Oct 1946 to Present</td>
</tr>
</tbody>
</table>
3.2.2.2 HEC-SSP 2.0 Analysis

The Hydrologic Engineering Center’s Statistical Software Package (HEC-SSP) conducts various statistical analyses of hydrologic data. It was used to conduct a Bulletin 17B flood flow frequency
analysis of the annual peak data for the Ship Creek gage, as well as duration analysis using the mean daily flows. These analyses were conducted as reference points for determining representative flows years from which to develop Eklutna and Thunderbird Creek flow hydrographs.

3.2.2.3 Regional Regression Analysis

Regional regression equations developed by USGS and published in USGS Report 03-4188 were applied to all delineated basins to determine flood flows for a range of recurrence intervals from 2- to 500-year. All basins were located within Regression Region 4. Inputs into the developed equations are drainage area in square miles, mean annual precipitation averaged over the drainage basin, and percent area of lakes and ponds.

Basin area was determined by using state hydrologic unit data called the Watershed Boundary Dataset (WBD), downloaded from USDA Geospatial Data Gateway as a shapefile. The shapefile was then edited to the desired basin boundaries using the new topographic data based on the May 2015 LiDAR data and to account for changes in the watershed. For example, the Eklutna watershed was trimmed to exclude areas tributary to the Upper Reservoir and areas below the Lower Eklutna Dam.

Precipitation values were derived from the precipitation source data used in the development of the regression equations, and as recommended by the authors of USGS Report 03-4188. Mean precipitation values for each basin were determined by intersecting the isolines with the basin areas, and conducting an area-average analysis.

Percent area of lakes and ponds was determined to be zero for Lower Eklutna and Thunderbird Creek by visually reviewing the USGS quadrangle maps. USGS Report 03-4151 Bridge Scour at Selected Alaska Bridges completed regression analysis of Ship Creek and listed a lake and pond percentage of 0.32, which was used for this analysis.

3.2.2.4 Typical Year Selection

To develop the input hydrograph data for the sediment transport analysis, a typical flow year needed to be selected from the Ship Creek mean daily flow dataset. Once selected, this dataset would be adjusted to represent the Eklutna flows for use in the study area basins. The hydrograph plots for Ship Creek were reviewed to identify a typical annual flow series considering peak and volume. The full 2010 year was selected as representative of a typical average year for the region. See Figure 11 for the Ship Creek hydrographs.
3.2.2.5 Basin Comparison and Flow Adjustment

The selected Ship Creek flow data for 2010 was first scaled for both Lower Eklutna and Thunderbird Creek using relative basin size. This is a standard approach for basins in close proximity and that share similar attributes in terms of size, shape, land cover and land use.

The Ship Creek flow data was subsequently adjusted using the watershed flow relationships from the regional regression analysis. Flow values were scaled down based on the ratio of determined flood flows for each basin. The regression equations account for multiple basin characteristics, rather than just basin area. Comparing the results, the regional regression method of flow data scaling was selected. Figure 12 depicts the results for the 2010 dataset (TB = Thunderbird Creek, RR = Regional Regression Equation method). The plot indicates very close agreement between the two scaling methods for Thunderbird Creek, but less so for Lower Eklutna. This is likely due to basin size differences and the inherent biases and errors associated with the empirical nature of regional regression equations. The equations are empirically derived from gage data from multiple basins within the area, so analyzed basin size compared to the dataset basins may provide some variety to results; or simply the equations themselves tend to over estimate or underestimate flows depending on basin size. Scaling flows with the regional regression comparison yielded slightly higher flows for Thunderbird, but significantly lower for Eklutna. The lower Eklutna results with the regression scaling were deemed more conservative as they would result in slower erosion rates for the sediment plug.

As with all data limited hydrologic analyses, a level of uncertainty exists related to analysis assumptions. The methods utilized in this study are commonly used for un-gaged basins or those with limited data. However, no two basins are alike and further study and data collection may require refinement to the present understanding of the typical flow patterns.
3.3 Modeling Setup

Sediment transport model geometry requires careful consideration of cross section location for proper representation of flow paths. It is critical that cross sections are oriented perpendicular to flow and properly capture terrain features that impact the hydraulic behavior of the system. Parameters defining the composition of the bed material and the potential erosion and deposition areas are also required for each modeled cross section. Sediment transport analyses require additional parameters for sediment transport functions, bed material sorting methods, and fall velocity computation method. Discussion of these parameters is included in the following sections.

3.3.1 Geometry

A 1D HEC-RAS model geometry was developed using the HEC-GeoRAS tool within ArcMap 10.3. Model geometry consisted of the stream centerline, model cross sections, overbank flowpaths, and areas of ineffective flow.

The first step in defining the model geometry is to create the stream centerline. The Lower Eklutna and Thunderbird Creek stream centerlines were developed by review of aerial imagery and the use of generated contours from the TIN.

Following the development of the model centerline, the main channel limits (bank stations) and the overbank flow paths are typically developed in order to aid in cross section alignment. These features are also required by HEC-GeoRAS in order to define features of each modeling section (bank stations, downstream reach lengths). In the case of this model, the sole focus is sediment
transport. With that end in mind, the bank stations and overbank flow paths were co-located and delineated based upon the likely erodible bed limits. HEC-RAS sediment transport analysis requires erodible bed limits to be set for each cross section, with the option of defining the erodible limits as the cross section bank stations. The bank station/flowpath lines were created, using the surface contours, with the intent of using these features to define the erodible limits.

Similar to defining the stream centerline, model cross sections were defined using elevation contours and the model flowpaths. For the purposes of a sediment transport modeling, model cross sections were spaced further apart than the typical hydraulics only model. This approach is typical for sediment modeling approaches.

Ineffective flow areas were included for several reasons. First, the ineffective flow areas were included in the vicinity of each bridge to limit the available flow area upstream and downstream due to the constricted bridge openings. Ineffective flow areas were also added near the confluence with the Knik River, where cross sections were unable to contain flow. Ineffective flow areas were also used to aid in the stability of the sediment transport computations. There must be flow in the main channel portion of the cross section, or the transport computations will cease. With cross sections thousands of feet wide over a relatively flat floodplain and with independent flow paths, there are some areas within sections which sit lower in elevation than the designated main channel. Without ineffective flow areas these lower channels would incorrectly model conveyance areas.

Manning’s Roughness values varied between overbank and channel areas. Manning’s roughness for overbank areas and alluvial plane below the railroad bridge had to be estimated for most of the project reach based on field survey, standard Manning’s value photo documentation, and aerial photographs.

Three bridges were included in the model: Old Glenn Highway (constructed in 2015-2016), Glenn Highway, and the ARRC Bridge. The bridges were based upon available as-built data and elevation data pulled from the modeling surface. While adequate for sediment transport analysis, further details and review would be required before using model results at the bridges for normal bridge hydraulic analysis.

A short reach was included for Thunderbird Creek in order to define an inflowing equilibrium sediment load. This reach is less than 1000 feet long and ends with a junction at Eklutna River. The HEC-RAS Model Workmap located in Appendix A presents a summary of the HEC-RAS model river reaches and cross sections.

### 3.3.2 Input Flow Hydrographs

The stream flow scenario used in the transport modeling consisted of ten, back to back typical flow years. One of the objectives of the sediment transport analysis is to estimate time requirement to fully mobilize aggraded materials behind the Lower Eklutna Dam. A series of typical years was deemed a conservative approach to identifying duration of potential downstream impacts due to sedimentation. The use of high return interval flow events (25-year or more) mobilize material and flush the system quicker, but are less conservative.

The series of typical years was developed by reviewing data from the Ship Creek gage as discussed in Section 3.2.2 of this report. The year 2010 was identified as the best representation of typical annual runoff and selected for use. The mean daily flow data 2010 was scaled for both the Lower Eklutna and Thunderbird Creek watersheds by the ratios of the 2-year Regional Regression results. The resulting year-long hydrographs were put into a 10 year sequence for use in sediment modeling.
Figure 13 provides the flow series for Lower Eklutna, Thunderbird Creek, and at the confluence of the two.

**Figure 13: Modeling Hydrograph Input, 10 Typical Year Series**

An additional 10-year hydrograph was prepared to investigate the impacts of a single peak 10-year event on sediment trends. The peak 10-year event was included in the first typical year to represent a peak precipitation event and was based upon a 10-year flow event on Ship Creek in 2013. This approach was completed based on discussions with the permitting team to best identify a potential larger sediment mobilizing event. The 10-year peak event hydrograph was used for analysis of a course sediment plug material. Figure 14 depicts the sequential 10 years of flow derived from scaling Ship Creek data, but includes the single spike to a ten year flow.
3.3.3 Sediment Transport Inputs

This section describes the selection of the major sediment transport modeling input variables; including inflowing sediment load, bed material gradation, sediment transport equation, and computational increment.

**Bed Material Properties**

HEC-RAS sediment transport modeling allows for variable bed material properties along the modeled reach. Transport functions can be sensitive to grain size and distributions, so it’s important to input realistic gradations for each portion of the modeled reach. Sediment gradations presented in Section 2.3.1 of this report were used for definition of the bed material properties. The “Adjusted Pebble Count” data grain size distribution was adjusted to include the Sample 5 fine sediment composition ratios (material below 2 mm). Sample 5 fine ratios were included in the pebble count, as the pebble count did not capture material below 2 mm. Sands, silts, and clays added to the pebble count assumed the same ratio of fine grain ratios as Sample 5. This approach assumed sands, silts, and clays were approximately 7% of the pebble count gradation, based on the field sampling, and did not change the median grain size of the sample. Figure 15 presents the Adjusted Pebble Count.
Figure 15: Adjusted Pebble Count Grain Size Distribution

Given the wide range of sediment gradations sampled in the sediment plug three sediment gradations were modeled to represent a the range of bed material. A total of three sediment plug gradations were modeled to represent the full range of the materials observed in the field. Non-sediment plug bed material gradations were selected based on field observations and sensitivity analysis.

Table 3 presents a summary of the full model reach HEC-RAS cross section number and which site sample grain size distribution was used downstream of that section in the model. Table 4 presents a summary of the sediment plug sample modeled and the representative median grain size. Additional sediment sampling could potentially refine the bed material assumptions.

Table 3: Full Model Reach Bed Material Properties Summary

<table>
<thead>
<tr>
<th>River</th>
<th>Cross Section</th>
<th>Downstream Bed Material Gradation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eklutna</td>
<td>41119</td>
<td>Adjusted Pebble</td>
</tr>
<tr>
<td>Eklutna</td>
<td>23839</td>
<td>Varies – Sediment Plug</td>
</tr>
<tr>
<td>Eklutna</td>
<td>20096</td>
<td>Sample 3</td>
</tr>
<tr>
<td>Thunderbird</td>
<td>732</td>
<td>Adjusted Pebble</td>
</tr>
</tbody>
</table>
**Table 4: Sediment Plug Bed Material Properties Summary**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Median Grain Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 2</td>
<td>4.2</td>
</tr>
<tr>
<td>Sample 5</td>
<td>0.2</td>
</tr>
<tr>
<td>Adjusted Pebble</td>
<td>38.2</td>
</tr>
</tbody>
</table>

**Sediment Reservoir Depth**

A sediment reservoir depth is defined in the sediment transport model for vertical erodible limits. This reservoir depth identifies the maximum amount of erosion that can occur and is used to create the bed material sediment volume that is sorted and available for transport into flows. Outside of the reach behind the dam, the sediment reservoir depth was assumed to be 10 feet below existing grades. This was a conservative approach allowing for more sediment supply and did not limit erosion potential associated with bed rock. For the “no-action” sediment model the reservoir depth at the Lower Eklutna Dam crest (HEC-RAS section 20390) was set to zero. For dam removal models reservoir depths through the sediment plug were assumed to be the equivalent of 10 feet below the historic grade, based on a consistent slope from the upstream end of the sediment plug to the base of the dam. During the site visit no significant bedrock formations were observed that would have limited erosion depths and no cross sections were assumed to be erosion resistant. Further definition of the presence of bed rock through the Eklutna would provide the opportunity for sediment model refinements.

**Inflowing Sediment Load**

Sediment transport modeling requires the definition of an inflowing sediment load to initiate sediment transport computations. There was no gage data available to identify suspended sediment or total loads for the Lower Eklutna River, so an equilibrium sediment load was defined in the HEC-RAS model for the upstream boundary. The equilibrium load in HEC-RAS is set to the computed transport capacity at the upstream most cross section. HEC-RAS computes the sediment transport capacity, for each time step, at the specified upstream cross section and then uses this as the sediment inflow. Since the load is set equal to the transport capacity for each grain size present in the bed material gradation, there will be no aggradation or degradation at this cross section.

It is also critical to note that the bed material gradation has a major impact on inflowing sediment loads when using the equilibrium upstream boundary condition. A range of sediment gradations were tested at the upstream boundary. The adjusted pebble count represented observed field conditions most accurately and also provided the most reliable validation of “no-action” sediment trends upstream of the Lower Eklutna Dam.

**Sediment Transport Function**

HEC-RAS has a wide range of sediment transport functions available for computing the capacity of flows to mobilize and carry sediment downstream. Each sediment transport function has specific ranges of conditions that are appropriate for use. Professional experience and knowledge of the system are instrumental in selecting an appropriate sediment transport function. The following sediment transport functions were considered for use in the sediment transport model:

- Laursen
After comparing preliminary model results from a number of the transport functions and reviewing the development of each, Meyer-Peter Muller was selected. Meyer-Peter Muller is best suited for relatively coarse sediment systems and was developed for grain sizes in the range of those observed in the Eklutna River. Additionally, the Meyer-Peter Muller function was developed for energy gradients similar to the Eklutna River for both upstream supply reaches and potential downstream depositional reaches. Meyer-Peter Muller validated well with the expected “no-action” sediment trends upstream of the Lower Eklutna Dam.

**Computational Time Step**

Computation time step is required in sediment transport analyses to define how often the channel geometry is updated in the model run. Generally, it is assumed that the computation increment should not be shorter than the time needed for sediment to travel from one cross section to the next. A computation increment shorter than that travel time would not realistically represent real world physical conditions as sediment could be accounted for numerically at 2 cross sections simultaneously. Too short of a computation increment could amplify results/errors and significant model run times can occur.

If computational increments are too large then model instabilities can occur when channel geometry is updated too infrequently to allow hydraulics to properly re-compute. A number of time step sensitivities were completed for sediment transport models and a time step of 1 hour was used for Eklutna River hydrograph flows under 65 cfs and a time step of 0.25 hours was used for Eklutna River hydrograph flows over 65 cfs. Variable time steps were used as more channel changes occur in higher flows requiring more frequent hydraulic computations.

### 3.4 Results

A total of 4 sediment transport models were completed for the Lower Eklutna Dam removal. A “no-action” model run was completed for comparison of a future no dam removal to proposed dam removal assumptions. Three dam removal models were run investigating a range of sediment plug gradations. A range of sediment plug gradations were modeled to help envelope expected behaviors given uncertainty in the composition of the sediment plug. Sediment plug gradations range from coarse gravel to medium sands. Table 5 presents a summary of the sediment transport model runs.

<table>
<thead>
<tr>
<th>Table 5: Sediment Transport Model Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model Description</strong></td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>No-Action</td>
</tr>
<tr>
<td>Fine Gravel Plug</td>
</tr>
<tr>
<td>Sand Plug</td>
</tr>
<tr>
<td>Coarse Gravel Plug</td>
</tr>
</tbody>
</table>
Additionally, a bed mobility analysis was completed to help validate sediment transport model results. Bed mobility analyses define the threshold at which bed material is transported and help indicate if sediment transport model trends are reasonable.

Due to limited available information on the historic behavior of Eklutna River and limited sediment transport input data, a number of modeling assumptions had to be made. Limited historic data and the necessity for large scale modeling assumptions did not allow for detailed model validation or calibration. Sediment transport models are generally limited to identifying bed mobility trends and Eklutna modeling limitations further enforced the need to limit sediment model output use to trend analyses. Quantitative erosion or deposition values should not be taken from the model results without further refinements. Based on this, sediment model output discussion is limited to trends observed in the model results.

### 3.4.1 Bed Mobility Analysis

Sediment mobility calculations were completed for two bed material grain size distributions sampled from within the sediment plug and the pebble count. Mobility computations were completed for Sample 2, Sample 3, and the single pebble count collected during the site visit. This bed mobility analysis utilized a modified critical shear stress approach as defined in a technical publication by the USDA Forest Service, Stream Simulation Working Group (USDA 2008). The method is based on determining a critical shear stress that is able to mobilize the particle size gradation on the stream bottom and comparing that to the applied boundary shear for various flow rates. When the applied boundary shear is greater than the critical shear, the sediment gradation begins to mobilize with the flow.

Hydraulic properties needed in the sediment mobility calculations were obtained from steady state version of the sediment transport model. Numerous flow profiles were run, at 10 cfs increments, in order to identify critical flow thresholds for particle mobility. The wide range of flow rates was used in calculations to determine which flows fully mobilized bed material at the dam, post removal. The original channel slope can be estimated by comparing the elevation difference between the upstream end of the sediment plug to the base of the dam, and dividing by the channel distance between the two. This is approximately 0.02 ft/ft. A channel section upstream of the dam that approximately replicates this hydraulic condition can be used to understand bed mobilization of the sediment slug. Hydraulic properties were taken for flows at HEC-RAS Section 25276, which is located outside of the influence of the Lower Eklutna Dam. This section has a thalweg slope of 0.022ft/ft, and demonstrated an ability to move both sediment samples for all flows 10 cfs and greater. This suggests that flow conditions through most of a typical year will be able to carry sediment downstream. The pebble count, taken at an observed gravel bar, was mobile at approximately 30 cfs. Table 6 presents a summary of the bed mobility results for all three samplings.

<table>
<thead>
<tr>
<th>Sediment Sample</th>
<th>$D_{50}$ (mm)</th>
<th>Fully Mobilizing Flow (cfs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 2</td>
<td>14</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Sample 3</td>
<td>32</td>
<td>&lt;10</td>
</tr>
<tr>
<td>Pebble Count/Adjusted Pebble Count</td>
<td>42</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 6: Bed Material Properties Summary
3.4.2 No-Action Model

Figure 16 presents a summary profile plot of the “no-action” sediment transport model output. Sediment plug median grain sizes modeled were 4.2 mm. This plot illustrates the invert elevation after 1 simulation year and the invert elevation after 10 simulation years. Erosional areas are colored green and depositional areas are colored orange. The 1 year simulation results are a slightly lighter shade than the 10 year simulation results. The existing stream bed profile is illustrated as a dashed black line.

**Figure 16: No-Action Profile Comparison**

![No-Action Profile Comparison](image)

The “no-action” sediment transport model results indicate fairly little change in Eklutna River invert elevations upstream of the Lower Eklutna Dam. Sediment modeling indicates erosion downstream of the Eklutna dam to the confluence with Thunderbird Creek. From approximately the Thunderbird Creek confluence to the Old Glenn Highway Bridge, deposition is predicted in the model. Deposition in this reach was caused by the expansion of the Eklutna River from the mouth of the canyon onto the alluvial fan. The contraction of the flows through the Old Glenn Highway Bridge causes downstream erosion and the confinement of flows to low flow braided channels. Sediment trends downstream of the Railroad Bridge are slightly erosional.

It should be noted that the depositional trend observed downstream of Thunderbird Creek is likely not going to realistically occur to the magnitude predicted by the model. The site visit confirmed the
potential for deposition in this area, but only minor deposition was observed. While the sediment model hydraulics indicate the potential for deposition in this area, nuances in transport approaches and modeling assumptions impact the magnitude predicted in the model. Similarly, erosion immediately downstream of the Glenn Highway Bridge is likely to occur, but to a lesser magnitude.

It should be noted that HEC-RAS sediment modeling is based on one dimensional processes and as such is not ideal for modeling sediment transport in two dimensional alluvial fan conditions. HEC-RAS modeling will not capture the complexity of split flows, avulsion of channels, or erosion of new channels. However, the HEC-RAS modeling was set up to approximately represent these areas and can be used for discussion purposes. General trends for sediment deposition or erosion in these areas can be derived from the sediment transport model results. However, more thorough analysis of deposition patterns on the Eklutna alluvial fan would require a multi-dimensional model.

### 3.4.3 Fine Gravel Plug Model

Figure 17 presents a profile plot of the fine gravel plug sediment transport model. Sediment plug median grain sizes modeled were 4.2 mm. This plot illustrates the thalweg elevation after 1 simulation year and the invert elevation after 10 simulation years. Erosional areas are colored green and depositional areas are colored orange. The 1 year simulation results are a slightly lighter shade than the 10 year simulation results. The existing stream bed profile is illustrated as a dashed black line.
The fine gravel dam removal sediment transport model indicates the thalweg elevation through the sediment plug returns to a natural slope within approximately one year. When compared to the “no-action” model results the fine gravel model illustrates fairly similar behavior. The fine gravel model does exhibit a reduction in erosion downstream of the Lower Eklutna Dam with some minor deposition. Long term erosion predicted around the bridges is also reduced in the fine gravel model. This is likely a result of the increased sediment load coming downstream. Some deposition of material is observed in the alluvial fan downstream of the ARRC Bridge.

It should be noted that because the sediment plug material is primarily transported in the first year, the 1-year simulation profile is the best representation of the impacts of dam removal. Additional channel movement shown in the 10-year simulation is likely due to the natural inflowing loads from the upstream canyon and has magnitude prediction limitations similar to the “no-action” model. For example, deposition in the vicinity of the Thunderbird Creek confluence associated with dam removal is primarily illustrated by the 1-year simulation profile.

Also of interest is the large portion of the sediment deposited in the vicinity of Thunderbird Creek in the very coarse sand (1 mm) to coarse gravel (32 mm). Much of this material is generated from Thunderbird Creek and is not associated with the dam removal. Additionally, this indicates that a majority of the fine sands, silts, and clays wash through the system and are not deposited in the vicinity of Thunderbird Creek.
Further refinements to the Thunderbird Creek modeling assumptions would likely impact the magnitude of deposition predicted in this area.

3.4.4 Sand Plug Model

Figure 18 presents a profile plot of the sand plug sediment transport model. Sediment plug median grain sizes modeled were 0.2 mm. This plot illustrates the thalweg elevation after 1 simulation year and the invert elevation after 10 simulation years. Erosional areas are colored green and depositional areas are colored orange. The 1 year simulation results are a slightly lighter shade than the 10 year simulation results. The existing stream bed profile is illustrated as a dashed black line.

**Figure 18: Sand Plug Profile Comparison**

Sand plug sediment model results are similar to the fine gravel results. The 1 year simulation results show that the sediment plug erodes to a more natural slope. Long term erosion is observed downstream of the Lower Eklutna Dam as the sediment plug is composed of finer material and does not deposit as readily as the fine gravel. The long term erosion predicted under the bridges is limited by the sand sediment plug model. Minor long term deposition is predicted on the alluvial fan downstream of the ARRC Bridge. Similar to the fine gravel model the 1-year simulation results should be considered in identifying the predicted impacts from dam removal.
3.4.5 Coarse Gravel Plug Model

Figure 19 presents a profile plot of the coarse gravel plug sediment transport model. Sediment plug median grain sizes modeled were 38 mm. This plot illustrates the thalweg elevation after 1 simulation year and the invert elevation after 10 simulation years. Erosional areas are colored green and depositional areas are colored orange. The 1 year simulation results are a slightly lighter shade than the 10 year simulation results. The existing stream bed profile is illustrated as a dashed black line.

**Figure 19: Coarse Gravel Plug Profile Comparison**

The coarse gravel plug model has sediment behaviors that diverge from those observed in the fine gravel and sand plug models. The coarse gravel plug takes longer to return to a more natural slope through the Lower Eklutna Dam reach, even with the peak 10-year event in the first year of the simulation. This is due to the much larger grain size material. Additionally, because of the limited amount of sediment conveyed out of the sediment plug downstream the erosion under the bridges is similar to that observed in the “no-action” model. The long term erosion downstream of the Lower Eklutna Dam is reduced from the “no-action” model as the larger material that is conveyed from the sediment plug deposits here and is more flow resistant.
3.4.6 High Flow Events

Demolition of the dam consists of removing sediment from behind the upstream face and periodically casting it over the face where it will be either flushed with bypass water or moved downstream with a bulldozer to keep the area downstream of the dam clear. Concrete will be removed from at least below Ordinary High Water along the canyon walls. The remaining sediment will be graded to a 6h:1v slope and left in place.

As described above, the low flow channel thalweg will incise steep side slopes in the sediment plug and meander in the channel as the stream migrates to the path of least resistance. In addition to incising the low flow channels, the meandering water will head cut the sediment plug, resulting in a slope steeper than 6h:1v, until the head cut becomes near vertical at the armor layers as a result of stream processes.

This process will repeat itself until the majority of the sediment is transported downstream, leaving residual sediment along the edges of the stream channel. This process will accelerate with higher flows which will mobilize higher volumes of sediment and flush residual sediment from the canyon walls. Eventually the stream will reach an equilibrium and more closely resemble existing conditions upstream of the sediment plug.

The Eklutna River is somewhat protected from flood events by the presence of the earthen dam at Eklutna Lake. During most years the lake level does not reach the dam; when it does water spills over a concrete spillway into a large pond immediately downstream of the dam. There is no active release mechanism on the dam to release water into the Eklutna River, only when the lake level reaches the spillway elevation does water reach the Eklutna River. There is a port in the spillway that can be opened, however it is not intended to be cycled on a regular basis. In most cases the water elevation of Eklutna Lake does not reach the toe of the dam.

Historical records from CH2M-Hill and U.S.G.S show the Eklutna Lake dam is overtopped periodically. The lake provides about 192,000 acre feet of water storage for the Eklutna Hydroelectric Project; the intake elevation is at 814 feet and the upper end of effective storage elevation is 876 feet. In addition, the Anchorage Water and Wastewater Utility (AWWU) purchases water from the power utilities for their treatment plant downstream that also includes a small hydropower turbine.

During the winter, when there is little to no water recharge, the lake is drawn down for hydropower and water supply uses. After spring breakup the lake gradually fills again throughout the summer. It is rare for Eklutna Lake to overtop the spillway, but such events generally occur during the late summer and early fall when lake levels are at their highest, peaking quickly and then extend for several weeks before lake levels drop below the crest of the spillway.

Previous H&H modeling by Crane Johnson with the U.S. Army Corps of Engineers conducted in 2007 estimate that, with the lake full, the calculated 100 year flood is 1,210 cfs into the Eklutna River. The presence of the Eklutna Lake Dam which attenuates peak flows. It should be noted that this study was not completed and the information it contained was not peer reviewed.

To understand the fate of the sediment during high flow/over topping events, a fine gravel model and a coarse gravel 100-year discharge sediment models were created using the methods discussed in previous sections. A 100-year peak flood event hydrograph was prepared, identical to the first 1.5 years of the 10-year peak hydrograph as illustrated in Figure 14, the only difference being that the 100-year peak replaced the 10-year peak assuming a 5-day storm duration. Additionally,
Thunderbird Creek hydrographs were increased to simulate 100-year peak flows assuming a 10-year and 100-year ratio similar to Eklutna.

Below are the two plots of the comparison for a coarse gravel sediment plug and a fine gravel sediment plug. The 100-year analysis results behaved as expected with the exception of the upstream end of the sediment plug in the 4.2 mm gravel model. This is likely due to the larger inflowing sediment load produced in the upstream boundary condition from the higher discharges.
The 100-year discharge coarse gravel sediment model predicted overall trends similar to those predicted in the 10-year peak discharge model. The 100-year discharge scoured approximately 50% more coarse gravel at the dam and approximately 75% more material at the Railroad Bridge. Approximately 70% less material was mobilized upstream of the Glenn Highway Bridge in the 100-year event, but maintained an overall erosional trend in the first 1.5 years.

The 100-year discharge fine gravel sediment model predicted overall trends similar to what was predicted for the average year discharge model. The 100-year discharge mobilized approximately the same amount of the fine gravel plug at the dam as the average year model predicted but had increased inflowing sediment loads at the upstream end of the plug. The 100-year discharge total bed material scoured upstream of the Glen Highway Bridge was approximately half of that predicted for the average year model. Bed material upstream of the Railroad bridge was mobilized significantly more than the average year fine gravel model predicted. Increases in 100-year predicted bed mobility upstream of the Railroad Bridge is likely the result of much larger discharges and increased sediment conveyance capacity.

Thunderbird Creek equilibrium sediment loads into Eklutna River increase significantly with 100-year discharges and would likely be of larger magnitude than the predicted increase in material conveyed out of the sediment plug. Increased loads from Eklutna and Thunderbird associated with the 100-year peak event do not result in significant deposition predicted downstream of the canyon outfall. Sediment modeling predicts the majority of sediment deposition occurs in between the Glen Highway Bridge and the Railroad Bridge spread out across the alluvial fan and in all of the smaller braided channels.
There would likely be some minor deposition of sediment upstream of the new Glen Highway Bridge as this area opens up and flattens out, but the vast majority of the sediment is predicted to be carried underneath the bridge and deposit in the braided channel system and dense vegetation downstream. No erosion of the stream abutments are expected to occur as a result of this sediment load.

Under the most likely scenarios of the one-year and ten-year events, the magnitudes of deposition and erosion are expected to be small. As the model attempts to predict the fate of sediment, a monitoring plan should be developed to track changes to the flow regime, water quality, and sediment deposition.

A post-project monitoring plan is being prepared as part of the permit application which will track the fate of sediment through surveys and time lapse cameras. An emergency action plan will be included as part of the monitoring plan and include protocols in case of unexpected deposition that changes the Eklutna River’s hydraulics.

### 3.4.7 Discussion

With the sediment modeling uncertainties and limited ability to validate the sediment model results a range of sensitivities were investigated to best identify sediment trends associated with removal of the Lower Eklutna Dam. Sensitivities indicated that the majority of sediment plug scenarios will mobilize and move out of the canyon in approximately the first year. This is in agreement with the bed mobility computations that indicate that flows in excess of 10 cfs mobilize Sample 2 and Sample 3 sediment plug gradations. The sediment that deposits downstream of the canyon mouth is generally coarse sand to coarse gravel and does not tend to migrate downstream of original deposition areas over time. Additional aggradation is observed after the initial sediment plug depositions that are related to natural sediment loads in Eklutna River.

It was also assumed that the material in the sediment plug was most likely conveyed into the Lower Eklutna Dam reservoir by flows similar to the reduced discharges that exist today. It is estimated that sediment resistant to erosion from existing flows would not be present in the sediment plug as they would have no way to have been conveyed into the reservoir. Sediment slides in the vicinity of the sediment plug are assumed to have minor influences on the overall material gradations. It is also unlikely that the adjusted pebble gradation is prevalent throughout the sediment plug as this material was not observed as a dominant gradation in the sediment plug in the field. The adjusted pebble gradation was more representative of the armor layer observed upstream of the Lower Eklutna Dam and is not necessarily representative of the full sediment depth in the reservoir. Therefore the results of the Course Gravel Plug analysis not thought to be representative of the post dam removal response.

Based on the assessments outlined above, it is anticipated that post dam removal, materials will begin to erode from the sediment plug by lower flows that do not inundate the entire canyon bottom. As a result, erosion will likely initiate within existing low flow channels and will quickly incise and create steep banks upstream of the existing dam. The incising low flow channel will approach a thalweg approaching the more natural canyon slope of approximately 2%. Over time, during the channel re-establishment period the eroded channel will slowly adjust by deepening and subsequently widening once the bank slough into the channel from being over steepened. Figure 20 illustrates a cross section plot of how the model predicts the rapid incision of the low flow channel in the sediment plug over a 2 year period.
Modeling results for the historic alluvial fan, downstream of the canyon mouth, indicate a tendency for some erosion. This alluvial fan area would typically be a depositional zone during high sediment discharge events. However, since the Upper Eklutna Dam limits peak depositional flows there are limited out-of-bank depositional conditions. Since the alluvial fan maintains approximately the same slope as the canyon and has similar low flow channel widths more channelized flow durations exist and less deposition is predicted than would normally be associated with an unregulated system. Additionally, one dimensional sediment modeling approaches do not fully capture the two dimensional nature of channel avulsion, abandonment, and erosion typical of alluvial fans.

4 Conclusions

HEC-RAS sediment modeling was prepared in support of the removal of the Lower Eklutna Dam. Sediment modeling is focused on identifying trends of erosion and deposition that result from removal of the dam. Uncertainties in the historic behavior and sediment inputs required numerous sensitivity analyses that helped envelope the possible sediment trends associated with removal of the dam.

Generally, all sediment gradations, other than the coarsest armor layer, are transported out of the Lower Eklutna Dam sediment plug within approximately one to two years. Review of modeled sediment deposited downstream of the Lower Eklutna Dam indicates finer sediments are generally conveyed through the Eklutna River reach and into the Knik Arm. The coarse sands to coarse gravels are the primary sediment deposited in the model. The “no-action” alternative indicates a tendency for erosion immediately downstream of the Lower Eklutna Dam and in the vicinity of the Glenn Highway Bridge and the ARRC Bridge. The dam removal options, to some degree, limit the erosion immediately downstream of the Lower Eklutna Dam and, in some cases, deposit material. The fine gravel and sand sediment plugs reduce long term erosion potential under the Glenn Highway Bridge and the ARRC Bridge. All of the sediment models, including “no-action” predict deposition from approximately the Thunderbird Creek confluence to the Old Glenn Highway Bridge.
Overall the comparison of dam removal sediment trends to “no-action” sediment trends predict minimal long term negative impacts to the Eklutna River. Additionally, most silts and fine sands are anticipated to wash through the system and be conveyed downstream to the Knik Arm.

However, deposition is predicted upstream of the Old Glenn Highway Bridge in all of the sediment model iterations, including the “no-action” alternative. Because of uncertainties in the modeling an emergency action plan will be developed to address sediment deposition under each of the bridges in the event unforeseen conditions generate sediment deposits impacting conveyance capacity of the facilities.

These sediment transport results are based on assumptions discussed above and professional judgment. Model validation and calibration was not possible with the available information and limits model results to a qualitative comparison of impacts between “no-action” and dam removal options. Further sensitivity analyses could also help to refine model results for uncertainty in hydrology and geotechnical characteristics. Results from the current level of sediment transport modeling should not be used to identify quantitative sediment patterns, but rather trends. Additional historic, geotechnical, hydrologic, sediment load, and physical data would be required to refine model results for qualitative assessments.
5 References


Appendix A. Exhibits
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Appendix B. Bed Mobility Computations
This page is intentionally left blank.
Calculations based on guidance from the USFS Streambed Simulation Appendix E Streambed Mobility

Grain size distributions based on grab samples by Shannon and Wilson Inc.

Equations:

\[ \tau_c = \frac{\gamma_{w} D_{50}^{0.5}}{D_{50}} \]

\[ \gamma_c = \frac{D_{50}}{D_{50}} \]

\[ \tau = \gamma \cdot \frac{D_{50}}{D_{50}} \]

Material Property | Sample S3 | Sediment
--- | --- | ---
Percent Finer | (mm) | 
D10 | 0.5 |
D30 | 4.6 |
D50 | 31.8 |
D84 | 38.5 |
D90 | 55.8 |
D95 | 7.0 |

Flow Characteristics

**XS 25726**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full channel flow (ft³/s)</td>
<td>10, 20, 30, 40, 50, 60, 150</td>
</tr>
<tr>
<td>Bankfull Width (ft)</td>
<td>29.15, 29.15, 29.15, 29.15, 29.15, 29.15, 29.15</td>
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<tr>
<td>Active Bed Width (ft)</td>
<td>11.23, 12.79, 13.89, 14.58, 15.23, 15.82, 25.37</td>
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<tr>
<td>Channel Cross Sectional Area (ft²)</td>
<td>3.26, 5.42, 7.26, 8.94, 10.55, 12.09, 25.86</td>
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<td>Hydraulic Radius for Active Channel (ft)</td>
<td>0.29, 0.42, 0.52, 0.60, 0.68, 0.75, 1.00</td>
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<tr>
<td>Channel Wetted Perimeter (ft)</td>
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<tr>
<td>Acceleration of Gravity (ft/s²)</td>
<td>32.2, 32.2, 32.2, 32.2, 32.2, 32.2, 32.2</td>
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Modified Critical Shear Stress

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<tr>
<th>Property</th>
<th>Value</th>
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</thead>
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<tr>
<td>( \tau_{c,0} ) (lb/ft²)</td>
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<td>( \tau_{c,10} ) (lb/ft²)</td>
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<td>( \tau_{c,25} ) (lb/ft²)</td>
<td>0.50, 0.63, 0.73, 0.82, 0.88, 0.94, 1.17</td>
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Particle Stability | UNSTABLE, UNSTABLE, UNSTABLE, UNSTABLE, UNSTABLE, UNSTABLE, UNSTABLE |
Calculations based on guidance from the USFS Streambed Simulation Appendix E Streambed Mobility

Grain size distributions based on grab samples by Shannon and Wilson Inc.

**Sediment**

<table>
<thead>
<tr>
<th>Material Property</th>
<th>Sample 52</th>
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<tbody>
<tr>
<td>Percent Finer</td>
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<tr>
<td>(D_{50})</td>
<td>0.5</td>
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<tr>
<td>(D_{63})</td>
<td>4.2</td>
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<tr>
<td>(D_{95})</td>
<td>14.0</td>
</tr>
<tr>
<td>(D_{90})</td>
<td>17.0</td>
</tr>
<tr>
<td>(D_{95}/D_{50})</td>
<td>43.8</td>
</tr>
<tr>
<td>(D_{84}/D_{50})</td>
<td>3.4</td>
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**Flow Characteristics**

<table>
<thead>
<tr>
<th>XS 25726</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full channel flow (ft³/s)</td>
</tr>
<tr>
<td>Active channel flow (ft³/s)</td>
</tr>
<tr>
<td>Bankfull width (ft)</td>
</tr>
<tr>
<td>Active bed width (ft)</td>
</tr>
<tr>
<td>Slope (ft/ft)</td>
</tr>
<tr>
<td>Channel cross sectional area (ft²)</td>
</tr>
<tr>
<td>Channel wetted perimeter (ft)</td>
</tr>
<tr>
<td>Hydraulic radius for active channel (ft)</td>
</tr>
<tr>
<td>Density of water (lb/ft³)</td>
</tr>
<tr>
<td>Acceleration of gravity (ft/s²)</td>
</tr>
</tbody>
</table>

**Modified Critical Shear Stress**

\[
\tau_{c00} = \gamma \frac{d_{50}}{g} \\
\tau_{c84} = \gamma \frac{d_{84}}{g} \\
\tau_{bf} = \gamma \frac{d_{bf}}{g}
\]

<table>
<thead>
<tr>
<th>Particle Stability</th>
<th>UNSTABLE</th>
<th>UNSTABLE</th>
<th>UNSTABLE</th>
<th>UNSTABLE</th>
<th>UNSTABLE</th>
<th>UNSTABLE</th>
<th>UNSTABLE</th>
</tr>
</thead>
</table>

**Equations:**

\[
\tau_c = \tau_{c00} D_{50}^{0.1} D_{50}^{0.63} \\
\gamma = \frac{\rho g}{d_{50}}
\]

where:

- \(\tau_c\): critical shear stress in which the sediment particle of interest begins to move (lb/ft² or N/m²).
- \(\tau_{c00}\): dimensionless Shields parameter for \(D_{50}\) particle size (this value can either be obtained from Table E.1, or the value 0.045 can be used for a \(K\) = hydraulic radius (ft) poorly sorted channel bed).
- \(\gamma\): energy slope or bed slope (ft/ft).
- \(D_{50}\): the diameter of the median or the 50th percentile particle size of the channel bed.
- \(D_{84}\): the diameter of the particle size of interest. For stream simulation the particle size of interest is typically \(D_{50}\) and/or \(D_{95}\).

Assuming \(\gamma = 165\) lb/ft² and \(\gamma = 62.4\) lb/ft², equation 5 can be simplified to:

\[
\tau_c = 102.6 \tau_{c00} D_{50}^{0.1} D_{50}^{0.63}
\]
Calculations based on guidance from the USFS Streambed Simulation Appendix E Streambed Mobility
Grain size distributions based on grab samples by Shannon and Wilson Inc.

Material Property | Pebble Count
--- | ---
Percent Finer | (mm)
D₁₀  | 13.7
D₂₅  | 24.3
D₅₀  | 41.8
D₇₅  | 49.5
D₉₀  | 59.8
D₈₄/D₅₀ | 2

Flow Characteristics

<table>
<thead>
<tr>
<th>XS 25726</th>
<th>Full channel flow (ft³/s)</th>
<th>10</th>
<th>20</th>
<th>30</th>
<th>40</th>
<th>50</th>
<th>60</th>
<th>150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active channel flow (ft³/s)</td>
<td></td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>150</td>
</tr>
<tr>
<td>Bankfull Width (ft)</td>
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<td>38.84</td>
<td>38.84</td>
<td></td>
</tr>
<tr>
<td>Active Bed Width (ft)</td>
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<td>35.64</td>
<td></td>
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<tr>
<td>Channel Cross Sectional Area (ft²)</td>
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<td>7.15</td>
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<td>12.98</td>
<td>14.83</td>
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<tr>
<td>Channel Wetted Perimeter (ft)</td>
<td>18.31</td>
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<td>22.93</td>
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<td>26.93</td>
<td>28.73</td>
<td>35.91</td>
<td></td>
</tr>
<tr>
<td>Hydraulic Radius for Active Channel (ft)</td>
<td>0.25</td>
<td>0.34</td>
<td>0.40</td>
<td>0.45</td>
<td>0.48</td>
<td>0.52</td>
<td>0.81</td>
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<tr>
<td>Density of Water (lb/ft³)</td>
<td>62.4</td>
<td>62.4</td>
<td>62.4</td>
<td>62.4</td>
<td>62.4</td>
<td>62.4</td>
<td>62.4</td>
<td></td>
</tr>
<tr>
<td>Acceleration of Gravity (ft/s²)</td>
<td>32.2</td>
<td>32.2</td>
<td>32.2</td>
<td>32.2</td>
<td>32.2</td>
<td>32.2</td>
<td>32.2</td>
<td></td>
</tr>
</tbody>
</table>

Modified Critical Shear Stress

| τ₀₉₀ (lb/ft²) | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 | 0.042 |
| τ₀₄₄ (lb/ft²) | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 |
| τ₀₄₄ (lb/ft²) | 0.26 | 0.39 | 0.50 | 0.57 | 0.65 | 0.71 | 0.99 |

Particle Stability | STABLE | STABLE | UNSTABLE | UNSTABLE | UNSTABLE | UNSTABLE | UNSTABLE | UNSTABLE
Appendix C. Sediment Evaluation Report
September 2, 2015

HDR Alaska, Inc.
2525 C Street, Suite 305
Anchorage, Alaska 99503

Attn: Mr. Mark Dalton

RE: OLD EKLUTNA RIVER DAM SEDIMENT EVALUATION, REVISED, EKLUTNA, ALASKA

This revised letter report documents the results of geotechnical and environmental studies by Shannon & Wilson, Inc. for the Old Eklutna River Dam Sediment Evaluation project in Eklutna, Alaska. Revisions include the addition of regulatory guidelines and discussion. Our original letter was submitted August 13, 2015. We understand that preliminary plans are being developed to decommission the dam in order to restore habitat in the area. The dam is 60 to 70 feet tall on the downstream side and was reportedly constructed in the 1920s. On the upstream side of the dam, sediment has naturally deposited and accumulated over time and at the time of our field visit was level with the top of the dam structure. The incised gorge is approximately 100 to 150 deep (above the crest of the dam). According to Brad Meiklejohn (The Conservation Fund), the flow within the gorge is from seeps and springs, as the Eklutna Lake reservoir outflow is routed away from the gorge for power and water utility purposes. The purpose of this study was to collect sediment samples for physical and chemical property evaluation. Presented in this letter is a description of our reconnaissance efforts and laboratory testing, results of laboratory testing (both physical and chemical), and field observations made during reconnaissance.

Authorization to proceed with this work was received in the form of a subconsultant agreement signed by Mr. Tim Gallagher on July 7, 2015. Our work was conducted in general accordance with Approach 1 of our May 20, 2015 proposal.

FIELD RECONNAISSANCE AND OBSERVATIONS

The reconnaissance effort took place on July 14, 2015, and was conducted on foot by Ms. Katra Wedeking, geologist, and Ms. Katie Nolan, environmental scientist, from our Anchorage office. Ms. Wedeking and Ms. Nolan were accompanied by the field team, which included
representatives from HDR Alaska, The Conservation Fund, and Eklutna Village. Our field explorations consisted of surface observations, hand-excavated test pits, and sediment sample collection for both physical and chemical analyses.

We hand excavated shallow (less than 2 feet deep) test pits for sample collection at the bottom of the gorge in several locations within the active channel. Sediment samples were designated Sample S1 through S5 for physical testing and Samples SS1 through SS3 for chemical analyses. Sediment samples designated for physical testing (moisture content and gradation properties) were collected from the test pits, sealed in moisture tight bags, and transported to our Anchorage laboratory for testing. Analytical sample collection depths varied between 2.5 to 8 inches below ground surface (bgs) because of the shallow water level. Analytical sediment samples were collected in laboratory-supplied jars in decreasing order of volatility. For each analysis of volatile compounds, at least 25 grams of sediment, but no more than could be completely submerged with 25-milliliters of methanol, was placed into a pre-weighted 4-ounce jar with a septa lid. A 25-milliliter aliquot of methanol containing laboratory-added surrogates was quickly added to the sample jar to submerge the sample. Samples for non-volatile analyses were collected by completely filling laboratory-supplied jars using dedicated stainless steel spoons. The analytical samples were placed in a cooler with ice packs, and transferred to SGS North America (SGS) using chain of custody procedures.

The approximate sampling locations are presented on Figure 1 and select site photos are included as Figure 2. Samples S1 and SS1 were collected approximately 23 feet behind the dam face (see Figure 2, Photo 3), and Samples S2 and SS2 were collected approximately 51 feet behind the dam face. For collection of Samples S3 and S4 as well as Sample SS3, we walked upstream approximately 1,000 feet to a site where debris had been dumped into the gorge at the bottom of a steep rock face and scree slope (see Figure 2, Photo 4). Sample SS3 was collected from the surface sediment that had accumulated on top of the debris, as collection beneath the debris was inaccessible. We observed numerous tires, several vehicle parts, a refrigerator, mattresses, traffic cones, road signs, and various scrap metal. Hand digging in the area indicated that the debris extended beneath the surface sediment to an unknown depth. Sample S5 was collected from the base of the south side gorge wall in an area where the rock had been undercut by previous channel action and finer grained material had been deposited.

The sample locations, shown on Figure 1, were recorded with a handheld GPS unit that is generally considered accurate to within 20 feet horizontally. It should be noted that GPS accuracy may be affected by tree canopies, geographic features (such as deep gorges), and other
atmospheric anomalies. The sample locations shown on the site plan should be considered approximate.

LABORATORY TESTING

Laboratory tests for physical analyses were performed on Samples S1 through S5 recovered during our reconnaissance to confirm field classifications and to estimate the index properties of the typical materials encountered. The physical laboratory testing was formulated with emphasis on estimating the material gradation and in-situ water content.

Water content tests were performed in general accordance with ASTM International (ASTM) D2216. The results of the water content measurements for the samples tested are presented in the attached Summary of Physical Test Results.

Grain size classification (gradation) testing was performed to estimate the particle size distribution of selected samples. The gradation testing generally followed the procedures described in ASTM C136. Grain size classification curves are presented in the attachments as Figure 3 and percent passing each sieve size is presented in the attached Summary of Physical Test Results.

For chemical analyses, three analytical samples were analyzed for gasoline range organics (GRO) by Alaska Method AK 101, diesel range organics (DRO) by AK 102, residual range organics (RRO) by AK 103, volatile organic compounds (VOCs) by Environmental Protection Agency (EPA) Method 8260B, semi-volatile organic compounds (SVOCs) by EPA Method 8270D, Resource Conservation and Recovery Act (RCRA) metals by EPA Method 6020A, Toxicity Characteristic Leaching Procedure (TCLP) metals by EPA Method 6020A, polychlorinated biphenyls (PCBs) by EPA Method 8082A, and pesticides by EPA Method 8270D SIM. The analytical results for the sediment samples are presented in the attached Summary of Analytical Results.

Physical Analyses Testing Results

Gradation testing was accomplished on five samples collected from four test pits. Grain size curves and a summary of test results are provided in Figure 3 and the attached Summary of Physical Test Results, respectively. Results from Samples S1 through S3, which were collected from gravel bars, indicate that the material is classified as poorly to well-graded sand with gravel or poorly graded gravel with sand. Sample S4 was collected from approximately 1.3 feet below ground surface (bgs) within the same test pit as Sample S3 (from approximately 0.8 feet bgs),
and was classified as silt. Sample S5 was collected at the side of the gorge (not within the active river flow) at the base of a rock face and was classified as silty sand with approximately 25 percent fines (by weight).

**Chemical Analyses Testing Results**

Sample SS3, collected at the dump site, contained an estimated concentration of 21.5 mg/kg DRO. DRO was not detected in the other two sediment samples. Detectable RRO concentrations were measured in Samples SS1 and SS3 at 36.2 and 228 milligrams per kilogram (mg/kg), respectively. RRO was not detected in Sample SS2.

Each of the three analytical samples contained detectable concentrations of six RCRA metals (arsenic, barium, chromium, lead, mercury, and silver). Samples SS2 and SS3 also contained estimated concentrations of cadmium at levels below the laboratory limit of quantitation (LOQ). Each sample contained a detectable concentration of TCLP barium, and Sample SS3 contained an estimated concentration of TCLP arsenic.

The remaining tested analytes (GRO, VOCs, SVOCs, PCBs, and pesticides) were not detected in the project samples.

At your request, we have provided the following discussion of potentially applicable regulatory action levels. We have not conducted a comparison of analytical results to these action levels, as their specific applicability to project specific needs (e.g. habitat risk evaluation, upland disposal, etc.) has not been determined. Note that given the limited scope of our explorations, the results herein should not be considered indicative of the entire project area and/or all the sediment that has been deposited behind and upstream of the dam. According to the Alaska Department of Environmental Conservation (ADEC) Division of Spill Prevention and Response Contaminated Sites Program technical memorandum dated January, 2013, “the state does not have a framework for screening, assessment and remediation of contaminated sediment.” It is our understanding that sediment evaluation will be site specific and at the discretion of ADEC project managers depending on many project and environmental factors. The technical memorandum recommends that the Threshold Effects Level (TEL) and Probable Effects Level (PEL) Sediment Quality Guidelines (SQGs) from the National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRTs) be used for sediment evaluation. TEL values represent the concentration below which adverse effects are expected to occur only rarely. PEL values represent the concentration above which adverse effects are frequently expected. According to the ADEC technical memorandum, the SQGs are
guidelines only, and should not be used as sediment cleanup levels, they are meant to be used as a first tier screening for sediment evaluation. In addition, they do not address bioaccumulation or biomagnification.

Also included on our Summary of Analytic Results are the ADEC Method 2 standards listed in Tables B1 and B2, 18 AAC 75.341 for soil. These standards are also considered tier one sediment screening for those compounds with no SQuiRTs values. The material within the bottom of the gorge is at present state considered sediment because it has been deposited by the Eklutna River. It is part of the active channel within the bottom of the gorge. We understand that if the material is removed from the stream channel and stockpiled upland for use (as fill) or disposal, it would be considered soil, and ADEC soil criteria would be applicable.

To evaluate metals, we have included screening levels for total metals concentration as well as characteristic hazardous waste thresholds regulated under the Resource Conservation Recovery Act (RCRA) (40 CFR 261.24 Table 1). The criteria apply to the leachable component in environmental media (soil, sediment, water) as measured using toxicity characteristic leaching procedure (TCLP) testing protocols and would be applicable if the material was removed and needed to be disposed.

It is noted that our limited sampling effort was intended to evaluate whether tested contaminants may be present. Based on visual observation of the debris upstream of the dam, we expect that further chemical testing and evaluation will be necessary depending on future permitting with regulatory agencies. Future discussion and open communication with regulatory agencies will be essential as the project moves forward. Only through agency coordination will final clean up thresholds for contaminants be able to be determined.

CONCLUSIONS

In reviewing the above information, it is important to understand that our sampling and observations are that of the upper 1 to 2 feet of existing surface sediments behind the dam. Given the 60 to 70-foot free standing height at the dam face, a significant amount of sediment has been deposited behind the structure. As such, we expect that there is likely a significant amount of variability in the gradation and the chemical characteristics of that sediment with depth. The dynamic alluvial environment has likely resulted in cross bedding of silt, sand, and gravel through alternating periods of high and low flow. Similarly, the presence of refuse and dumped debris at the floor of the gorge behind the dam suggests that there could be additional,
undocumented debris that has been buried by sedimentation. This debris could be a potential source of environmental contamination.

CLOSURE AND LIMITATIONS

The findings we have presented within this report are based on the limited sampling and analyses that we conducted in accordance with Approach 1 in our proposal. The sediment test data are not intended to provide representative characterization of the entire study area. Definitive determination regarding the presence, absence, or magnitude of contamination is limited to the specific locations, depths, and samples collected. In addition, the data cannot be used to represent areas outside the lateral and vertical extent of the specified sample collection area and it is possible that higher levels of contaminant constituents may be found. As a result, the limited sampling and analysis performed can only provide you with our professional judgment as to the environmental characteristics of this site, and in no way guarantees that an agency or its staff will reach the same conclusions as Shannon & Wilson, Inc. The data presented in this report should be considered representative of the time of our site reconnaissance.

This report was prepared for the exclusive use of our client and their representatives for evaluating the site as it relates to the geotechnical and environmental aspects discussed herein. The conclusions and interpretation contained in this report are based on site conditions as they existed at the time of our site visit. If there is a substantial lapse of time between the submittal of this report and the start of work at the site, or if conditions have changed due to natural causes or human activity, it is recommended that this report be reviewed to determine the applicability of the conclusions considering the changed conditions and time lapse. Unanticipated sediment conditions are commonly encountered and cannot fully be determined by merely taking sediment samples or excavating test holes. Shannon & Wilson has prepared the attachment Important Information About Your Geotechnical/Environmental Report to assist you and others in understanding the use and limitations of the reports.

Copies of documents that may be relied upon by our client are limited to the printed copies (also known as hard copies) that are signed or sealed by Shannon & Wilson with a wet, blue ink signature. Files provided in electronic media format are furnished solely for the convenience of the client. Any conclusion or information obtained or derived from such electronic files shall be at the user’s sole risk. If there is a discrepancy between the electronic files and the hard copies, or you question the authenticity of the report please contact the undersigned.
Eklutna Sediment Evaluation
September 2, 2015
Page 7 of 7

We appreciate this opportunity to be of service. Please contact the undersigned at (907) 561-2120 with questions or comments concerning the contents of this report.

Sincerely,

SHANNON & WILSON, INC.

Katra Wedeking, CPG
Senior Geologist

Attachments: Site Plan
Photo Pages (2 sheets)
Grain Size Classification (2 sheets)
Summary of Physical Test Results
Summary of Analytical Results
SGS Laboratory Report of Analysis
Important Information About Your Geotechnical/Environmental Report

References:


LEGEND

- Sample S1 and SS1: Approximate Location of Sample S1 and SS1, collected by Shannon & Wilson, July 2015

Map adapted from aerial imagery provided by Google Earth Pro, reproduced by permission granted by Google Earth™ Mapping Service.

Old Eklutna River Dam Sediment Evaluation
Eklutna, Alaska

SITE PLAN

August 2015

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 1
Photo 1: Looking south-southeast at the Old Eklutna River Dam. (July 14, 2015)

Photo 2: Looking west at accumulated sediment on the upstream side of the dam. (July 14, 2015)
Photo 3: Looking west-northwest at the shallow test pit excavated approximately 23 feet behind the dam face. (July 14, 2015)

Photo 4: Looking northeast at dump site located upstream of the dam. (July 14, 2015)
# Geotechnical and Environmental Consultants

## Old Eklutna River Dam Sediment Evaluation

### Eklutna, Alaska

August 2015

# Grain Size Classification

### Sample Cc

<table>
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<th>Sample Depth, Ft</th>
<th>D10</th>
<th>D30</th>
<th>D100</th>
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<tr>
<td>1.3 - 1.5</td>
<td>0.09</td>
<td>0.24</td>
<td>4.75</td>
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<tr>
<td>0.7 - 0.9</td>
<td>0.75</td>
<td>1.30</td>
<td>12.5</td>
</tr>
</tbody>
</table>

### Classification

- Gravel (G) 25
- Sand (S) 75
- Silt (S) 93
- Clay (C) 93

### Coarse, Medium, Fine

- coarse
- medium
- fine

### Grain Size Classification

- CLAY
  - Clayey Silt (ML)
- SILT OR CLAY
- SAND
- COBBLES

### U.S. Sieve Numbers

- #6
- #10
- #20
- #40
- #60
- #100
- #200

### U.S. Sieve Opening in Inches

- #6: 0.24
- #10: 0.4
- #20: 0.07
- #40: 0.03
- #60: 0.01
- #100: 0.001

### Hydrometer

### Depth, Ft

- D10: 0.09
- D30: 0.24
- D100: 4.75

### %Gravel

- 25

### %Sand

- 75

### %Silt

- 93

### %Clay

- 93

### D60

- 1.3 - 1.5

### D10

- 0.7 - 0.9

### D100

- 12.5

### Cu

- 1.3 - 1.5

### LL

- 0.7 - 0.9

### PI

- 12.5

### Classification

- Clayey Silt (ML)
- Silty Sand (SM)
- Silt or Clay

---

*SHANNON & WILSON, INC.*

*Sheet 2 of 2*
### Project Information

**Project Name:** Old Eklutna River Dam Sediment Evaluation  
**Project Location:** Eklutna, Alaska  
**Client:** HDR Alaska  
**Project Number:** 32-1-02472  
**Collection Date:** July 14, 2015

### Summary of Physical Test Results

<table>
<thead>
<tr>
<th>Parameter Tested</th>
<th>Method</th>
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<tbody>
<tr>
<td>Moisture Content - %</td>
<td>ASTM D2216</td>
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<tr>
<td>Grain Size (Sieve) - % passing</td>
<td>ASTM C117/C136</td>
</tr>
<tr>
<td>Sieve Size - mm (USS)</td>
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</tr>
<tr>
<td>75 (3&quot;)</td>
<td></td>
</tr>
<tr>
<td>63 (2.5&quot;)</td>
<td>100</td>
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<tr>
<td>50 (2&quot;)</td>
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<tr>
<td>37.5 (1.5&quot;)</td>
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</tr>
<tr>
<td>25 (1&quot;)</td>
<td>93</td>
</tr>
<tr>
<td>19 (3/4&quot;)</td>
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<tr>
<td>4.75 (#4)</td>
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### Sample Identifier and Collection Depth

<table>
<thead>
<tr>
<th>Sample</th>
<th>Depth</th>
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<tbody>
<tr>
<td>Sample S1</td>
<td>1.5 feet bgs</td>
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<tr>
<td>Sample S2</td>
<td>1.8 feet bgs</td>
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<tr>
<td>Sample S3</td>
<td>0.8 feet bgs</td>
</tr>
<tr>
<td>Sample S4</td>
<td>1.3 feet bgs</td>
</tr>
<tr>
<td>Sample S5</td>
<td>0.7 feet bgs</td>
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### Key

<table>
<thead>
<tr>
<th>Description</th>
<th>Not tested or not applicable</th>
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<tbody>
<tr>
<td>%</td>
<td>Percent</td>
</tr>
<tr>
<td>mm</td>
<td>Millimeters</td>
</tr>
<tr>
<td>&quot;</td>
<td>Inches</td>
</tr>
<tr>
<td>bgs</td>
<td>Below ground surface</td>
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---

---
### SUMMARY OF ANALYTICAL RESULTS

<table>
<thead>
<tr>
<th>Parameter Tested</th>
<th>Method*</th>
<th>NOAA SQuiRTs Freshwater Sediment TEL (mg/kg)**</th>
<th>NOAA SQuiRTs Freshwater Sediment PEL (mg/kg)**</th>
<th>ADEC Cleanup Criteria for Soil (mg/kg)**</th>
<th>RCRA/TCLP P Standard (mg/L)***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Range Organics (GRO) - mg/kg</td>
<td>AK 101</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&lt;0.980</td>
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<tr>
<td>Diesel Range Organics (DRO) - mg/kg</td>
<td>AK 102</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>&lt;11.3</td>
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<tr>
<td>Residual Range Organics (RRO) - mg/kg</td>
<td>AK 103</td>
<td>-</td>
<td>10,000</td>
<td>-</td>
<td>36.2</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOCs) - mg/kg</td>
<td>EPA 8260B</td>
<td>various</td>
<td>various</td>
<td>various</td>
<td>ND</td>
</tr>
<tr>
<td>Semi-Volatile Organic Compounds (SVOCs) - mg/kg</td>
<td>EPA 8270D</td>
<td>various</td>
<td>various</td>
<td>various</td>
<td>ND</td>
</tr>
<tr>
<td>Pesticides - mg/kg</td>
<td>EPA 8270D SIM</td>
<td>various</td>
<td>various</td>
<td>various</td>
<td>ND</td>
</tr>
<tr>
<td>Polychlorinated Biphenyls (PCBs) - mg/kg</td>
<td>EPA 8082A</td>
<td>0.0341</td>
<td>0.277</td>
<td>1</td>
<td>&lt;0.0279</td>
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**RCRA Metals (Total)**

<table>
<thead>
<tr>
<th>Parameter Tested</th>
<th>Method*</th>
<th>NOAA SQuiRTs Freshwater Sediment TEL (mg/kg)**</th>
<th>NOAA SQuiRTs Freshwater Sediment PEL (mg/kg)**</th>
<th>ADEC Cleanup Criteria for Soil (mg/kg)**</th>
<th>RCRA/TCLP P Standard (mg/L)***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic - mg/kg</td>
<td>EPA 6020A</td>
<td>5.9</td>
<td>17</td>
<td>4</td>
<td>-</td>
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<tr>
<td>Barium - mg/kg</td>
<td>EPA 6020A</td>
<td>-</td>
<td>-</td>
<td>1,100</td>
<td>-</td>
</tr>
<tr>
<td>Cadmium - mg/kg</td>
<td>EPA 6020A</td>
<td>0.596</td>
<td>3.53</td>
<td>5.0</td>
<td>-</td>
</tr>
<tr>
<td>Chromium - mg/kg</td>
<td>EPA 6020A</td>
<td>37.3</td>
<td>90</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>Lead - mg/kg</td>
<td>EPA 6020A</td>
<td>35</td>
<td>91.3</td>
<td>400</td>
<td>-</td>
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<tr>
<td>Mercury - mg/kg</td>
<td>EPA 6020A</td>
<td>0.174</td>
<td>0.486</td>
<td>1.4</td>
<td>-</td>
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<tr>
<td>Selenium - mg/kg</td>
<td>EPA 6020A</td>
<td>-</td>
<td>-</td>
<td>3.4</td>
<td>-</td>
</tr>
<tr>
<td>Silver - mg/kg</td>
<td>EPA 6020A</td>
<td>0.500 (LEL)</td>
<td>0.500 (LEL)</td>
<td>11.2</td>
<td>0.0770 J</td>
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</table>

**RCRA Metals (TCLP)**

<table>
<thead>
<tr>
<th>Parameter Tested</th>
<th>Method*</th>
<th>NOAA SQuiRTs Freshwater Sediment TEL (mg/kg)**</th>
<th>NOAA SQuiRTs Freshwater Sediment PEL (mg/kg)**</th>
<th>ADEC Cleanup Criteria for Soil (mg/kg)**</th>
<th>RCRA/TCLP P Standard (mg/L)***</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic - mg/L</td>
<td>EPA 1311/6020A</td>
<td>-</td>
<td>-</td>
<td>5.0</td>
<td>-</td>
</tr>
<tr>
<td>Barium - mg/L</td>
<td>EPA 1311/6020A</td>
<td>-</td>
<td>-</td>
<td>100</td>
<td>0.328</td>
</tr>
<tr>
<td>Cadmium - mg/L</td>
<td>EPA 1311/6020A</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>&lt;0.0500</td>
</tr>
<tr>
<td>Chromium - mg/L</td>
<td>EPA 1311/6020A</td>
<td>-</td>
<td>-</td>
<td>5.0</td>
<td>&lt;0.100</td>
</tr>
<tr>
<td>Lead - mg/L</td>
<td>EPA 1311/6020A</td>
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<td>-</td>
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<td>&lt;0.0250</td>
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<tr>
<td>Mercury - mg/L</td>
<td>EPA 1311/6020A</td>
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<td>-</td>
<td>0.2</td>
<td>&lt;0.0500</td>
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<tr>
<td>Selenium - mg/L</td>
<td>EPA 1311/6020A</td>
<td>-</td>
<td>-</td>
<td>1.0</td>
<td>&lt;0.500</td>
</tr>
<tr>
<td>Silver - mg/L</td>
<td>EPA 1311/6020A</td>
<td>-</td>
<td>-</td>
<td>5.0</td>
<td>&lt;0.0500</td>
</tr>
</tbody>
</table>

Notes:
- * = See SGS Laboratory Report for compounds tested, methods, and laboratory reporting limits
- ** = NOAA Screening Quick Reference Tables (SQuiRTs) TEL and PEL values for freshwater sediment (November 2008) and benthic organisms
- *** = Soil cleanup level is the most stringent Method 2 standard listed in Table B1 or B2, 18 AAC 75, for the "under-40-inch (precipitation) zone" (October 2014)
- **** = 40 CFR 261.24 Table 1 Maximum Concentration of Contaminants for the Toxicity Characteristic hazardous waste
- TEL = NOAA SQuiRTs Lowest Effect Level, the level of sediment contamination that can be tolerated by the majority of benthic organisms. Provided for Silver as no TEL or PEL was given.
- PEL = Threshold Effects Level
- TCLP = Toxicity Characteristic Leaching Procedure
- mg/kg = Milligrams per kilogram
- mg/L = Milligrams per liter
- bgs = Below ground surface
- J = Analyte detected, but at a concentration less than the limit of quantitation. See the SGS Laboratory Report for details.
- <0.980 = Analyte not detected; laboratory limit of detection is 0.980 mg/kg
- 36.2 = Analyte detected at a concentration of 36.2 mg/kg
- ND = Analytes not detected
- RCRA = Resource Conservation and Recovery Act
- SHANNON & WILSON, INC.

Page 1 of 1
To: Shannon & Wilson, Inc.  
5430 Fairbanks St. Suite 3  
Anchorage, AK 99518  
(907)561-2120

Report Number: 1153644  
Client Project: 32-1-02472 Eklutna Sediment

Dear Katra Wedeking,

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 Victoria 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.

Victoria Pennick                                 Date
Project Manager  
Victoria.Pennick@sgs.com
Case Narrative

SGS Client: Shannon & Wilson, Inc.
SGS Project: 1153644
Project Name/Site: 32-1-02472 Eklutna Sediment
Project Contact: Katra Wedeking

Refer to sample receipt form for information on sample condition.

SS3 (1153644003) PS
AK101 - Surrogate recovery for 4-bromofluorobenzene (47.5 %) does not meet QC criteria. Sample was analyzed twice and results confirmed.
8270D SIM - The pesticide LOQs are elevated due to sample dilution. The sample was analyzed at a dilution due to matrix interference with internal standards.

1153644003MS (1277311) MS
8082A - MS recovery for Aroclor-1016 (164%) does not meet QC criteria due to matrix interference. Refer to the LCS for accuracy.

1158220001MS (1277606) MS
6020A - Metals MS recoveries for barium (131%) and chromium (127%) do not meet QC criteria. The post digestion spike was successful.

1153644003MS (1277862) MS
8270D SIM - Pesticide MS recoveries for several compounds do not meet QC criteria. Refer to the LCS for accuracy requirements.
8270D SIM - The pesticide LOQs are elevated due to sample dilution. The sample was analyzed at a dilution due to matrix interference with internal standards.

1153644003MSD (1277312) MSD
8082A - MSD recovery for Aroclor-1016 (141%) does not meet QC criteria due to matrix interference. Refer to the LCS for accuracy.

1158220001MSD (1277607) MSD
6020A - Metals MSD recoveries for barium (76%) and chromium (123%) do not meet QC criteria. The post digestion spike was successful.

1153644003MSD (1277863) MSD
8270D SIM - Pesticide MSD recovery for several compounds do not meet QC criteria. Refer to the LCS for accuracy requirements.
8270D SIM - Pesticide MS/MSD RPD for several compounds do not meet QC criteria. These analytes were not detected above the LOQ in the parent sample.
8270D SIM - The pesticide LOQs are elevated due to sample dilution. The sample was analyzed at a dilution due to matrix interference with internal standards.

*QC comments may be associated with the field samples found in this report. When applicable, comments will be applied to associated field samples.
<table>
<thead>
<tr>
<th>Laboratory ID</th>
<th>Client Sample ID</th>
<th>Analytical Batch</th>
<th>Analyte</th>
<th>Reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>8270D SIMS (PEST)</td>
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<tr>
<td>12777860</td>
<td>LCS for HBN 1713998 [XXX/33602]</td>
<td>XMS8803</td>
<td>Endosulfan I</td>
<td>SP</td>
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<tr>
<td>1277862</td>
<td>1153644003MS</td>
<td>XMS8803</td>
<td>Endosulfan I</td>
<td>SP</td>
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<td>1153644003MSD</td>
<td>XMS8803</td>
<td>Endosulfan I</td>
<td>SP</td>
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<td>1280307</td>
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<td>XMS8803</td>
<td>Endosulfan I</td>
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<td>Endosulfan I</td>
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<td>12777311</td>
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<td>BLC</td>
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<td>1277600</td>
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<td>Aroclor-1016</td>
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<td>BLC</td>
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<td>1277601</td>
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<td>XGC9048</td>
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<td>BLC</td>
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<tr>
<td>1277745</td>
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<td>BLC</td>
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<td>BLC</td>
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<td>12777219</td>
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<td>1-Chloronaphthalene</td>
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<td>2-Chloronaphthalene</td>
<td>RSP</td>
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<td>1158247001MS</td>
<td>XMS8781</td>
<td>2-Chloronaphthalene</td>
<td>RSP</td>
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<tr>
<td>1277221</td>
<td>1158247001MSD</td>
<td>XMS8781</td>
<td>1-Chloronaphthalene</td>
<td>PNF</td>
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<tr>
<td>1277221</td>
<td>1158247001MSD</td>
<td>XMS8781</td>
<td>2-Chloronaphthalene</td>
<td>RSP</td>
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<tr>
<td>1277769</td>
<td>CCV for HBN 1713906 [XMS/8781]</td>
<td>XMS8781</td>
<td>1-Chloronaphthalene</td>
<td>BLC</td>
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<tr>
<td>1277769</td>
<td>CCV for HBN 1713906 [XMS/8781]</td>
<td>XMS8781</td>
<td>2-Chloronaphthalene</td>
<td>BLC</td>
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<tr>
<td>Laboratory ID</td>
<td>Client Sample ID</td>
<td>Analytical Batch</td>
<td>Analyte</td>
<td>Reason</td>
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<tr>
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### Manual Integration Reason Code Descriptions

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<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>O</td>
<td>Original Chromatogram</td>
</tr>
<tr>
<td>M</td>
<td>Modified Chromatogram</td>
</tr>
<tr>
<td>SS</td>
<td>Skimmed surrogate</td>
</tr>
<tr>
<td>BLG</td>
<td>Closed baseline gap</td>
</tr>
<tr>
<td>RP</td>
<td>Reassign peak name</td>
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<tr>
<td>PIR</td>
<td>Pattern integration required</td>
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<td>IT</td>
<td>Included tail</td>
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<tr>
<td>SP</td>
<td>Split peak</td>
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<tr>
<td>RSP</td>
<td>Removed split peak</td>
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<tr>
<td>FPS</td>
<td>Forced peak start/stop</td>
</tr>
<tr>
<td>BLC</td>
<td>Baseline correction</td>
</tr>
<tr>
<td>PNF</td>
<td>Peak not found by software</td>
</tr>
</tbody>
</table>

All DRO/RRO analysis are integrated per SOP.
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, 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>
</tr>
</thead>
<tbody>
<tr>
<td>SS1</td>
<td>1153644001</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Soil/Solid (dry weight)</td>
</tr>
<tr>
<td>SS2</td>
<td>1153644002</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Soil/Solid (dry weight)</td>
</tr>
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<td>SS3</td>
<td>1153644003</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Soil/Solid (dry weight)</td>
</tr>
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<td>STB</td>
<td>1153644004</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Soil/Solid (dry weight)</td>
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<td>1153644005</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Solid/Soil (Wet Weight)</td>
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<td>1153644006</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Solid/Soil (Wet Weight)</td>
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<td>SS3</td>
<td>1153644007</td>
<td>07/14/2015</td>
<td>07/14/2015</td>
<td>Solid/Soil (Wet Weight)</td>
</tr>
</tbody>
</table>

#### Method Description

<table>
<thead>
<tr>
<th>Method</th>
<th>Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK102</td>
<td>Diesel/Residual Range Organics</td>
</tr>
<tr>
<td>AK103</td>
<td>Diesel/Residual Range Organics</td>
</tr>
<tr>
<td>AK101</td>
<td>Gasoline Range Organics (S)</td>
</tr>
<tr>
<td>SW6020A TCLP</td>
<td>Metals by ICP-MS</td>
</tr>
<tr>
<td>SW6020A</td>
<td>Metals by ICP-MS (S)</td>
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<tr>
<td>SM21 2540G</td>
<td>Percent Solids SM2540G</td>
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<td>8270D SIMS (PEST)</td>
<td>Pesticides 8270D SIM GC/MS</td>
</tr>
<tr>
<td>SW8082A</td>
<td>SW8082 PCB's</td>
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<tr>
<td>SW8270D</td>
<td>SW846 8270 Semi-Volatiles by GC/MS (S)</td>
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<tr>
<td>SW8260B</td>
<td>VOC 8260 (S) Field Extracted</td>
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### Detectable Results Summary

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<th>Lab Sample ID: 1153644001</th>
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<tr>
<td><strong>Metals by ICP/MS</strong></td>
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</tr>
<tr>
<td>Parameter</td>
<td>Result</td>
</tr>
<tr>
<td>Arsenic</td>
<td>4.58</td>
</tr>
<tr>
<td>Barium</td>
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<tr>
<td>Chromium</td>
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</tr>
<tr>
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<tr>
<td>Silver</td>
<td>0.0770J</td>
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<tr>
<td><strong>Semivolatile Organic Fuels</strong></td>
<td></td>
</tr>
<tr>
<td>Parameter</td>
<td>Result</td>
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<tr>
<td>Residual Range Organics</td>
<td>36.2</td>
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<td>Barium</td>
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<tr>
<td>Barium</td>
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<tr>
<td>Barium</td>
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Results of SS1

Client Sample ID: SS1
Client Project ID: 32-1-02472 Eklutna Sediment
Lab Sample ID: 1153644001
Lab Project ID: 1153644

Collection Date: 07/14/15 10:04
Received Date: 07/14/15 16:45
Matrix: Soil/Solid (dry weight)
Solids (%): 88.4
Location:

Results by Metals by ICP/MS

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<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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<tr>
<td>Arsenic</td>
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<tr>
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Batch Information

Analytical Batch: MMS9004
Analytical Method: SW6020A
Analyst: EAB
Analytical Date/Time: 07/21/15 13:21
Container ID: 1153644001-A

Prep Batch: MXX28895
Prep Method: SW3050B
Prep Date/Time: 07/17/15 15:01
Prep Initial WT/Vol.: 1.086 g
Prep Extract Vol: 50 mL
### Results of SS1

Client Sample ID: **SS1**  
Client Project ID: **32-1-02472 Eklutna Sediment**  
Lab Sample ID: **1153644001**  
Lab Project ID: **1153644**  
Collection Date: 07/14/15 10:04  
Received Date: 07/14/15 16:45  
Matrix: Soil/Solid (dry weight)  
Solids (%): 88.4

#### Results by Organochlorinated Pesticides by GC/MS

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<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>4,4'-DDD</td>
<td>1.13 U</td>
<td>2.25</td>
<td>0.697</td>
<td>ug/Kg</td>
<td>1</td>
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<td>07/28/15 19:07</td>
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<tr>
<td>4,4'-DDE</td>
<td>1.13 U</td>
<td>2.25</td>
<td>0.697</td>
<td>ug/Kg</td>
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<tr>
<td>4,4'-DDT</td>
<td>1.13 U</td>
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<tr>
<td>Aldrin</td>
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<td>0.529</td>
<td>ug/Kg</td>
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<td>alpha-BHC</td>
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<td>0.529</td>
<td>ug/Kg</td>
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<td>ug/Kg</td>
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</tr>
<tr>
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<td>0.529</td>
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<td>ug/Kg</td>
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<td>1.13 U</td>
<td>2.25</td>
<td>0.697</td>
<td>ug/Kg</td>
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<td>07/28/15 19:07</td>
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<tr>
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<td>0.529</td>
<td>ug/Kg</td>
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</table>

#### Surrogates

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<th>LOQ(CL)</th>
<th>Date Analyzed</th>
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<td>46-115</td>
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<tr>
<td>Terphenyl-d14 (surr)</td>
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#### Batch Information

- **Analytical Batch**: XMS8803  
- **Analytical Method**: 8270D SIMS (PEST)  
- **Analyst**: SP  
- **Analytical Date/Time**: 07/28/15 19:07  
- **Container ID**: 1153644001-A  
- **Prep Batch**: XXX33602  
- **Prep Method**: SW3550C  
- **Prep Date/Time**: 07/19/15 13:59  
- **Prep Initial Wt./Vol.**: 22.623 g  
- **Prep Extract Vol**: 1 mL  
- **Print Date**: 07/31/2015 3:31:45PM  

---

**J flagging is activated**
### Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644001  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 88.4  
**Location:**

### Results by Polychlorinated Biphenyls

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<tr>
<td>Aroclor-1016</td>
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<td>07/17/15 16:58</td>
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### Surrogates

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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
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<tr>
<td>Decachlorobiphenyl (surr)</td>
<td>106</td>
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### Batch Information

- **Prep Batch:** XXX33584  
- **Prep Method:** SW3550C  
- **Prep Initial Wt./Vol.:** 22.832 g  
- **Prep Date/Time:** 07/17/15 09:40  
- **Prep Extract Vol.:** 5 mL  
- **Analytical Batch:** XGC9049  
- **Analytical Method:** SW8082A  
- **Analyst:** NLL  
- **Analytical Date/Time:** 07/17/15 16:58  
- **Container ID:** 1153644001-A  

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Print Date: 07/31/2015 3:31:45PM  
J flagging is activated
### Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644001  
**Lab Project ID:** 1153644

- **Collection Date:** 07/14/15 10:04  
- **Received Date:** 07/14/15 16:45  
- **Matrix:** Soil/Solid (dry weight)  
- **Solids (%):** 88.4

#### Results by Semivolatile Organic Fuels

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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>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Range Organics</td>
<td>11.3 U</td>
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<td>6.99</td>
<td>mg/Kg</td>
<td>1</td>
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<td>07/18/15 18:38</td>
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</tbody>
</table>

**Surrogates**

- Sa Androstane (surr)  
  - **Qual:** 91.2  
  - **Units:** 50-150  
  - **DF:** 1  
  - **Date Analyzed:** 07/18/15 18:38

#### Batch Information

- **Prep Batch:** XXX33575  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 07/16/15 09:57  
- **Prep Initial Wt./Vol.:** 30.085 g  
- **Prep Extract Vol:** 1 mL

- **Analytical Batch:** XFC11950  
- **Analytical Method:** AK102  
- **Analyst:** AYC  
- **Analytical Date/Time:** 07/18/15 18:38  
- **Container ID:** 1153644001-A

<table>
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<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>Residual Range Organics</td>
<td>36.2</td>
<td>22.5</td>
<td>6.99</td>
<td>mg/Kg</td>
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**Surrogates**

- n-Triacontane-d62 (surr)  
  - **Qual:** 97.1  
  - **Units:** 50-150  
  - **DF:** 1  
  - **Date Analyzed:** 07/18/15 18:38

#### Batch Information

- **Prep Batch:** XXX33575  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 07/16/15 09:57  
- **Prep Initial Wt./Vol.:** 30.085 g  
- **Prep Extract Vol:** 1 mL

- **Analytical Batch:** XFC11950  
- **Analytical Method:** AK103  
- **Analyst:** AYC  
- **Analytical Date/Time:** 07/18/15 18:38  
- **Container ID:** 1153644001-A

**Print Date:** 07/31/2015 3:31:45PM  
**J flagging is activated**

*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  
11 of 95
## Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644001  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 88.4  
**Location:**

### Results by Semivolatile Organics GC/MS

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Print Date: 07/31/2015 3:31:45PM

J flagging is activated

Member of SGS Group

SGS North America Inc.

200 West Potter Drive Anchorage, AK 95518

t 907.562.2343 f 907.561.5301 www.us.sgs.com
## Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644001  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 88.4  
**Location:**

## Results by Semivolatile Organics GC/MS

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### Surrogates

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<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,4,6-Tribromophenol (surr)</td>
<td>90.5</td>
<td>35-125</td>
<td>%</td>
<td>1</td>
<td></td>
<td>07/18/15 09:02</td>
</tr>
</tbody>
</table>

**Print Date:** 07/31/2015 3:31:45PM  
**J flagging is activated**
### Results of SS1

- **Client Sample ID:** SS1
- **Client Project ID:** 32-1-02472 Eklutna Sediment
- **Lab Sample ID:** 1153644001
- **Lab Project ID:** 1153644
- **Collection Date:** 07/14/15 10:04
- **Received Date:** 07/14/15 16:45
- **Matrix:** Soil/Solid (dry weight)
- **Solids (%):** 88.4
- **Location:**

### Results by Semivolatile Organics GC/MS

<table>
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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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<tbody>
<tr>
<td>2-Fluorobiphenyl (surr)</td>
<td>79.8</td>
<td>45-105</td>
<td>%</td>
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<td>2-Fluorophenol (surr)</td>
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<td>Nitrobenzene-d5 (surr)</td>
<td>67.4</td>
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<td>%</td>
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<td>Phenol-d6 (surr)</td>
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<td>Terphenyl-d14 (surr)</td>
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</tbody>
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### Batch Information

- **Analytical Batch:** XMS8781
- **Analytical Method:** SW8270D
- **Analyst:** DSH
- **Analytical Date/Time:** 07/18/15 09:02
- **Container ID:** 1153644001-A
- **Prep Batch:** XXX33577
- **Prep Method:** SW3550C
- **Prep Date/Time:** 07/16/15 10:42
- **Prep Initial Wt./Vol.:** 22.66 g
- **Prep Extract Vol.:** 1 mL

---

Print Date: 07/31/2015 3:31:45PM

J flagging is activated
### Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644001  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 88.4  
**Location:**

#### Results by Volatile Fuels

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<td>Gasoline Range Organics</td>
<td>0.980 U</td>
<td>1.96</td>
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#### Surrogates

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<tr>
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#### Batch Information

- **Analytical Batch:** VFC12544  
- **Analytical Method:** AK101  
- **Analyst:** ST  
- **Prep Batch:** VXX27629  
- **Prep Method:** SW5035A  
- **Prep Date/Time:** 07/14/15 10:04  
- **Prep Initial Wt./Vol.:** 108.043 g  
- **Prep Extract Vol:** 37.4879 mL  
- **Prep Date/Time:** 07/28/15 17:39  
- **Prep Initial Wt./Vol.:** 108.043 g  
- **Prep Extract Vol:** 37.4879 mL

Print Date: 07/31/2015 3:31:45PM

J flagging is activated

SGS North America Inc.  
200 West Potter Drive Anchorage, AK 95518  
t 907.562.2343 f 907.561.5301  www.us.sgs.com
### Results of SS1

Client Sample ID: SS1  
Client Project ID: 32-1-02472 Eklutna Sediment  
Lab Sample ID: 1153644001  
Lab Project ID: 1153644  
Collection Date: 07/14/15 10:04  
Received Date: 07/14/15 16:45  
Matrix: Soil/Solid (dry weight)  
Solids (%): 88.4  
Location: 

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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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<tbody>
<tr>
<td>1,1,1,2-Tetrachloroethane</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:17</td>
</tr>
<tr>
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<td>6.12</td>
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<tr>
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<td>3.06</td>
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<tr>
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<td>ug/Kg</td>
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</tr>
<tr>
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<td>6.12</td>
<td>ug/Kg</td>
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<tr>
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<tr>
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<tr>
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<td>6.12</td>
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<td>1,2-Dibromo-3-chloropropane</td>
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<td>6.12</td>
<td>ug/Kg</td>
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<td>07/20/15 19:17</td>
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<td>6.12</td>
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<tr>
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<td>19.6</td>
<td>6.12</td>
<td>ug/Kg</td>
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<td>07/20/15 19:17</td>
</tr>
<tr>
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<td>6.12</td>
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<td></td>
<td>07/20/15 19:17</td>
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<td>1,3,5-Trimethylbenzene</td>
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<td>6.12</td>
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<td>6.12</td>
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<tr>
<td>4-Chlorotoluene</td>
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<td>07/20/15 19:17</td>
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<tr>
<td>4-Isopropyltoluene</td>
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<tr>
<td>Benzene</td>
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<td>9.81</td>
<td>3.06</td>
<td>ug/Kg</td>
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<tr>
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<tr>
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<td>07/20/15 19:17</td>
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<tr>
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<td>48.6</td>
<td>ug/Kg</td>
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</table>
### Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644001  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 88.4  
**Location:**  

### Results by Volatile Gas Chromatography/Mass Spectrometry

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<th>Units</th>
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<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<td>6.12</td>
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<tr>
<td>cis-1,3-Dichloropropene</td>
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<td>Methylene chloride</td>
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<td>6.12</td>
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<td>6.12</td>
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<tr>
<td>sec-Butylbenzene</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
<td></td>
</tr>
<tr>
<td>tert-Butylbenzene</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
<td></td>
</tr>
<tr>
<td>Tetrachloroethene</td>
<td>4.91 U</td>
<td>9.81</td>
<td>3.06</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
<td></td>
</tr>
<tr>
<td>trans-1,2-Dichloroethene</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>µg/Kg</td>
<td>1</td>
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<td></td>
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<tr>
<td>trans-1,3-Dichloropropene</td>
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<td>19.6</td>
<td>6.12</td>
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</tr>
<tr>
<td>Trichloroethene</td>
<td>4.91 U</td>
<td>9.81</td>
<td>3.06</td>
<td>µg/Kg</td>
<td>1</td>
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</tr>
<tr>
<td>Trichlorofluoromethane</td>
<td>19.6 U</td>
<td>39.2</td>
<td>11.8</td>
<td>µg/Kg</td>
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<td>07/20/15 19:17</td>
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<tr>
<td>Vinyl acetate</td>
<td>39.3 U</td>
<td>78.5</td>
<td>24.3</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
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<tr>
<td>Vinyl chloride</td>
<td>9.80 U</td>
<td>19.6</td>
<td>6.12</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
<td></td>
</tr>
<tr>
<td>Xylenes (total)</td>
<td>29.4 U</td>
<td>58.8</td>
<td>17.9</td>
<td>µg/Kg</td>
<td>1</td>
<td>07/20/15 19:17</td>
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**Surrogates**

<table>
<thead>
<tr>
<th>Surrogate</th>
<th>Result</th>
<th>LOQ/CL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2-Dichloroethane-D4 (surr)</td>
<td>105</td>
<td>71-136</td>
<td>%</td>
<td>1</td>
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</tr>
<tr>
<td>4-Bromofluorobenzene (surr)</td>
<td>98.9</td>
<td>55-151</td>
<td>%</td>
<td>1</td>
<td>07/20/15 19:17</td>
</tr>
<tr>
<td>Toluene-d8 (surr)</td>
<td>112</td>
<td>85-116</td>
<td>%</td>
<td>1</td>
<td>07/20/15 19:17</td>
</tr>
</tbody>
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**Print Date:** 07/31/2015 3:31:45PM  

**J flagging is activated**
### Results of SS1

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>SS1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Client Project ID:</td>
<td>32-1-02472 Eklutna Sediment</td>
</tr>
<tr>
<td>Lab Sample ID:</td>
<td>1153644001</td>
</tr>
<tr>
<td>Lab Project ID:</td>
<td>1153644</td>
</tr>
<tr>
<td>Collection Date:</td>
<td>07/14/15 10:04</td>
</tr>
<tr>
<td>Received Date:</td>
<td>07/14/15 16:45</td>
</tr>
<tr>
<td>Matrix:</td>
<td>Soil/Solid (dry weight)</td>
</tr>
<tr>
<td>Solids (%):</td>
<td>88.4</td>
</tr>
</tbody>
</table>

### Results by Volatile Gas Chromatography/Mass Spectrometry

<table>
<thead>
<tr>
<th>Batch Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analytical Batch:</td>
</tr>
<tr>
<td>Analytical Method:</td>
</tr>
<tr>
<td>Analyst:</td>
</tr>
<tr>
<td>Analytical Date/Time:</td>
</tr>
<tr>
<td>Container ID:</td>
</tr>
</tbody>
</table>

| Prep Batch: | VXX27595 |
| Prep Method:| SW5035A  |
| Prep Date/Time: | 07/14/15 10:04 |
| Prep Initial Wt./Vol.: | 108.043 g |
| Prep Extract Vol: | 37.4879 mL |

---

Print Date: 07/31/2015 3:31:45PM

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## Results of SS2

**Client Sample ID:** SS2  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644002  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:36  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 91.9  
**Location:**  

### Results by Metals by ICP/MS

<table>
<thead>
<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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<tbody>
<tr>
<td>Arsenic</td>
<td>5.42</td>
<td>1.07</td>
<td>0.331</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Barium</td>
<td>27.7</td>
<td>0.321</td>
<td>0.100</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.0672 J</td>
<td>0.214</td>
<td>0.0663</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Chromium</td>
<td>6.00</td>
<td>0.427</td>
<td>0.128</td>
<td>mg/Kg</td>
<td>10</td>
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<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Lead</td>
<td>3.99</td>
<td>0.214</td>
<td>0.0663</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.0653</td>
<td>0.0427</td>
<td>0.0128</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.535 U</td>
<td>1.07</td>
<td>0.331</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
<tr>
<td>Silver</td>
<td>0.0727 J</td>
<td>0.214</td>
<td>0.0663</td>
<td>mg/Kg</td>
<td>10</td>
<td></td>
<td>07/21/15 13:23</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** MMS9004  
- **Analytical Method:** SW6020A  
- **Analyst:** EAB  
- **Analytical Date/Time:** 07/21/15 13:23  
- **Container ID:** 1153644002-A  
- **Prep Batch:** MXX28895  
- **Prep Method:** SW3050B  
- **Prep Date/Time:** 07/17/15 15:01  
- **Prep Initial Wt./Vol.:** 1.018 g  
- **Prep Extract Vol:** 50 mL  

---

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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

Member of SGS Group

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**Results of SS2**

Client Sample ID: **SS2**  
Client Project ID: **32-1-02472 Eklutna Sediment**  
Lab Sample ID: **1153644002**  
Lab Project ID: **1153644**  
Collection Date: **07/14/15 10:36**  
Received Date: **07/14/15 16:45**  
Matrix: Soil/Solid (dry weight)  
Solids (%): **91.9**  
Location:

**Results by Organochlorinated Pesticides by GC/MS**

<table>
<thead>
<tr>
<th>Parameter</th>
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<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,4'-DDD</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Aldrin</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>alpha-BHC</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>beta-BHC</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>delta-BHC</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Endosulfan I</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
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<tr>
<td>Endosulfan sulfate</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
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<tr>
<td>Endrin</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Endrin aldehyde</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Endrin ketone</td>
<td>2.69 U</td>
<td>5.38</td>
<td>1.61</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>gamma-BHC (Lindane)</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>0.805 U</td>
<td>1.61</td>
<td>0.506</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Heptachlor epoxide</td>
<td>1.08 U</td>
<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
<td>1</td>
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</tr>
<tr>
<td>Methoxychlor</td>
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<td>2.15</td>
<td>0.667</td>
<td>ug/Kg</td>
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<td>07/28/15 19:23</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>54.0 U</td>
<td>108</td>
<td>33.4</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/28/15 19:23</td>
</tr>
</tbody>
</table>

**Surrogates**

- 2-Fluorobiphenyl (surr): 54.6 % 46-115 % 1 07/28/15 19:23
- Terphenyl-d14 (surr): 76.4 % 58-113 % 1 07/28/15 19:23

**Batch Information**

Batch Information: XMS8803  
Analytical Method: 8270D SIMS (PEST)  
Prep Batch: XXX33602  
Prep Method: SW3550C  
Prep Initial Wt./Vol.: 22.743 g  
Prep Date/Time: 07/19/15 13:59  
Prep Extract Vol.: 1 mL  
Prep Date/Time: 07/28/15 19:23  
Prep Initial Wt./Vol.: 22.743 g  
Prep Extract Vol.: 1 mL  
Prep Date/Time: 07/28/15 19:23  
Prep Initial Wt./Vol.: 22.743 g  
Prep Extract Vol.: 1 mL

Print Date: 07/31/2015 3:31:45PM  
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## Results of SS2

**Client Sample ID:** SS2  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644002  
**Lab Project ID:** 1153644

**Collection Date:** 07/14/15 10:36  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 91.9

### Results by Polychlorinated Biphenyls

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<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aroclor-1016</td>
<td>26.9 U</td>
<td>53.9</td>
<td>16.2</td>
<td>ug/Kg</td>
<td>1</td>
<td>153.9</td>
<td>07/17/15 17:11</td>
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<tr>
<td>Aroclor-1221</td>
<td>26.9 U</td>
<td>53.9</td>
<td>16.2</td>
<td>ug/Kg</td>
<td>1</td>
<td>153.9</td>
<td>07/17/15 17:11</td>
</tr>
<tr>
<td>Aroclor-1232</td>
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<td>53.9</td>
<td>16.2</td>
<td>ug/Kg</td>
<td>1</td>
<td>153.9</td>
<td>07/17/15 17:11</td>
</tr>
<tr>
<td>Aroclor-1242</td>
<td>26.9 U</td>
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<td>16.2</td>
<td>ug/Kg</td>
<td>1</td>
<td>153.9</td>
<td>07/17/15 17:11</td>
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<tr>
<td>Aroclor-1248</td>
<td>26.9 U</td>
<td>53.9</td>
<td>16.2</td>
<td>ug/Kg</td>
<td>1</td>
<td>153.9</td>
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<tr>
<td>Aroclor-1254</td>
<td>26.9 U</td>
<td>53.9</td>
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<tr>
<td>Aroclor-1260</td>
<td>26.9 U</td>
<td>53.9</td>
<td>16.2</td>
<td>ug/Kg</td>
<td>1</td>
<td>153.9</td>
<td>07/17/15 17:11</td>
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</table>

#### Surrogates

<table>
<thead>
<tr>
<th>Surrogates</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>Decachlorobiphenyl (surr)</td>
<td>108</td>
<td>60-125</td>
<td>%</td>
<td>1</td>
<td></td>
<td></td>
<td>07/17/15 17:11</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** XGC9049  
- **Analytical Method:** SW8082A  
- **Analyst:** NLL  
- **Analytical Date/Time:** 07/17/15 17:11  
- **Container ID:** 1153644002-A

- **Prep Batch:** XXX33584  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 07/17/15 09:40  
- **Prep Initial Wt./Vol.:** 22.687 g  
- **Prep Extract Vol:** 5 mL

Print Date: 07/31/2015 3:31:45PM  
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### Results of SS2

**Client Sample ID: SS2**

**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644002  
**Lab Project ID:** 1153644

**Collection Date:** 07/14/15 10:36  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 91.9

#### Results by Semivolatile Organic Fuels

<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>Diesel Range Organics</td>
<td>10.8 U</td>
<td>21.6</td>
<td>6.70</td>
<td>mg/Kg</td>
<td>1</td>
<td></td>
<td>07/18/15 18:47</td>
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<tr>
<td><strong>Surrogates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sa Androstane (surr)</td>
<td>85.7</td>
<td>50-150</td>
<td>%</td>
<td></td>
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<td></td>
<td>07/18/15 18:47</td>
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</table>

#### Batch Information

**Analytical Batch:** XFC11950  
**Analytical Method:** AK102  
**Analyst:** AYC  
**Analytical Date/Time:** 07/18/15 18:47  
**Container ID:** 1153644002-A  
**Prep Batch:** XXX33575  
**Prep Method:** SW3550C  
**Prep Date/Time:** 07/16/15 09:57  
**Prep Initial Wt./Vol.:** 30.191 g  
**Prep Extract Vol:** 1 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>Residual Range Organics</td>
<td>10.8 U</td>
<td>21.6</td>
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#### Batch Information

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**Analytical Method:** AK103  
**Analyst:** AYC  
**Analytical Date/Time:** 07/18/15 18:47  
**Container ID:** 1153644002-A  
**Prep Batch:** XXX33575  
**Prep Method:** SW3550C  
**Prep Date/Time:** 07/16/15 09:57  
**Prep Initial Wt./Vol.:** 30.191 g  
**Prep Extract Vol:** 1 mL
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## Results of SS2

**Client Sample ID:** SS2  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644002  
**Lab Project ID:** 1153644

### Collection Date: 07/14/15 10:36  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 91.9  
**Location:**

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### Results by **Semivolatile Organics GC/MS**

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<td>Pyrene</td>
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### Surrogates

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<td>81.1</td>
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<td>07/18/15 09:19</td>
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Print Date: 07/31/2015 3:31:45PM

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

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24 of 95

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**Results of SS2**

Client Sample ID: **SS2**  
Client Project ID: **32-1-02472 Eklutna Sediment**  
Lab Sample ID: **1153644002**  
Lab Project ID: **1153644**  
Collection Date: **07/14/15 10:36**  
Received Date: **07/14/15 16:45**  
Matrix: Soil/Solid (dry weight)  
Solids (%): 91.9  
Location:  

**Results by Semivolatile Organics GC/MS**

<table>
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<tr>
<th>Parameter</th>
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<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tr>
<td>2-Fluorobiphenyl (surr)</td>
<td>69.6</td>
<td>45-105</td>
<td>%</td>
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<td>2-Fluorophenol (surr)</td>
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<tr>
<td>Nitrobenzene-d5 (surr)</td>
<td>56</td>
<td>35-100</td>
<td>%</td>
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<tr>
<td>Phenol-d6 (surr)</td>
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<td>%</td>
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<tr>
<td>Terphenyl-d14 (surr)</td>
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**Batch Information**

Analytical Batch: **XMS8781**  
Analytical Method: **SW8270D**  
Analyst: **DSH**  
Analytical Date/Time: **07/18/15 09:19**  
Container ID: **1153644002-A**  

Prep Batch: **XXX33577**  
Prep Method: **SW3550C**  
Prep Date/Time: **07/16/15 10:42**  
Prep Initial WT/ Vol.: **22.748 g**  
Prep Extract Vol: **1 mL**

Print Date: **07/31/2015 3:31:45PM**
**Results of SS2**

Client Sample ID: SS2  
Client Project ID: 32-1-02472 Eklutna Sediment  
Lab Sample ID: 1153644002  
Lab Project ID: 1153644  
Collection Date: 07/14/15 10:36  
Received Date: 07/14/15 16:45  
Matrix: Soil/Solid (dry weight)  
Solids (%): 91.9  
Location:  

**Results by Volatile Fuels**

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<td>Surrogates</td>
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<td>4-Bromofluorobenzene (surr)</td>
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**Batch Information**

- Analytical Batch: VFC12544  
- Analytical Method: AK101  
- Analyst: ST  
- Analytical Date/Time: 07/28/15 17:58  
- Prep Batch: VXX27629  
- Prep Method: SW5035A  
- Prep Date/Time: 07/14/15 10:36  
- Prep Initial Wt./Vol.: 143.321 g  
- Prep Extract Vol: 36.5669 mL  

Print Date: 07/31/2015 3:31:45PM  
J flagging is activated
### Results of SS2

**Client Sample ID:** SS2  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644002  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:36  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 91.9  
**Location:**

#### Results by Volatile Gas Chromatography/Mass Spectrometry

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<th>Parameter</th>
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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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<tbody>
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<td>6.95 U</td>
<td>13.9</td>
<td>4.33</td>
<td>ug/Kg</td>
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<td>4.33</td>
<td>ug/Kg</td>
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<td>ug/Kg</td>
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</tr>
<tr>
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<tr>
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<td>4.33</td>
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<tr>
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<td>1,2,3-Trichlorobenzene</td>
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<td>4.33</td>
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<td>4.33</td>
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<td>4.33</td>
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</table>

Print Date: 07/31/2015 3:31:45PM

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200 West Potter Drive Anchorage, AK 95518  
† 907.562.2343 ‡ 907.561.5301 www.us.sgs.com

Member of SGS Group

27 of 95
Results of SS2

Client Sample ID: **SS2**
Client Project ID: **32-1-02472 Eklutna Sediment**
Lab Sample ID: 1153644002
Lab Project ID: 1153644

Collection Date: 07/14/15 10:36
Received Date: 07/14/15 16:45
Matrix: Soil/Solid (dry weight)
Solids (%): 91.9
Location: 

Results by Volatile Gas Chromatography/Mass Spectrometry

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<th>Units</th>
<th>DF</th>
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<th>Date Analyzed</th>
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<td>4.33</td>
<td>ug/Kg</td>
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<td>07/20/15 19:33</td>
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<td>4.33</td>
<td>ug/Kg</td>
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<td>4.33</td>
<td>ug/Kg</td>
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<tr>
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<td>sec-Butylbenzene</td>
<td>6.95 U</td>
<td>13.9</td>
<td>4.33</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/20/15 19:33</td>
<td></td>
</tr>
<tr>
<td>Styrene</td>
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<td>13.9</td>
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<td>ug/Kg</td>
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<td></td>
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<tr>
<td>tert-Butylbenzene</td>
<td>6.95 U</td>
<td>13.9</td>
<td>4.33</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/20/15 19:33</td>
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<tr>
<td>Tetrachloroethene</td>
<td>3.47 U</td>
<td>6.94</td>
<td>2.16</td>
<td>ug/Kg</td>
<td>1</td>
<td>07/20/15 19:33</td>
<td></td>
</tr>
<tr>
<td>Toluene</td>
<td>6.95 U</td>
<td>13.9</td>
<td>4.33</td>
<td>ug/Kg</td>
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<td>07/20/15 19:33</td>
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<tr>
<td>trans-1,2-Dichloroethene</td>
<td>6.95 U</td>
<td>13.9</td>
<td>4.33</td>
<td>ug/Kg</td>
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<tr>
<td>trans-1,3-Dichloropropene</td>
<td>6.95 U</td>
<td>13.9</td>
<td>4.33</td>
<td>ug/Kg</td>
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<tr>
<td>Trichloroethene</td>
<td>3.47 U</td>
<td>6.94</td>
<td>2.16</td>
<td>ug/Kg</td>
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<tr>
<td>Trichlorofluoromethane</td>
<td>13.9 U</td>
<td>27.8</td>
<td>8.33</td>
<td>ug/Kg</td>
<td>1</td>
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<tr>
<td>Vinyl acetate</td>
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<td>55.5</td>
<td>17.2</td>
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<td>Vinyl chloride</td>
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<tr>
<td>Xylenes (total)</td>
<td>20.8 U</td>
<td>41.6</td>
<td>12.7</td>
<td>ug/Kg</td>
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<td>07/20/15 19:33</td>
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</tbody>
</table>

**Surrogates**

- 1,2-Dichloroethane-D4 (surr) | 106 | 71-136 | % | 1 | 07/20/15 19:33 |
- 4-Bromofluorobenzene (surr)   | 105 | 55-151 | % | 1 | 07/20/15 19:33 |
- Toluene-d8 (surr)              | 113 | 85-116 | % | 1 | 07/20/15 19:33 |

Print Date: 07/31/2015 3:31:45PM

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Results of SS2

Client Sample ID: SS2
Client Project ID: 32-1-02472 Eklutna Sediment
Lab Sample ID: 1153644002
Lab Project ID: 1153644

Collection Date: 07/14/15 10:36
Received Date: 07/14/15 16:45
Matrix: Soil/Solid (dry weight)
Solids (%): 91.9

Results by Volatile Gas Chromatography/Mass Spectrometry

Batch Information

Analytical Batch: VMS15109
Analytical Method: SW8260B
Analyst: ST
Analytical Date/Time: 07/20/15 19:33
Container ID: 1153644002-B

Prep Batch: VXX27595
Prep Method: SW5035A
Prep Date/Time: 07/14/15 10:36
Prep Initial Wt./Vol.: 143.321 g
Prep Extract Vol: 36.6669 mL

Print Date: 07/31/2015 3:31:45PM
J flagging is activated
### Results by Metals by ICP/MS

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<th>Allowable Limits</th>
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<tbody>
<tr>
<td>Arsenic</td>
<td>5.70</td>
<td>1.24</td>
<td>0.385</td>
<td>mg/Kg</td>
<td>10</td>
<td>10</td>
<td>07/21/15 13:25</td>
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<tr>
<td>Barium</td>
<td>44.2</td>
<td>0.373</td>
<td>0.117</td>
<td>mg/Kg</td>
<td>10</td>
<td>10</td>
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</tr>
<tr>
<td>Cadmium</td>
<td>0.0783 J</td>
<td>0.248</td>
<td>0.0770</td>
<td>mg/Kg</td>
<td>10</td>
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<td>07/21/15 13:25</td>
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<tr>
<td>Chromium</td>
<td>66.2</td>
<td>0.497</td>
<td>0.149</td>
<td>mg/Kg</td>
<td>10</td>
<td>10</td>
<td>07/21/15 13:25</td>
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<tr>
<td>Lead</td>
<td>4.82</td>
<td>0.248</td>
<td>0.0770</td>
<td>mg/Kg</td>
<td>10</td>
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<tr>
<td>Mercury</td>
<td>0.0900</td>
<td>0.0497</td>
<td>0.0149</td>
<td>mg/Kg</td>
<td>10</td>
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<td>07/21/15 13:25</td>
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<td>Selenium</td>
<td>0.620 U</td>
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<td>0.385</td>
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<td>10</td>
<td>10</td>
<td>07/21/15 13:25</td>
</tr>
<tr>
<td>Silver</td>
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<td>0.248</td>
<td>0.0770</td>
<td>mg/Kg</td>
<td>10</td>
<td>10</td>
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### Batch Information

- **Analytical Batch:** MMS9004
- **Analytical Method:** SW6020A
- **Analyst:** EAB
- **Analytical Date/Time:** 07/21/15 13:25
- **Container ID:** 1153644003-A
- **Prep Batch:** MXX28895
- **Prep Method:** SW3050B
- **Prep Date/Time:** 07/17/15 15:01
- **Prep Initial WT./Vol.:** 1.096 g
- **Prep Extract Vol:** 50 mL

---

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### Results of SS3

Client Sample ID: **SS3**  
Client Project ID: **32-1-02472 Eklutna Sediment**  
Lab Sample ID: **1153644003**  
Lab Project ID: **1153644**

**Collection Date:** 07/14/15 12:07  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 73.4

**Location:**

#### Results by Organochlorinated Pesticides by GC/MS

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<th>DF</th>
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<tbody>
<tr>
<td>4,4'-DDD</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
<td></td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
<td></td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
<td></td>
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<tr>
<td>Aldrin</td>
<td>5.10 U</td>
<td>10.2</td>
<td>3.19</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
<td></td>
</tr>
<tr>
<td>alpha-BHC</td>
<td>5.10 U</td>
<td>10.2</td>
<td>3.19</td>
<td>ug/Kg</td>
<td>5</td>
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<tr>
<td>alpha-Chlordane</td>
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<td>10.2</td>
<td>3.19</td>
<td>ug/Kg</td>
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<td></td>
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<tr>
<td>beta-BHC</td>
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<td>10.2</td>
<td>3.19</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
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</tr>
<tr>
<td>delta-BHC</td>
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<td>10.2</td>
<td>3.19</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
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<td>Dieldrin</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
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</tr>
<tr>
<td>Endosulfan I</td>
<td>5.10 U</td>
<td>10.2</td>
<td>3.19</td>
<td>ug/Kg</td>
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<td>07/28/15 19:40</td>
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<tr>
<td>Endosulfan II</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
<td>5</td>
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</tr>
<tr>
<td>Endosulfan sulfate</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
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<tr>
<td>Endrin</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
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<td>Endrin aldehyde</td>
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<tr>
<td>Endrin ketone</td>
<td>17.0 U</td>
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<tr>
<td>gamma-BHC (Lindane)</td>
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<td>10.2</td>
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<td>gamma-Chlordane</td>
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<td>ug/Kg</td>
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<tr>
<td>Heptachlor</td>
<td>6.80 U</td>
<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
<td>5</td>
<td>07/28/15 19:40</td>
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<td>Heptachlor epoxide</td>
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<td>4.21</td>
<td>ug/Kg</td>
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<td>07/28/15 19:40</td>
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<tr>
<td>Methoxychlor</td>
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<td>13.6</td>
<td>4.21</td>
<td>ug/Kg</td>
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<tr>
<td>Toxaphene</td>
<td>340 U</td>
<td>679</td>
<td>211</td>
<td>ug/Kg</td>
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<td>07/28/15 19:40</td>
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#### Surrogates

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<th>DF</th>
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<tbody>
<tr>
<td>2-Fluorobiphenyl (surr)</td>
<td>87.8</td>
<td>46-115</td>
<td>%</td>
<td></td>
<td>5</td>
<td>07/28/15 19:40</td>
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<tr>
<td>Terphenyl-d14 (surr)</td>
<td>93</td>
<td>58-113</td>
<td>%</td>
<td></td>
<td>5</td>
<td>07/28/15 19:40</td>
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#### Batch Information

**Analytical Batch:** XMS8803  
**Analytical Method:** 8270D SIMS (PEST)  
**Analyst:** SP  
**Analytical Date/Time:** 07/28/15 19:40  
**Container ID:** 1153644003-A

**Prep Batch:** XXX33602  
**Prep Method:** SW3550C  
**Prep Date/Time:** 07/19/15 13:59  
**Prep Initial Wt./Vol.:** 22.551 g  
**Prep Extract Vol:** 1 mL

Print Date: 07/31/2015 3:31:45PM  
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Results of SS3

Client Sample ID: SS3
Client Project ID: 32-1-02472 Eklutna Sediment
Lab Sample ID: 1153644003
Lab Project ID: 1153644
Collection Date: 07/14/15 12:07
Received Date: 07/14/15 16:45
Matrix: Soil/Solid (dry weight)
Solids (%): 73.4

Results by Polychlorinated Biphenyls

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<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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<tbody>
<tr>
<td>Aroclor-1016</td>
<td>33.8 U</td>
<td>67.6</td>
<td>20.3</td>
<td>ug/Kg</td>
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<tr>
<td>Aroclor-1221</td>
<td>33.8 U</td>
<td>67.6</td>
<td>20.3</td>
<td>ug/Kg</td>
<td>1</td>
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<td>Aroclor-1232</td>
<td>33.8 U</td>
<td>67.6</td>
<td>20.3</td>
<td>ug/Kg</td>
<td>1</td>
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<tr>
<td>Aroclor-1242</td>
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<td>20.3</td>
<td>ug/Kg</td>
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<tr>
<td>Aroclor-1248</td>
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<td>20.3</td>
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<td>Aroclor-1260</td>
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Surrogates

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<th>DF</th>
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<tbody>
<tr>
<td>Decachlorobiphenyl (surr)</td>
<td>105</td>
<td>60-125</td>
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<td>%</td>
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Batch Information

Analytical Batch: XGC9048
Analytical Method: SW8082A
 Analyst: NLL
Analytical Date/Time: 07/17/15 03:52
Container ID: 1153644003-A

Prep Batch: XXX33581
Prep Method: SW3550C
Prep Date/Time: 07/16/15 14:08
Prep Initial Wt./Vol.: 22.665 g
Prep Extract Vol: 5 mL
## Results of SS3

**Client Sample ID:** SS3  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644003  
**Lab Project ID:** 1153644

**Collection Date:** 07/14/15 12:07  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 73.4  
**Location:**

### Results by Semivolatile Organic Fuels

#### Diesel Range Organics

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<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>Diesel Range Organics</td>
<td>21.5 J</td>
<td>27.1</td>
<td>8.39</td>
<td>mg/Kg</td>
<td>1</td>
<td></td>
<td>07/18/15 18:57</td>
</tr>
</tbody>
</table>

#### Surrogates

**Sa Androstane (surr)**  
Result: 83  
LOQ/CL: 50-150  
Units: %  
DF: 1  
Date Analyzed: 07/18/15 18:57

### Batch Information

**Prep Batch:** XXX33575  
**Prep Method:** SW3550C  
**Prep Date/Time:** 07/16/15 09:57  
**Prep Initial Wt./Vol.:** 30.177 g  
**Prep Extract Vol.:** 1 mL

**Analytical Batch:** XFC11950  
**Analytical Method:** AK102  
**Analyst:** AYC  
**Analytical Date/Time:** 07/18/15 18:57

#### Residual Range Organics

<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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<tr>
<td>Residual Range Organics</td>
<td>228</td>
<td>27.1</td>
<td>8.39</td>
<td>mg/Kg</td>
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#### Surrogates

**n-Triacontane-d62 (surr)**  
Result: 89.8  
LOQ/CL: 50-150  
Units: %  
DF: 1  
Date Analyzed: 07/18/15 18:57

### Batch Information

**Prep Batch:** XXX33575  
**Prep Method:** SW3550C  
**Prep Date/Time:** 07/16/15 09:57  
**Prep Initial Wt./Vol.:** 30.177 g  
**Prep Extract Vol.:** 1 mL

**Analytical Batch:** XFC11950  
**Analytical Method:** AK103  
**Analyst:** AYC  
**Analytical Date/Time:** 07/18/15 18:57

## Batch Information

**Prep Batch:** XXX33575  
**Prep Method:** SW3550C  
**Prep Date/Time:** 07/16/15 09:57  
**Prep Initial Wt./Vol.:** 30.177 g  
**Prep Extract Vol.:** 1 mL

**Analytical Batch:** XFC11950  
**Analytical Method:** AK103  
**Analyst:** AYC  
**Analytical Date/Time:** 07/18/15 18:57

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Print Date: 07/31/2015 3:31:45PM  
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### Results of SS3

**Client Sample ID:** SS3  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644003  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 12:07  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 73.4

### Results by Semivolatile Organics GC/MS

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Print Date: 07/31/2015 3:31:45PM  
J flagging is activated
Results of SS3

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Client Project ID: 32-1-02472 Eklutna Sediment
Lab Sample ID: 1153644003
Lab Project ID: 1153644

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Solids (%): 73.4
Location:

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Surrogates

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Print Date: 07/31/2015 3:31:45PM

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

Member of SGS Group
35 of 95
## Results of SS3

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Result Qual</th>
<th>LOQ/CL</th>
<th>Units</th>
<th>DF</th>
<th>Allowable Limits</th>
<th>Date Analyzed</th>
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</thead>
<tbody>
<tr>
<td>2-Fluorobiphenyl (surr)</td>
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### Batch Information

- **Analytical Batch:** XMS8781
- **Analytical Method:** SW8270D
- **Analyst:** DSH
- **Analytical Date/Time:** 07/18/15 09:36
- **Container ID:** 1153644003-A

- **Prep Batch:** XXX33577
- **Prep Method:** SW3550C
- **Prep Date/Time:** 07/16/15 10:42
- **Prep Initial Wt./Vol.:** 22.524 g
- **Prep Extract Vol:** 1 mL
## Results of SS3

**Client Sample ID:** SS3  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644003  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 12:07  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 73.4  
**Location:**

## Results by Volatile Fuels

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### Surrogates

- **4-Bromofluorobenzene (surr):** 47.5 %
  - LOQ/CL: 50-150 %
  - DF: 1
  - Date Analyzed: 07/28/15 18:17

## Batch Information

- **Analytical Batch:** VFC12544  
- **Analytical Method:** AK101  
- **Analyst:** ST  
- **Analytical Date/Time:** 07/28/15 18:17  

- **Prep Batch:** VXX27629  
- **Prep Method:** SW5035A  
- **Prep Date/Time:** 07/14/15 12:07  
- **Prep Initial Wt./Vol.:** 110.826 g  
- **Prep Extract Vol:** 54.4332 mL

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**Print Date:** 07/31/2015 3:31:45PM  
**J flagging is activated**
### Results of SS3

**Client Sample ID:** SS3  
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**Lab Sample ID:** 1153644003  
**Lab Project ID:** 1153644  
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**Solids (%):** 73.4  
**Location:**

#### Results by Volatile Gas Chromatography/Mass Spectrometry

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J flagging is activated
### Results of SS3

**Client Sample ID:** SS3  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644003  
**Lab Project ID:** 1153644

**Collection Date:** 07/14/15 12:07  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** 73.4

**Location:**

**Results by Volatile Gas Chromatography/Mass Spectrometry**

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<td>10.4</td>
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<td>Xylenes (total)</td>
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**Surrogates**

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<tr>
<td>1,2-Dichloroethane-D4 (surr)</td>
<td>108</td>
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<td>4-Bromofluorobenzene (surr)</td>
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<td>Toluene-d8 (surr)</td>
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Results of SS3

Client Sample ID: SS3
Client Project ID: 32-1-02472 Eklutna Sediment
Lab Sample ID: 1153644003
Lab Project ID: 1153644

Collection Date: 07/14/15 12:07
Received Date: 07/14/15 16:45
Matrix: Soil/Solid (dry weight)
Solids (%): 73.4
Location:

Results by Volatile Gas Chromatography/Mass Spectrometry

Batch Information

Analytical Batch: VMS15109
Analytical Method: SW8260B
Analyst: ST
Analytical Date/Time: 07/20/15 19:49
Container ID: 1153644003-B

Prep Batch: VXX27595
Prep Method: SW5035A
Prep Date/Time: 07/14/15 12:07
Prep Initial Wt./Vol.: 110.826 g
Prep Extract Vol: 54.4332 mL

Print Date: 07/31/2015 3:31:45PM
J flagging is activated
### Results of STB

**Client Sample ID:** STB  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644004  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):**

#### Results by Volatile Fuels

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#### Surrogates

- **4-Bromofluorobenzene (surr):**  
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#### Batch Information

- **Prep Batch:** VXX27629  
- **Prep Method:** SW5035A  
- **Prep Date/Time:** 07/14/15 10:04  
- **Prep Initial Wt./Vol.:** 49.961 g  
- **Prep Extract Vol:** 25 mL  
- **Analytical Batch:** VFC12544  
- **Analytical Method:** AK101  
- **Analyst:** ST  
- **Analytical Date/Time:** 07/28/15 18:55  
- **Container ID:** 1153644004-A
### Results by Volatile Gas Chromatography/Mass Spectrometry

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<th>Date Analyzed</th>
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### Results by Volatile Gas Chromatography/Mass Spectrometry

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<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Tetrachloroethene</td>
<td>6.25 U</td>
<td>12.5</td>
<td>3.90</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Toluene</td>
<td>12.5 U</td>
<td>25.0</td>
<td>7.81</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:01</td>
</tr>
<tr>
<td>trans-1,2-Dichloroethene</td>
<td>12.5 U</td>
<td>25.0</td>
<td>7.81</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:01</td>
</tr>
<tr>
<td>trans-1,3-Dichloropropene</td>
<td>12.5 U</td>
<td>25.0</td>
<td>7.81</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>6.25 U</td>
<td>12.5</td>
<td>3.90</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Trichlorofluoromethane</td>
<td>25.0 U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
<td>1</td>
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<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Vinyl acetate</td>
<td>50.0 U</td>
<td>100</td>
<td>31.0</td>
<td>ug/Kg</td>
<td>1</td>
<td></td>
<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>12.5 U</td>
<td>25.0</td>
<td>7.81</td>
<td>ug/Kg</td>
<td>1</td>
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<tr>
<td>Xylenes (total)</td>
<td>37.5 U</td>
<td>75.1</td>
<td>22.8</td>
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<td>1</td>
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<td>07/20/15 19:01</td>
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### Surrogates

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<th>DL</th>
<th>Units</th>
<th>DF</th>
<th>Date Analyzed</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2-Dichloroethane-D4 (surr)</td>
<td>102</td>
<td>71-136</td>
<td>%</td>
<td>1</td>
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<td>07/20/15 19:01</td>
</tr>
<tr>
<td>4-Bromofluorobenzene (surr)</td>
<td>105</td>
<td>55-151</td>
<td>%</td>
<td>1</td>
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<td>07/20/15 19:01</td>
</tr>
<tr>
<td>Toluene-d8 (surr)</td>
<td>110</td>
<td>85-116</td>
<td>%</td>
<td>1</td>
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<td>07/20/15 19:01</td>
</tr>
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</table>
## Results of STB

**Client Sample ID:** STB  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644004  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Soil/Solid (dry weight)  
**Solids (%):** Location:

## Results by Volatile Gas Chromatography/Mass Spectrome

### Batch Information

- **Analytical Batch:** VMS15109  
- **Analytical Method:** SW8260B  
- **Analyst:** ST  
- **Analytical Date/Time:** 07/20/15 19:01  
- **Container ID:** 1153644004-A  
- **Prep Batch:** VXX27595  
- **Prep Method:** SW5035A  
- **Prep Date/Time:** 07/14/15 10:04  
- **Prep Initial Wt./Vol.:** 49.961 g  
- **Prep Extract Vol:** 25 mL
## Results of SS1

**Client Sample ID:** SS1  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644005  
**Lab Project ID:** 1153644  
**Collection Date:** 07/14/15 10:04  
**Received Date:** 07/14/15 16:45  
**Matrix:** Solid/Soil (Wet Weight)  
**Solids (%):**  
**Location:**

## Results by TCLP Constituents 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>Arsenic</td>
<td>0.125 U</td>
<td>0.250</td>
<td>0.0750</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:28</td>
</tr>
<tr>
<td>Barium</td>
<td>0.328</td>
<td>0.150</td>
<td>0.0470</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;100)</td>
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</tr>
<tr>
<td>Cadmium</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;1)</td>
<td>07/21/15 13:28</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0600</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:28</td>
</tr>
<tr>
<td>Lead</td>
<td>0.0250 U</td>
<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:28</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.00500 U</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;0.2)</td>
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</tr>
<tr>
<td>Selenium</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;1)</td>
<td>07/21/15 13:28</td>
</tr>
<tr>
<td>Silver</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:28</td>
</tr>
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</table>

## Batch Information

- **Analytical Batch:** MMS9004  
- **Analytical Method:** SW6020A TCLP  
- **Analyst:** EAB  
- **Analytical Date/Time:** 07/21/15 13:28  
- **Container ID:** 1153644005-A  
- **Prep Batch:** MXT5260  
- **Prep Method:** SW3010A  
- **Prep Date/Time:** 07/17/15 11:25  
- **Prep Initial Wt./Vol.:** 2.5 mL  
- **Prep Extract Vol:** 25 mL
**Results of SS2**

Client Sample ID: **SS2**  
Client Project ID: **32-1-02472 Eklutna Sediment**  
Lab Sample ID: **1153644006**  
Lab Project ID: **1153644**

Collection Date: **07/14/15 10:36**  
Received Date: **07/14/15 16:45**  
Matrix: **Solid/Soil (Wet Weight)**  
Solids (%):

<table>
<thead>
<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>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>0.125 U</td>
<td>0.250</td>
<td>0.0750</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:30</td>
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<tr>
<td>Barium</td>
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<td>0.150</td>
<td>0.0470</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;100)</td>
<td>07/21/15 13:30</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;1)</td>
<td>07/21/15 13:30</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0600</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:30</td>
</tr>
<tr>
<td>Lead</td>
<td>0.0250 U</td>
<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:30</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.00500 U</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;0.2)</td>
<td>07/21/15 13:30</td>
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<tr>
<td>Selenium</td>
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<td>1.00</td>
<td>0.310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;1)</td>
<td>07/21/15 13:30</td>
</tr>
<tr>
<td>Silver</td>
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<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:30</td>
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**Batch Information**

Analytical Batch: **MMS9004**  
Analytical Method: **SW6020A TCLP**  
Analyst: **EAB**  
Analytical Date/Time: **07/21/15 13:30**

Prep Batch: **MXT5260**  
Prep Method: **SW3010A**  
Prep Date/Time: **07/17/15 11:25**

Container ID: **1153644006-A**  
Prep Initial WT./Vol.: **2.5 mL**  
Prep Extract Vol: **25 mL**

---

Print Date: 07/31/2015 3:31:45PM  
J flagging is activated
**Results of SS3**

**Client Sample ID:** SS3  
**Client Project ID:** 32-1-02472 Eklutna Sediment  
**Lab Sample ID:** 1153644007  
**Lab Project ID:** 1153644

**Collection Date:** 07/14/15 12:07  
**Received Date:** 07/14/15 16:45  
**Matrix:** Solid/Soil (Wet Weight)  
**Solids (%):**

**Location:**

---

### Results by TCLP Constituents 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>
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<td>25</td>
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</tr>
<tr>
<td>Cadmium</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;1)</td>
<td>07/21/15 13:32</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.100 U</td>
<td>0.200</td>
<td>0.0600</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:32</td>
</tr>
<tr>
<td>Lead</td>
<td>0.0250 U</td>
<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:32</td>
</tr>
<tr>
<td>Mercury</td>
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<td>0.00310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;0.2)</td>
<td>07/21/15 13:32</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.500 U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;1)</td>
<td>07/21/15 13:32</td>
</tr>
<tr>
<td>Silver</td>
<td>0.0500 U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
<td>25</td>
<td>(&lt;5)</td>
<td>07/21/15 13:32</td>
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### Batch Information

- **Analytical Batch:** MMS9004  
- **Analytical Method:** SW6020A TCLP  
- **Analyst:** EAB  
- **Analytical Date/Time:** 07/21/15 13:32  
- **Container ID:** 1153644007-A

- **Prep Batch:** MXT5260  
- **Prep Method:** SW3010A  
- **Prep Date/Time:** 07/17/15 11:25  
- **Prep Initial WT./Vol.:** 2.5 mL  
- **Prep Extract Vol:** 25 mL

---

*J flagging is activated*
## Method Blank

Blank ID: LB1 for HBN 1713786 [TCLP/7874]  
Blank Lab ID: 1277411  
Matrix: Solid/Soil (Wet Weight)  
QC for Samples:  
1153644005, 1153644006, 1153644007

## Results by SW6020A TCLP

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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>Arsenic</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0750</td>
<td>mg/L</td>
</tr>
<tr>
<td>Barium</td>
<td>0.0750U</td>
<td>0.150</td>
<td>0.0470</td>
<td>mg/L</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.0600</td>
<td>mg/L</td>
</tr>
<tr>
<td>Lead</td>
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<td>0.0500</td>
<td>0.0155</td>
<td>mg/L</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.00500U</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.500U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/L</td>
</tr>
<tr>
<td>Silver</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
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</tbody>
</table>

## Batch Information

- Analytical Batch: MMS9001  
- Analytical Method: SW6020A TCLP  
- Instrument: Perkin Elmer Sciex ICP-MS P3  
- Analyst: EAB  
- Analytical Date/Time: 7/17/2015 5:18:37PM  
- Prep Batch: MXT5260  
- Prep Method: SW3010A  
- Prep Date/Time: 7/17/2015 11:25:00AM  
- Prep Initial Wt./Vol.: 2.5 mL  
- Prep Extract Vol: 25 mL

Print Date: 07/31/2015 3:31:48PM
### Method Blank

Blank ID: MB for HBN 1713876 [MXT/5260]
Blank Lab ID: 1277626
Matrix: Water (Surface, Eff., Ground)
QC for Samples:
1153644005, 1153644006, 1153644007

### Results by SW6020A TCLP

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>0.0125U</td>
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<tr>
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<td>0.00750U</td>
<td>0.0150</td>
<td>0.00470</td>
<td>mg/L</td>
</tr>
<tr>
<td>Cadmium</td>
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<td>0.0100</td>
<td>0.00300</td>
<td>mg/L</td>
</tr>
<tr>
<td>Chromium</td>
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<td>0.0200</td>
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<td>mg/L</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.0500U</td>
<td>0.100</td>
<td>0.0310</td>
<td>mg/L</td>
</tr>
<tr>
<td>Silver</td>
<td>0.00500U</td>
<td>0.0100</td>
<td>0.00310</td>
<td>mg/L</td>
</tr>
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### Batch Information

- Analytical Batch: MMS9001
- Analytical Method: SW6020A TCLP
- Instrument: Perkin Elmer Sciex ICP-MS P3
- Analyst: EAB
- Analytical Date/Time: 7/17/2015 5:16:15PM

- Prep Batch: MXT5260
- Prep Method: SW3010A
- Prep Date/Time: 7/17/2015 11:25:00AM
- Prep Initial Wt./Vol.: 25 mL
- Prep Extract Vol: 25 mL

Print Date: 07/31/2015 3:31:48PM
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1153644 [MXT5260]
Blank Spike Lab ID: 1277627
Date Analyzed: 07/17/2015 17:20

Matrix: Water (Surface, Eff., Ground)

QC for Samples: 1153644005, 1153644006, 1153644007

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**Results by SW6020A TCLP**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result (mg/L)</th>
<th>Rec (%)</th>
<th>CL (mg/L)</th>
</tr>
</thead>
<tbody>
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<td>Arsenic</td>
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<td>104</td>
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<tr>
<td>Barium</td>
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<td>107</td>
<td>(86-114)</td>
</tr>
<tr>
<td>Cadmium</td>
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<td>108</td>
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</tr>
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<td>Lead</td>
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<tr>
<td>Mercury</td>
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<td>110</td>
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<tr>
<td>Silver</td>
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<td>89</td>
<td>(85-116)</td>
</tr>
</tbody>
</table>

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**Batch Information**

Analytical Batch: MMS9001  
Prep Batch: MXT5260
Analytical Method: SW6020A TCLP  
Prep Method: SW3010A
Instrument: Perkin Elmer Sciex ICP-MS P3  
Prep Date/Time: 07/17/2015 11:25
Analyst: EAB  
Spike Init Wt./Vol.: 1 mg/L  
Extract Vol: 25 mL
Dupe Init Wt./Vol.:  
Extract Vol:  

Print Date: 07/31/2015 3:31:49PM
Matrix Spike Summary

Original Sample ID: 1277683  
MS Sample ID: 1277629 MS  
MSD Sample ID: 1277630 MSD

Analysis Date: 07/17/2015 17:23  
Analysis Date: 07/17/2015 17:25  
Analysis Date: 07/17/2015 17:28

Matrix: Solid/Soil (Wet Weight)  
QC for Samples: 1153644005, 1153644006, 1153644007

Results by SW6020A TCLP

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample</th>
<th>Spike</th>
<th>Rec (%)</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>
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<tbody>
<tr>
<td>Arsenic</td>
<td>0.125U</td>
<td>10.0</td>
<td>10.4</td>
<td>104</td>
<td>10.0</td>
<td>10.5</td>
<td>105</td>
<td>84-116</td>
<td>0.78</td>
<td>(&lt; 20)</td>
<td></td>
<td></td>
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<tr>
<td>Barium</td>
<td>0.267</td>
<td>10.0</td>
<td>11.0</td>
<td>107</td>
<td>10.0</td>
<td>10.9</td>
<td>107</td>
<td>86-114</td>
<td>0.63</td>
<td>(&lt; 20)</td>
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<tr>
<td>Cadmium</td>
<td>0.0500U</td>
<td>1.00</td>
<td>1.08</td>
<td>108</td>
<td>1.00</td>
<td>1.09</td>
<td>109</td>
<td>87-115</td>
<td>1.15</td>
<td>(&lt; 20)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td>0.100U</td>
<td>4.00</td>
<td>4.16</td>
<td>104</td>
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<td>101</td>
<td>85-116</td>
<td>2.66</td>
<td>(&lt; 20)</td>
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<tr>
<td>Lead</td>
<td>0.0250U</td>
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<td>11.2</td>
<td>112</td>
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<td>112</td>
<td>88-115</td>
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<tr>
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<td>10.7</td>
<td>107</td>
<td>80-120</td>
<td>0.99</td>
<td>(&lt; 20)</td>
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<td></td>
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<tr>
<td>Silver</td>
<td>0.0500U</td>
<td>1.00</td>
<td>0.895</td>
<td>90</td>
<td>1.00</td>
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<td>89</td>
<td>85-116</td>
<td>0.55</td>
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Batch Information

Analytical Batch: MMS9001  
Analytical Method: SW6020A TCLP  
Instrument: Perkin Elmer Sciex ICP-MS P3  
Analytical Date/Time: 7/17/2015 5:25:42PM

Prep Batch: MXT5260  
Prep Method: Waters Digest for Metals by ICP-MS(TCLP)  
Prep Date/Time: 7/17/2015 11:25:00AM  
Prep Initial Wt./Vol.: 2.50mL  
Prep Extract Vol: 25.00mL
### Method Blank

Blank ID: MB for HBN 1713869 [MXX/28895]  
Blank Lab ID: 1277604  
Matrix: Soil/Solid (dry weight)  
QC for Samples:  
1153644001, 1153644002, 1153644003

### Results by SW6020A

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>0.500U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Barium</td>
<td>0.150U</td>
<td>0.300</td>
<td>0.094</td>
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</tr>
<tr>
<td>Cadmium</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.062</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Chromium</td>
<td>0.200U</td>
<td>0.400</td>
<td>0.120</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Lead</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.062</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.0200U</td>
<td>0.0400</td>
<td>0.0120</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.500U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Silver</td>
<td>0.100U</td>
<td>0.200</td>
<td>0.062</td>
<td>mg/Kg</td>
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### Batch Information

Analytical Batch: MMS9004  
Analytical Method: SW6020A  
Instrument: Perkin Elmer Sciex ICP-MS P3  
Analyst: EAB  
Analytical Date/Time: 7/21/2015 12:19:10PM  
Prep Batch: MXX28895  
Prep Method: SW3050B  
Prep Date/Time: 7/17/2015 3:01:09PM  
Prep Initial Wt./Vol.: 1 g  
Prep Extract Vol: 50 mL
# Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1153644 [MXX28895]  
**Blank Spike Lab ID:** 1277605  
**Date Analyzed:** 07/21/2015 12:21  
**Matrix:** Soil/Solid (dry weight)  
**QC for Samples:** 1153644001, 1153644002, 1153644003

---

## Results by SW6020A

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>50</td>
<td>52.2</td>
<td>104</td>
<td>(82-118)</td>
</tr>
<tr>
<td>Barium</td>
<td>50</td>
<td>53.1</td>
<td>106</td>
<td>(86-116)</td>
</tr>
<tr>
<td>Cadmium</td>
<td>5</td>
<td>5.40</td>
<td>108</td>
<td>(84-116)</td>
</tr>
<tr>
<td>Chromium</td>
<td>20</td>
<td>21.2</td>
<td>106</td>
<td>(83-119)</td>
</tr>
<tr>
<td>Lead</td>
<td>50</td>
<td>57.3</td>
<td>115</td>
<td>(84-118)</td>
</tr>
<tr>
<td>Mercury</td>
<td>0.5</td>
<td>0.522</td>
<td>104</td>
<td>(74-126)</td>
</tr>
<tr>
<td>Selenium</td>
<td>50</td>
<td>53.9</td>
<td>108</td>
<td>(80-119)</td>
</tr>
<tr>
<td>Silver</td>
<td>5</td>
<td>5.31</td>
<td>106</td>
<td>(83-118)</td>
</tr>
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## Batch Information

- **Analytical Batch:** MMS9004  
- **Analytical Method:** SW6020A  
- **Instrument:** Perkin Elmer Sciex ICP-MS P3  
- **Analyst:** EAB  
- **Prep Batch:** MXX28895  
- **Prep Method:** SW3050B  
- **Prep Date/Time:** 07/17/2015 15:01  
- **Spike Init Wt./Vol.:** 50 mg/Kg  
- **Extract Vol.:** 50 mL  
- **Dupe Init Wt./Vol.:**  
- **Extract Vol.:**  

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Print Date: 07/31/2015 3:31:51PM

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

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Member of SGS Group
### Matrix Spike Summary

<table>
<thead>
<tr>
<th>Original Sample ID</th>
<th>Analysis Date</th>
<th>MS Sample ID</th>
<th>Analysis Date</th>
<th>MSD Sample ID</th>
<th>Analysis Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1158220001</td>
<td>07/21/2015</td>
<td>1277606 MS</td>
<td>07/21/2015</td>
<td>1277607 MSD</td>
<td>07/21/2015</td>
</tr>
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</table>

QC for Samples: 1153644001, 1153644002, 1153644003

### Results by SW6020A

<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>Arsenic</td>
<td>7.69</td>
<td>51.1</td>
<td>61.8</td>
<td>106</td>
<td>51.8</td>
<td>62.4</td>
<td>106</td>
<td>82-118</td>
<td>0.90</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Barium</td>
<td>173</td>
<td>51.1</td>
<td>240</td>
<td>131</td>
<td>*</td>
<td>51.8</td>
<td>212</td>
<td>76</td>
<td>12.40</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Cadmium</td>
<td>0.200J</td>
<td>5.11</td>
<td>5.73</td>
<td>108</td>
<td>5.18</td>
<td>5.70</td>
<td>106</td>
<td>84-116</td>
<td>0.63</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Chromium</td>
<td>20.0</td>
<td>20.4</td>
<td>45.9</td>
<td>127</td>
<td>*</td>
<td>20.8</td>
<td>45.4</td>
<td>123</td>
<td>0.86</td>
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</tr>
<tr>
<td>Lead</td>
<td>17.3</td>
<td>51.1</td>
<td>73.2</td>
<td>109</td>
<td>51.8</td>
<td>72.1</td>
<td>106</td>
<td>84-118</td>
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<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Mercury</td>
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<td>0.580</td>
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<td>104</td>
<td>74-126</td>
<td>2.10</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Selenium</td>
<td>0.535U</td>
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<td>55.5</td>
<td>109</td>
<td>51.8</td>
<td>55.7</td>
<td>108</td>
<td>80-119</td>
<td>0.41</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Silver</td>
<td>0.0907J</td>
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<td>5.36</td>
<td>103</td>
<td>5.18</td>
<td>5.39</td>
<td>102</td>
<td>83-118</td>
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### Batch Information

- Analytical Batch: MMS9004
- Analytical Method: SW6020A
- Instrument: Perkin Elmer Sciex ICP-MS P3
- Analyst: EAB
- Analytical Date/Time: 7/21/2015 12:26:15PM

- Prep Batch: MXX28895
- Prep Method: Soils/Solids Digest for Metals by ICP-MS
- Prep Date/Time: 7/17/2015 3:01:09PM
- Prep Initial Wt./Vol.: 1.13g
- Prep Extract Vol: 50.00mL

Print Date: 07/31/2015 3:31:52PM
## Bench Spike Summary

Original Sample ID: 1158220001  
MS Sample ID: 1277608 BND  
MSD Sample ID:  
Analysis Date: 07/21/2015 12:33  
Matrix: Soil/Solid (dry weight)  
QC for Samples: 1153644001, 1153644002, 1153644003

### Results by SW6020A

<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>Barium</td>
<td>173</td>
<td>269</td>
<td>449</td>
<td>103</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80-120</td>
<td></td>
</tr>
<tr>
<td>Chromium</td>
<td>20.0</td>
<td>134</td>
<td>164</td>
<td>107</td>
<td></td>
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<td></td>
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<td>80-120</td>
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### Batch Information

- **Analytical Batch:** MMS9004  
- **Analytical Method:** SW6020A  
- **Instrument:** Perkin Elmer Sciex ICP-MS P3  
- **Prep Batch:** MXX28895  
- **Prep Method:** Soils/Solids Digest for Metals by ICP-MS  
- **Prep Date/Time:** 7/17/2015 3:01:09PM  
- **Prep Initial Wt./Vol.:** 1.08g  
- **Prep Extract Vol:** 50.00mL  
- **Analytical Date/Time:** 7/21/2015 12:33:20PM  
- **Prep Date/Time:** 7/17/2015 3:01:09PM  
- **Prep Initial Wt./Vol.:** 1.08g  
- **Prep Extract Vol:** 50.00mL

Print Date: 07/31/2015 3:31:52PM
**Method Blank**

Blank ID: MB for HBN 1713732 [SPT/9664]  
Blank Lab ID: 1277156  
Matrix: Soil/Solid (dry weight)

QC for Samples:  
1153644001, 1153644002, 1153644003

**Results by SM21 2540G**

<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>
<tr>
<td>Total Solids</td>
<td>100</td>
<td></td>
<td></td>
<td>%</td>
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**Batch Information**

- Analytical Batch: SPT9664  
- Analytical Method: SM21 2540G  
- Instrument:  
- Analyst: A.R  
- Analytical Date/Time: 7/15/2015  5:02:00PM
### Duplicate Sample Summary

Original Sample ID: 1153637003  
Duplicate Sample ID: 1277157  
Analysis Date: 07/15/2015 17:02  
Matrix: Soil/Solid (dry weight)

QC for Samples:  
1153644001, 1153644002, 1153644003

### Results by SM21 2540G

<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>Total Solids</td>
<td>88.1</td>
<td>87.0</td>
<td>%</td>
<td>1.20</td>
<td>(&lt; 5 )</td>
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</table>

### Batch Information

- Analytical Batch: SPT9664
- Analytical Method: SM21 2540G
- Instrument: SM21 2540G
- Analyst: A.R
Duplicate Sample Summary

Original Sample ID: 1153647001
Duplicate Sample ID: 1277158
Analysis Date: 07/15/2015 17:02
Matrix: Soil/Solid (dry weight)
QC for Samples: 1153644001, 1153644002, 1153644003

Results by SM21 2540G

<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>Total Solids</td>
<td>91.3</td>
<td>91.3</td>
<td>%</td>
<td>0.03</td>
<td>(&lt; 5 )</td>
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Batch Information

Analytical Batch: SPT9664
Analytical Method: SM21 2540G
Instrument: SM21 2540G
Analyst: A.R
**Method Blank**

Blank ID: MB for HBN 1714212 [VXX/27595]  
Matrix: Soil/Solid (dry weight)

Blank Lab ID: 1278173

QC for Samples:  
1153644001, 1153644002, 1153644003, 1153644004

**Results by SW8260B**

<table>
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<th>Parameter</th>
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<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
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<tr>
<td>1,1,1,2-Tetrachloroethane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,1,1-Trichloroethane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,1,2,2-Tetrachloroethane</td>
<td>6.25U</td>
<td>12.5</td>
<td>3.90</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,1,2-Trichloroethane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,1-Dichloroethane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,1-Dichloroethene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,2,3-Trichlorobenzene</td>
<td>25.0U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,2,3-Trichloropropene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>1,2,4-Trichlorobenzene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,2,4-Trimethylbenzene</td>
<td>25.0U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
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<tr>
<td>1,2-Dibromo-3-chloropropane</td>
<td>50.0U</td>
<td>100</td>
<td>31.0</td>
<td>ug/Kg</td>
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<td>1,2-Dibromoethane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,2-Dichlorobenzene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>1,2-Dichloroethane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>1,2-Dichloropropene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>1,3,5-Trimethylbenzene</td>
<td>12.5U</td>
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<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>1,3-Dichlorobenzene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>1,3-Dichloropropane</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>1,4-Dichlorobenzene</td>
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<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
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<tr>
<td>2,2-Dichloropropene</td>
<td>12.5U</td>
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<td>7.80</td>
<td>ug/Kg</td>
</tr>
<tr>
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<td>125U</td>
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<td>78.0</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>2-Chlorotoluene</td>
<td>12.5U</td>
<td>25.0</td>
<td>7.80</td>
<td>ug/Kg</td>
</tr>
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<td>2-Hexanone</td>
<td>125U</td>
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<td>78.0</td>
<td>ug/Kg</td>
</tr>
<tr>
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<td>12.5U</td>
<td>25.0</td>
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### Results by SW8260B

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### Surrogates

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### Method Blank

Blank ID: MB for HBN 1714212 [VXX/27595]  
Blank Lab ID: 1278173  
Matrix: Soil/Solid (dry weight)

QC for Samples:  
1153644001, 1153644002, 1153644003, 1153644004

### Results by SW8260B

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Prep Batch: VXX27595  
Prep Method: SW5035A  
Prep Date/Time: 7/20/2015 8:00:00AM  
Prep Initial Wt./Vol.: 50 g  
Prep Extract Vol: 25 mL
### Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1153644 [VXX27595]

**Blank Spike Lab ID:** 1278174

**Date Analyzed:** 07/20/2015 14:37

**Matrix:** Soil/Solid (dry weight)

**QC for Samples:** 1153644001, 1153644002, 1153644003, 1153644004

### Results by SW8260B

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<td>104</td>
<td>(70-124)</td>
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<tr>
<td>1,1,2-Trichloroethane</td>
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<td>109</td>
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<td>98</td>
<td>(76-125)</td>
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Blank Spike Summary

Blank Spike ID: LCS for HBN 1153644 [VXX27595]
Blank Spike Lab ID: 1278174
Date Analyzed: 07/20/2015 14:37

Matrix: Soil/Solid (dry weight)

QC for Samples: 1153644001, 1153644002, 1153644003, 1153644004

Results by SW8260B

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<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
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<td>Trichlorofluoromethane</td>
<td>750</td>
<td>791</td>
<td>106</td>
<td>(62-140)</td>
</tr>
<tr>
<td>Vinyl acetate</td>
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<td>796</td>
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<td>(50-151)</td>
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<td>Vinyl chloride</td>
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<td>622</td>
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<td>(56-135)</td>
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<td>Xylenes (total)</td>
<td>2250</td>
<td>2480</td>
<td>110</td>
<td>(78-124)</td>
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**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1153644 [VXX27595]
Blank Spike Lab ID: 1278174
Date Analyzed: 07/20/2015 14:37

Matrix: Soil/Solid (dry weight)

QC for Samples: 1153644001, 1153644002, 1153644003, 1153644004

**Results by SW8260B**

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<tr>
<th>Parameter</th>
<th>Spike</th>
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<th>Rec (%)</th>
<th>CL</th>
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**Batch Information**

Analytical Batch: VMS15109
Analytical Method: SW8260B
Instrument: VQA 7890/5975 GC/MS
Analyst: ST

Prep Batch: VXX27595
Prep Method: SW5035A
Prep Date/Time: 07/20/2015 08:00
Spike Init Wt./Vol.: 750 ug/Kg
Extract Vol: 25 mL
Dupe Init Wt./Vol.: Extract Vol:
Matrix Spike Summary

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<th>Result</th>
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<th>Spike</th>
<th>Result</th>
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<td>758</td>
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Matrix Spike Summary

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<th>Spike</th>
<th>Result</th>
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<td>73-125</td>
<td>0.16</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>Tetrachloroethene</td>
<td>5.60U</td>
<td>669</td>
<td>740</td>
<td>111</td>
<td>669</td>
<td>767</td>
<td>115</td>
<td>73-128</td>
<td>3.60</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>Toluene</td>
<td>11.2U</td>
<td>669</td>
<td>718</td>
<td>107</td>
<td>669</td>
<td>732</td>
<td>109</td>
<td>77-121</td>
<td>1.80</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>trans-1,2-Dichloroethene</td>
<td>11.2U</td>
<td>669</td>
<td>687</td>
<td>103</td>
<td>669</td>
<td>697</td>
<td>104</td>
<td>74-125</td>
<td>1.30</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>trans-1,3-Dichloropropene</td>
<td>11.2U</td>
<td>669</td>
<td>635</td>
<td>95</td>
<td>669</td>
<td>636</td>
<td>95</td>
<td>71-130</td>
<td>0.11</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>Trichloroethene</td>
<td>5.60U</td>
<td>669</td>
<td>709</td>
<td>106</td>
<td>669</td>
<td>721</td>
<td>108</td>
<td>77-123</td>
<td>1.80</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>Trichlorofluoromethane</td>
<td>22.3U</td>
<td>669</td>
<td>622</td>
<td>93</td>
<td>669</td>
<td>507</td>
<td>76</td>
<td>62-140</td>
<td>20.20   *</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>Vinyl acetate</td>
<td>44.6U</td>
<td>669</td>
<td>638</td>
<td>95</td>
<td>669</td>
<td>634</td>
<td>95</td>
<td>50-151</td>
<td>0.63</td>
<td></td>
</tr>
<tr>
<td>Vinyl chloride</td>
<td>11.2U</td>
<td>669</td>
<td>557</td>
<td>83</td>
<td>669</td>
<td>561</td>
<td>84</td>
<td>56-135</td>
<td>0.64</td>
<td>(&lt; 20)</td>
</tr>
<tr>
<td>Xylenes (total)</td>
<td>33.5U</td>
<td>2010</td>
<td>2120</td>
<td>105</td>
<td>2010</td>
<td>2150</td>
<td>107</td>
<td>78-124</td>
<td>1.50</td>
<td>(&lt; 20)</td>
</tr>
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</table>

**Surrogates**

<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>1,2-Dichloroethane-D4 (surr)</td>
<td>669</td>
<td>633</td>
<td>95</td>
<td>669</td>
<td>636</td>
<td>95</td>
<td>71-136</td>
<td>0.46</td>
<td></td>
</tr>
<tr>
<td>4-Bromofluorobenzene (surr)</td>
<td>1790</td>
<td>1490</td>
<td>83</td>
<td>1790</td>
<td>1510</td>
<td>84</td>
<td>55-151</td>
<td>1.40</td>
<td></td>
</tr>
<tr>
<td>Toluene-d8 (surr)</td>
<td>669</td>
<td>740</td>
<td>111</td>
<td>669</td>
<td>755</td>
<td>113</td>
<td>85-116</td>
<td>2.00</td>
<td></td>
</tr>
</tbody>
</table>

* meets limits with rounding.
### Matrix Spike Summary

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sample spikes</th>
<th>Matrix Spike (%)</th>
<th>Spike Duplicate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RPD (%)</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Batch Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep Batch: VXX27595</td>
</tr>
<tr>
<td>Prep Method: Vol. Extraction SW8260 Field Extracted L</td>
</tr>
<tr>
<td>Prep Date/Time: 7/20/2015 8:00:00AM</td>
</tr>
<tr>
<td>Prep Initial Wt./Vol.: 56.02g</td>
</tr>
<tr>
<td>Prep Extract Vol: 25.00mL</td>
</tr>
</tbody>
</table>

| Original Sample ID: 1278175 |
| MS Sample ID: 1278183 MS |
| MSD Sample ID: 1278184 MSD |
| Analysis Date: 07/20/2015 15:02 |
| Analysis Date: 07/20/2015 15:18 |
| Matrix: Solid/Soil (Wet Weight) |

QC for Samples: 1153644001, 1153644002, 1153644003, 1153644004

Results by SW8260B
## Method Blank

Blank ID: MB for HBN 1714988 [VXX/27629]  
Blank Lab ID: 1279761  
Matrix: Soil/Solid (dry weight)

QC for Samples:  
1153644001, 1153644002, 1153644003, 1153644004

## Results by AK101

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Range Organics</td>
<td>0.948J</td>
<td>2.50</td>
<td>0.750</td>
<td>mg/Kg</td>
</tr>
<tr>
<td><strong>Surrogates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-Bromofluorobenzene (surr)</td>
<td>102</td>
<td>50-150</td>
<td>%</td>
<td></td>
</tr>
</tbody>
</table>

## Batch Information

- **Analytical Batch:** VFC12544  
- **Analytical Method:** AK101  
- **Instrument:** Agilent 7890A PID/FID  
- **Analyst:** ST  
- **Analytical Date/Time:** 7/28/2015 11:36:00AM  
- **Prep Batch:** VXX27629  
- **Prep Method:** SW5035A  
- **Prep Date/Time:** 7/28/2015 8:00:00AM  
- **Prep Initial Wt./Vol.:** 50 g  
- **Prep Extract Vol.:** 25 mL
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1153644 [VXX27629]  
Blank Spike Lab ID: 1279764  
Date Analyzed: 07/28/2015 12:34  
QC for Samples: 1153644001, 1153644002, 1153644003, 1153644004

Spike Duplicate ID: LCSD for HBN 1153644  
Spike Duplicate Lab ID: 1279765  
Matrix: Soil/Solid (dry weight)

**Results by AK101**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/Kg)</th>
<th>Spike Duplicate (mg/Kg)</th>
<th>CL</th>
<th>RPD (%)</th>
<th>RPD CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline Range Organics</td>
<td>10.0</td>
<td>10.0</td>
<td>105</td>
<td>(60-120)</td>
<td>4.00</td>
</tr>
<tr>
<td>Surrogates</td>
<td></td>
<td></td>
<td></td>
<td>(&lt;20)</td>
<td></td>
</tr>
<tr>
<td>4-Bromofluorobenzene (surr)</td>
<td>1.25</td>
<td>1.25</td>
<td>107</td>
<td>(50-150)</td>
<td>30.30</td>
</tr>
</tbody>
</table>

**Batch Information**

Analytical Batch: VFC12544  
Analytical Method: AK101  
Instrument: Agilent 7890A PID/FID  
Analyst: ST  

Prep Batch: VXX27629  
Prep Method: SW5035A  
Prep Date/Time: 07/28/2015 08:00  
Spike Init Wt./Vol.: 10.0 mg/Kg  
Extract Vol: 25 mL  
Dupe Init Wt./Vol.: 10.0 mg/Kg  
Extract Vol: 25 mL
**Method Blank**

Blank ID: MB for HBN 1713745 [XXX/33575]  
Blank Lab ID: 1277198  
Matrix: Soil/Solid (dry weight)

QC for Samples:  
1153644001, 1153644002, 1153644003

**Results by AK102**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diesel Range Organics</td>
<td>10.0U</td>
<td>20.0</td>
<td>6.20</td>
<td>mg/Kg</td>
</tr>
</tbody>
</table>

**Surrogates**

<table>
<thead>
<tr>
<th>Surrogate</th>
<th>Result</th>
<th>LOQ/CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>5a Androstane (surr)</td>
<td>86.6</td>
<td>60-120</td>
</tr>
</tbody>
</table>

**Batch Information**

<table>
<thead>
<tr>
<th>Analytical Batch:</th>
<th>XFC11950</th>
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</thead>
<tbody>
<tr>
<td>Analytical Method:</td>
<td>AK102</td>
</tr>
<tr>
<td>Instrument:</td>
<td>HP 6890 Series II FID SV D R</td>
</tr>
<tr>
<td>Analyst:</td>
<td>AYC</td>
</tr>
<tr>
<td>Analytical Date/Time</td>
<td>7/18/2015 5:39:00PM</td>
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<table>
<thead>
<tr>
<th>Prep Batch:</th>
<th>XXX33575</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prep Method:</td>
<td>SW3550C</td>
</tr>
<tr>
<td>Prep Date/Time:</td>
<td>7/16/2015 9:57:19AM</td>
</tr>
<tr>
<td>Prep Initial Wt./Vol.:</td>
<td>30 g</td>
</tr>
<tr>
<td>Prep Extract Vol:</td>
<td>1 mL</td>
</tr>
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</table>
### Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1153644 [XXX33575]
**Blank Spike Lab ID:** 1277199
**Date Analyzed:** 07/18/2015  17:48
**QC for Samples:** 1153644001, 1153644002, 1153644003

**Spike Duplicate ID:** LCSD for HBN 1153644 [XXX33575]
**Spike Duplicate Lab ID:** 1277200
**Matrix:** Soil/Solid (dry weight)

---

### Results by AK102

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/Kg)</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>Diesel Range Organics</td>
<td></td>
<td>167</td>
<td>132</td>
<td>79</td>
<td>167</td>
<td>135</td>
<td>81</td>
<td>(75-125)</td>
<td>2.00</td>
<td>(&lt;20)</td>
</tr>
<tr>
<td>Surrogates</td>
<td></td>
<td>3.33</td>
<td>97.8</td>
<td>98</td>
<td>3.33</td>
<td>101</td>
<td>101</td>
<td>(60-120)</td>
<td>3.30</td>
<td></td>
</tr>
</tbody>
</table>

**Surrogates**
- 5a Androstane (surr)

---

### Batch Information

- **Analytical Batch:** XFC11950
- **Analytical Method:** AK102
- **Instrument:** HP 6890 Series II FID SV D R
- **Analyst:** AYC

- **Prep Batch:** XXX33575
- **Prep Method:** SW3550C
- **Prep Date/Time:** 07/16/2015  09:57
- **Spike Init Wt./Vol.:** 167 mg/Kg  **Extract Vol.:** 1 mL
- **Dupe Init Wt./Vol.:** 167 mg/Kg  **Extract Vol.:** 1 mL
### Method Blank

Blank ID: MB for HBN 1713745 [XXX/33575]  
Blank Lab ID: 1277198  
Matrix: Soil/Solid (dry weight)  
QC for Samples:  
1153644001, 1153644002, 1153644003

### Results by AK103

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residual Range Organics</td>
<td>10.0U</td>
<td>20.0</td>
<td>6.20</td>
<td>mg/Kg</td>
</tr>
<tr>
<td><strong>Surrogates</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n-Triacontane-d62 (surr)</td>
<td>94.4</td>
<td>60-120</td>
<td></td>
<td>%</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch:** XFC11950  
- **Analytical Method:** AK103  
- **Instrument:** HP 6890 Series II FID SV D R  
- **Analyst:** AYC  
- **Analytical Date/Time:** 7/18/2015 5:39:00PM  
- **Prep Batch:** XXX33575  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 7/16/2015 9:57:19AM  
- **Prep Initial Wt./Vol.:** 30 g  
- **Prep Extract Vol:** 1 mL
Blank Spike Summary

Blank Spike ID: LCS for HBN 1153644 [XXX33575]
Blank Spike Lab ID: 1277199
Date Analyzed: 07/18/2015 17:48
QC for Samples: 1153644001, 1153644002, 1153644003

Spike Duplicate ID: LCSD for HBN 1153644 [XXX33575]
Spike Duplicate Lab ID: 1277200
Matrix: Soil/Solid (dry weight)

Results by AK103

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Blank Spike (mg/Kg)</th>
<th>Spike Duplicate (mg/Kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Spike</td>
<td>Result</td>
</tr>
<tr>
<td>Residual Range Organics</td>
<td>167</td>
<td>148</td>
</tr>
<tr>
<td>n-Triacontane-d62 (surr)</td>
<td>3.33</td>
<td>92.4</td>
</tr>
</tbody>
</table>

Batch Information

Analytical Batch: XFC11950
Analytical Method: AK103
Instrument: HP 6890 Series II FID SV D R
Analyst: AYC

Prep Batch: XXX33575
Prep Method: SW3550C
Prep Date/Time: 07/16/2015 09:57
Spike Init Wt./Vol.: 167 mg/Kg  Extract Vol: 1 mL
Dupe Init Wt./Vol.: 167 mg/Kg  Extract Vol: 1 mL
<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,4-Trichlorobenzene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>1,2-Dichlorobenzene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>1,3-Dichlorobenzene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>1,4-Dichlorobenzene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>1-Chloronaphthalene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>1-Methylnaphthalene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,4,5-Trichlorophenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,4,6-Trichlorophenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,4-Dichlorophenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,4-Dimethylphenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,4-Dinitrophenol</td>
<td>1.50U</td>
<td>3.00</td>
<td>0.940</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,4-Dinitrotoluene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,6-Dichlorophenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2,6-Dinitrotoluene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Chloronaphthalene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Chlorophenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Methyl-4,6-dinitrophenol</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Methylnaphthalene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Methylphenol (o-Cresol)</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Nitroaniline</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>2-Nitrophenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>3&amp;4-Methylphenol (p&amp;m-Cresol)</td>
<td>0.500U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>3,3-Dichlorobenzidine</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>3-Nitroaniline</td>
<td>0.250U</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>4-Bromophenyl-phenylether</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>4-Chloro-3-methylphenol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>4-Chloroaniline</td>
<td>0.250U</td>
<td>0.500</td>
<td>0.150</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>4-Chlorophenyl-phenylether</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>4-Nitroaniline</td>
<td>1.50U</td>
<td>3.00</td>
<td>0.940</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>4-Nitrophenol</td>
<td>0.500U</td>
<td>1.00</td>
<td>0.310</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Acenaphthene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Acenaphthylene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.0780</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Aniline</td>
<td>1.00U</td>
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<td>0.620</td>
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</tr>
<tr>
<td>Anthracene</td>
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<td>0.0780</td>
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<tr>
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<td>0.0780</td>
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<tr>
<td>Benzo(a)Anthracene</td>
<td>0.125U</td>
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<td>0.125U</td>
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<td>0.0780</td>
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<td>0.125U</td>
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<td>0.0780</td>
<td>mg/Kg</td>
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## Method Blank

**Blank ID:** MB for HBN 1713749 [XXX/33577]  
**Matrix:** Soil/Solid (dry weight)  
**Blank Lab ID:** 1277218  
**QC for Samples:**  
1153644001, 1153644002, 1153644003

### Results by SW8270D

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Benzo[g,h,i]pyrene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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<tr>
<td>Benzo[k]fluoranthene</td>
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<td>Benzyl alcohol</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Bis(2chloro1methylethyl)Ether</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
</tr>
<tr>
<td>Bis(2-Chloroethoxy)methane</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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<td>Bis(2-Chloroethyl)ether</td>
<td>0.125U</td>
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<td>mg/Kg</td>
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<td>bis(2-Ethylhexyl)phthalate</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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<td>mg/Kg</td>
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<td>0.078</td>
<td>mg/Kg</td>
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<tr>
<td>Dimethylphthalate</td>
<td>0.125U</td>
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<td>mg/Kg</td>
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<td>Di-n-butylphthalate</td>
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<td>mg/Kg</td>
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<td>Fluorene</td>
<td>0.125U</td>
<td>0.250</td>
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<td>0.125U</td>
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<td>Hexachlorobutadiene</td>
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<td>0.250</td>
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<td>mg/Kg</td>
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<tr>
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<td>0.125U</td>
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<td>mg/Kg</td>
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<tr>
<td>Nitrobenzene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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<tr>
<td>N-Nitrosodimethylamine</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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<tr>
<td>N-Nitroso-di-n-propylamine</td>
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<td>0.250</td>
<td>0.078</td>
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<tr>
<td>N-Nitrosodiphenylamine</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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<tr>
<td>Pentachlorophenol</td>
<td>1.00U</td>
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<td>0.620</td>
<td>mg/Kg</td>
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<tr>
<td>Phenanthrene</td>
<td>0.125U</td>
<td>0.250</td>
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<tr>
<td>Phenol</td>
<td>0.125U</td>
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<td>mg/Kg</td>
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<tr>
<td>Pyrene</td>
<td>0.125U</td>
<td>0.250</td>
<td>0.078</td>
<td>mg/Kg</td>
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</table>

### Surrogates

- 2,4,6-Tribromophenol (surr): 74.8 % 35-125 %
- 2-Fluorobiphenyl (surr): 58.2 % 45-105 %
- 2-Fluorophenol (surr): 50 % 35-105 %
### Method Blank

Blank ID: MB for HBN 1713749 [XXX/33577]
Blank Lab ID: 1277218

Matrix: Soil/Solid (dry weight)

QC for Samples:
1153644001, 1153644002, 1153644003

### Results by SW8270D

<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>Nitrobenzene-d5 (surr)</td>
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<td>35-100</td>
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<tr>
<td>Phenol-d6 (surr)</td>
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<td>40-100</td>
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<td>Terphenyl-d14 (surr)</td>
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### Batch Information

- Analytical Batch: XMS8781
- Analytical Method: SW8270D
- Instrument: HP 6890/5973 SSA
- Analyst: DSH
- Analytical Date/Time: 7/18/2015 2:14:00AM

- Prep Batch: XXX33577
- Prep Method: SW3550C
- Prep Date/Time: 7/16/2015 10:42:30AM
- Prep Initial Wt./Vol.: 22.5 g
- Prep Extract Vol: 1 mL

Print Date: 07/31/2015 3:32:06PM
## Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1153644 [XXX33577]

**Blank Spike Lab ID:** 1277219

**Date Analyzed:** 07/18/2015 03:05

**Matrix:** Soil/Solid (dry weight)

**QC for Samples:** 1153644001, 1153644002, 1153644003

### Results by SW8270D

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,4-Trichlorobenzene</td>
<td>4.44</td>
<td>2.22</td>
<td>50</td>
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<td>1,2-Dichlorobenzene</td>
<td>4.44</td>
<td>2.12</td>
<td>48</td>
<td>(45-100)</td>
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<td>1,3-Dichlorobenzene</td>
<td>4.44</td>
<td>2.08</td>
<td>47</td>
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<td>1,4-Dichlorobenzene</td>
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<td>2.12</td>
<td>48</td>
<td>(35-105)</td>
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<tr>
<td>1-Chloronaphthalene</td>
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<td>3.34</td>
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<td>2.52</td>
<td>57</td>
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<tr>
<td>2,4-Dimethylphenol</td>
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<td>2,4-Dinitrophenol</td>
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<td>2-Methylphenol (o-Cresol)</td>
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<td>2.51</td>
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<td>3&amp;4-Methylphenol (p&amp;m-Cresol)</td>
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</table>
## Blank Spike Summary

Blank Spike ID: LCS for HBN 1153644 [XXX33577]
Blank Spike Lab ID: 1277219
Date Analyzed: 07/18/2015 03:05

Matrix: Soil/Solid (dry weight)

QC for Samples: 1153644001, 1153644002, 1153644003

### Results by SW8270D

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<th>Parameter</th>
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<th>Result</th>
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<th>CL</th>
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<td>4.45</td>
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<td>Carbazole</td>
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<td>(45-115 )</td>
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<td>(55-110 )</td>
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<td>Di-n-butylphthalate</td>
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<td>(55-115 )</td>
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<td>4.36</td>
<td>98</td>
<td>(40-120 )</td>
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### Blank Spike Summary

**Blank Spike ID:** LCS for HBN 1153644 [XXX33577]  
**Blank Spike Lab ID:** 1277219  
**Date Analyzed:** 07/18/2015 03:05  

**Matrix:** Soil/Solid (dry weight)  
**QC for Samples:** 1153644001, 1153644002, 1153644003

### Results by SW8270D

#### Blank Spike (mg/Kg)

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<td>Pyrene</td>
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<td>93</td>
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#### Surrogates

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### Batch Information

- **Analytical Batch:** XMS8781  
- **Analytical Method:** SW8270D  
- **Instrument:** HP 6890/5973 SSA  
- **Analyst:** DSH  
- **Prep Batch:** XXX33577  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 07/16/2015 10:42  
- **Spike Init Wt./Vol.:** 4.44 mg/Kg  
- **Extract Vol.:** 1 mL  
- **Dupe Init Wt./Vol.:**  
- **Extract Vol.:**
## Matrix Spike Summary

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<td>07/18/2015 6:29</td>
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QC for Samples: 1153644001, 1153644002, 1153644003

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### Results by SW8270D

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<th>Result</th>
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<th>Spike</th>
<th>Result</th>
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<td>94</td>
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### Matrix Spike Summary

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<th>Result</th>
<th>Rec (%)</th>
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<th>Rec (%)</th>
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<th>RPD (%)</th>
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<td>1.00</td>
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<td>4.26</td>
<td>92</td>
<td>45-125</td>
<td>3.40</td>
<td>(&lt; 30 )</td>
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**Surrogates**

<table>
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<tr>
<th>Parameter</th>
<th>Result</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>2,4,6-Tribromophenol (surr)</td>
<td>9.25</td>
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<td>9.23</td>
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### Matrix Spike Summary

Original Sample ID: 1158247001  
MS Sample ID: 1277220 MS  
MSD Sample ID: 1277221 MSD  

QC for Samples: 1153644001, 1153644002, 1153644003

Analysis Date: 07/18/2015 6:29  
Analysis Date: 07/18/2015 6:46  

Matrix: Soil/Solid (dry weight)

---

### Results by SW8270D

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<tr>
<th>Parameter</th>
<th>Sample</th>
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<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>2-Fluorobiphenyl (surr)</td>
<td>4.62</td>
<td>3.52</td>
<td>76</td>
<td>4.61</td>
<td>3.29</td>
<td>71</td>
<td>45-105</td>
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<td>6.60</td>
<td></td>
</tr>
<tr>
<td>2-Fluorophenol (surr)</td>
<td>9.25</td>
<td>5.40</td>
<td>58</td>
<td>9.23</td>
<td>4.98</td>
<td>54</td>
<td>35-105</td>
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<td>8.10</td>
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<td>Nitrobenzene-d5 (surr)</td>
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### Batch Information

Analytical Batch: XMS8781  
Analytical Method: SW8270D  
Instrument: HP 6890/5973 SSA  
Analyst: DSH  
Analytical Date/Time: 7/18/2015 6:29:00AM

Prep Batch: XXX33577  
Prep Method: Sonication Extraction Soil SW8270  
Prep Date/Time: 7/16/2015 10:42:30AM  
Prep Initial Wt./Vol.: 22.66g  
Prep Extract Vol: 1.00mL
### Method Blank

Blank ID: MB for HBN 1713770 [XXX/33581]  
Blank Lab ID: 1277309  
QC for Samples: 1153644003  
Matrix: Soil/Solid (dry weight)

### Results by SW8082A

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<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
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<tbody>
<tr>
<td>Aroclor-1016</td>
<td>25.0U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
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<tr>
<td>Aroclor-1221</td>
<td>25.0U</td>
<td>50.0</td>
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<td>ug/Kg</td>
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<tr>
<td>Aroclor-1232</td>
<td>25.0U</td>
<td>50.0</td>
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<td>ug/Kg</td>
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<td>Aroclor-1242</td>
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<td>ug/Kg</td>
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<tr>
<td>Aroclor-1248</td>
<td>25.0U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Aroclor-1254</td>
<td>25.0U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
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<td>Aroclor-1260</td>
<td>25.0U</td>
<td>50.0</td>
<td>15.0</td>
<td>ug/Kg</td>
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**Surrogates**

<table>
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<th>Units</th>
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<td>Decachlorobiphenyl (surr)</td>
<td>114</td>
<td>60-125</td>
<td>%</td>
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### Batch Information

- **Analytical Batch:** XGC9048  
- **Analytical Method:** SW8082A  
- **Instrument:** HP 6890 Series II ECD SV H F  
- **Analyst:** NLL  
- **Analytical Date/Time:** 7/17/2015  2:51:00AM

- **Prep Batch:** XXX33581  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 7/16/2015  2:08:00PM  
- **Prep Initial Wt./Vol.:** 22.5 g  
- **Prep Extract Vol.:** 5 mL

Print Date: 07/31/2015  3:32:09PM
## Blank Spike Summary

Blank Spike ID: LCS for HBN 1153644 [XXX33581]  
Blank Spike Lab ID: 1277310  
Date Analyzed: 07/17/2015 03:03  
QC for Samples: 1153644003  
Matrix: Soil/Solid (dry weight)

### Results by SW8082A

<table>
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<th>Result</th>
<th>Rec (%)</th>
<th>CL (range)</th>
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<tbody>
<tr>
<td>Aroclor-1016</td>
<td>222</td>
<td>202</td>
<td>91</td>
<td>(47-134)</td>
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<tr>
<td>Aroclor-1260</td>
<td>222</td>
<td>258</td>
<td>116</td>
<td>(53-140)</td>
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### Surrogates

<table>
<thead>
<tr>
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<th>Result</th>
<th>Rec (%)</th>
<th>CL (range)</th>
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<tbody>
<tr>
<td>Decachlorobiphenyl (surr)</td>
<td>222</td>
<td>114</td>
<td>114</td>
<td>(60-125)</td>
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### Batch Information

- **Analytical Batch:** XGC9048  
- **Analytical Method:** SW8082A  
- **Instrument:** HP 6890 Series II ECD SV H F  
- **Analyst:** NLL  
- **Prep Batch:** XXX33581  
- **Prep Method:** SW3550C  
- **Prep Date/Time:** 07/16/2015 14:08  
- **Spike Init Wt./Vol.:** 222 ug/Kg  
- **Extract Vol.:** 5 mL  
- **Dupe Init Wt./Vol.:**  
- **Extract Vol.:**
### Matrix Spike Summary

- **Original Sample ID:** 1153644003  
  - **Analysis Date:** 07/17/2015 3:52
- **MS Sample ID:** 1277311 MS  
  - **Analysis Date:** 07/17/2015 4:29
- **MSD Sample ID:** 1277312 MSD  
  - **Analysis Date:** 07/17/2015 5:05
- **Matrix:** Soil/Solid (dry weight)
- **QC for Samples:** 1153644003

### Results by SW8082A

#### Parameter

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<tr>
<th>Parameter</th>
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<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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<td>Aroclor-1016</td>
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<td>489</td>
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<td>Aroclor-1260</td>
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<td>371</td>
<td>124</td>
<td>53-140</td>
<td>8.31</td>
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#### Surrogates

- **Decachlorobiphenyl (surr)**  
  - Sample: 298  
  - Result: 309  
  - Rec (%): 104  
  - Spike: 298  
  - Result: 323  
  - Rec (%): 108  
  - CL: 60-125  
  - RPD ( %) : 3.96

### Batch Information

- **Analytical Batch:** XGC9048  
  - **Prep Batch:** XXX33581
- **Analytical Method:** SW8082A  
  - **Prep Method:** Sonication Extraction Soil SW8080 PCB
- **Instrument:** HP 6890 Series II ECD SV H F  
  - **Prep Date/Time:** 7/16/2015 2:08:00PM
- **Analyst:** NLL  
  - **Prep Initial Wt./Vol.:** 22.87g
- **Analytical Date/Time:** 7/17/2015 4:29:00AM  
  - **Prep Extract Vol:** 5.00mL

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Print Date: 07/31/2015 3:32:11PM
Method Blank

Blank Lab ID: 1277434
QC for Samples:
1153644001, 1153644002

Results by SW8082A

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<th>Results</th>
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<th>DL</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
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<td>25.0U</td>
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<td>ug/Kg</td>
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<td>Aroclor-1232</td>
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<td>25.0U</td>
<td>50.0</td>
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<td>ug/Kg</td>
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Surrogates

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>Units</th>
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<tbody>
<tr>
<td>Decachlorobiphenyl (surr)</td>
<td>113</td>
<td>60-125</td>
<td>%</td>
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Batch Information

Analytical Batch: XGC9048
Analytical Method: SW8082A
Instrument: HP 6890 Series II ECD SV H F
Analyst: NLL
Analytical Date/Time: 7/17/2015 3:28:00PM

Prep Batch: XXX33584
Prep Method: SW3550C
Prep Date/Time: 7/17/2015 9:40:00AM
Prep Initial Wt./Vol.: 22.5 g
Prep Extract Vol: 5 mL
**Blank Spike Summary**

Blank Spike ID: LCS for HBN 1153644 [XXX33584]
Blank Spike Lab ID: 1277435
Date Analyzed: 07/17/2015 15:41

Matrix: Soil/Solid (dry weight)

QC for Samples: 1153644001, 1153644002

Results by **SW8082A**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aroclor-1016</td>
<td>222</td>
<td>147</td>
<td>66</td>
<td>(47-134)</td>
</tr>
<tr>
<td>Aroclor-1260</td>
<td>222</td>
<td>251</td>
<td>113</td>
<td>(53-140)</td>
</tr>
</tbody>
</table>

**Surrogates**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decachlorobiphenyl (surr)</td>
<td>222</td>
<td>115</td>
<td>115</td>
<td>(60-125)</td>
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</tbody>
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**Batch Information**

Analytical Batch: XGC9048
Analytical Method: SW8082A
Instrument: HP 6890 Series II ECD SV H F
Analyst: NLL

Prep Batch: XXX33584
Prep Method: SW3550C
Prep Date/Time: 07/17/2015 09:40
Spike Init Wt./Vol.: 222 ug/Kg
Extract Vol.: 5 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>
<th>RPD CL</th>
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</thead>
<tbody>
<tr>
<td>Aroclor-1016</td>
<td>26.9U</td>
<td>240</td>
<td>264</td>
<td>110</td>
<td>240</td>
<td>223</td>
<td>93</td>
<td>47-134</td>
<td>16.70</td>
<td>(&lt; 30 )</td>
</tr>
<tr>
<td>Aroclor-1260</td>
<td>26.9U</td>
<td>240</td>
<td>267</td>
<td>111</td>
<td>240</td>
<td>252</td>
<td>105</td>
<td>53-140</td>
<td>5.54</td>
<td>(&lt; 30 )</td>
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**Surrogates**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decachlorobiphenyl (surr)</td>
<td>240</td>
<td>271</td>
<td>113</td>
</tr>
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</table>

**Batch Information**

- Analytical Batch: XGC9049
- Analytical Method: SW8082A
- Instrument: HP 6890 Series II ECD SV H F
- Analyst: NLL
- Analytical Date/Time: 7/17/2015 5:23:00PM
- Prep Batch: XXX33584
- Prep Method: Sonication Extraction Soil SW8080 PCB
- Prep Date/Time: 7/17/2015 9:40:05AM
- Prep Initial Wt./Vol.: 22.66g
- Prep Extract Vol: 5.00mL

Print Date: 07/31/2015 3:32:14PM
**Method Blank**

Blank ID: MB for HBN 1713998 [XXX/33602]  
Blank Lab ID: 1277859  
Matrix: Soil/Solid (dry weight)

QC for Samples:  
1153644001, 1153644002, 1153644003

**Results by 8270D SIMS (PEST)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Results</th>
<th>LOQ/CL</th>
<th>DL</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,4'-DDD</td>
<td>2.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Aldrin</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>alpha-BHC</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>beta-BHC</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>delta-BHC</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Endosulfan I</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Endosulfan sulfate</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Endrin</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Endrin aldehyde</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Endrin ketone</td>
<td>2.50U</td>
<td>5.00</td>
<td>1.50</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>gamma-BHC (Lindane)</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Heptachlor epoxide</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>0.750U</td>
<td>1.50</td>
<td>0.470</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>1.00U</td>
<td>2.00</td>
<td>0.620</td>
<td>ug/Kg</td>
</tr>
<tr>
<td>Toxaphene</td>
<td>50.0U</td>
<td>100</td>
<td>31.0</td>
<td>ug/Kg</td>
</tr>
</tbody>
</table>

**Surrogates**

- 2-Fluorobiphenyl (surr) 66.3 46-115 %
- Terphenyl-d14 (surr) 82.8 58-113 %

**Batch Information**

- Analytical Batch: XMS8803
- Analytical Method: 8270D SIMS (PEST)
- Instrument: HP 6890 Series II MS2 SVOA
- Analyst: SP
- Analytical Date/Time: 7/28/2015 4:22:00PM

- Prep Batch: XXX33602
- Prep Method: SW3550C
- Prep Date/Time: 7/19/2015 1:59:25PM
- Prep Initial WT/Vol.: 22.5 g
- Prep Extract Vol: 1 mL

Print Date: 07/31/2015 3:32:15PM

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## Blank Spike Summary

Blank Spike ID: LCS for HBN 1153644 [XXX33602]
Blank Spike Lab ID: 1277860
Date Analyzed: 07/28/2015 17:28

Matrix: Soil/Solid (dry weight)

QC for Samples: 1153644001, 1153644002, 1153644003

### Results by 8270D SIMS (PEST)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>4,4'-DDD</td>
<td>11.1</td>
<td>10.7</td>
<td>96</td>
<td>(56-139)</td>
</tr>
<tr>
<td>4,4'-DDE</td>
<td>11.1</td>
<td>11.1</td>
<td>100</td>
<td>(56-134)</td>
</tr>
<tr>
<td>4,4'-DDT</td>
<td>11.1</td>
<td>13.1</td>
<td>118</td>
<td>(50-141)</td>
</tr>
<tr>
<td>Aldrin</td>
<td>11.1</td>
<td>10.6</td>
<td>95</td>
<td>(45-136)</td>
</tr>
<tr>
<td>alpha-BHC</td>
<td>11.1</td>
<td>9.87</td>
<td>89</td>
<td>(45-137)</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>11.1</td>
<td>11.2</td>
<td>101</td>
<td>(54-133)</td>
</tr>
<tr>
<td>beta-BHC</td>
<td>11.1</td>
<td>11.8</td>
<td>107</td>
<td>(50-136)</td>
</tr>
<tr>
<td>delta-BHC</td>
<td>11.1</td>
<td>11.9</td>
<td>107</td>
<td>(47-139)</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>11.1</td>
<td>10.7</td>
<td>97</td>
<td>(56-136)</td>
</tr>
<tr>
<td>Endosulfan I</td>
<td>11.1</td>
<td>11.3</td>
<td>101</td>
<td>(53-132)</td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>11.1</td>
<td>11.6</td>
<td>104</td>
<td>(53-134)</td>
</tr>
<tr>
<td>Endosulfan sulfate</td>
<td>11.1</td>
<td>11.9</td>
<td>107</td>
<td>(55-136)</td>
</tr>
<tr>
<td>Endrin</td>
<td>11.1</td>
<td>13.7</td>
<td>123</td>
<td>(57-140)</td>
</tr>
<tr>
<td>Endrin aldehyde</td>
<td>11.1</td>
<td>9.84</td>
<td>89</td>
<td>(35-137)</td>
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<tr>
<td>Endrin ketone</td>
<td>11.1</td>
<td>11.8</td>
<td>106</td>
<td>(55-136)</td>
</tr>
<tr>
<td>gamma-BHC (Lindane)</td>
<td>11.1</td>
<td>10.8</td>
<td>97</td>
<td>(49-135)</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>11.1</td>
<td>11.3</td>
<td>101</td>
<td>(47-136)</td>
</tr>
<tr>
<td>Heptachlor epoxide</td>
<td>11.1</td>
<td>11.4</td>
<td>103</td>
<td>(52-136)</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>11.1</td>
<td>11.3</td>
<td>101</td>
<td>(53-135)</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>11.1</td>
<td>13.5</td>
<td>122</td>
<td>(52-143)</td>
</tr>
</tbody>
</table>

**Surrogates**

<table>
<thead>
<tr>
<th>Surrogate</th>
<th>Spike</th>
<th>Result</th>
<th>Rec (%)</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-Fluorobiphenyl (surr)</td>
<td>22.2</td>
<td>67.6</td>
<td>68</td>
<td>(46-115)</td>
</tr>
<tr>
<td>Terphenyl-d14 (surr)</td>
<td>22.2</td>
<td>81.8</td>
<td>82</td>
<td>(58-113)</td>
</tr>
</tbody>
</table>

### Batch Information

- **Analytical Batch**: XMS8803
- **Analytical Method**: 8270D SIMS (PEST)
- **Instrument**: HP 6890 Series II MS2 SVOA
- **Analyst**: SP
- **Prep Batch**: XXX33602
- **Prep Method**: SW3550C
- **Prep Date/Time**: 07/19/2015 13:59
- **Spike Init Wt./Vol.**: 11.1 ug/Kg
- **Extract Vol.**: 1 mL
- **Dupe Init Wt./Vol.**: Extract Vol.
### Results by 8270D SIMS (PEST)

#### Matrix Spike Summary

- **Original Sample ID:** 1153644003
- **MS Sample ID:** 1277862 MS
- **MSD Sample ID:** 1277863 MSD
- **Analysis Date:** 07/28/2015 19:40
- **Analysis Date:** 07/28/2015 19:56
- **Analysis Date:** 07/28/2015 20:13
- **Matrix:** Soil/Solid (dry weight)
- **QC for Samples:** 1153644001, 1153644002, 1153644003

#### Matrix Spike (ug/Kg) vs Spike Duplicate (ug/Kg)

<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>4,4'-DDD</td>
<td>6.80U</td>
<td>15.0</td>
<td>18.8</td>
<td>125</td>
<td>15.0</td>
<td>18.1</td>
<td>121</td>
<td>56-139</td>
<td>3.60</td>
<td>(&lt; 20 )</td>
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<tr>
<td>4,4'-DDE</td>
<td>6.80U</td>
<td>15.0</td>
<td>17.0</td>
<td>113</td>
<td>15.0</td>
<td>16.6</td>
<td>111</td>
<td>56-134</td>
<td>2.90</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
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<td>6.80U</td>
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<td>6.80U</td>
<td>0</td>
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<td>15.0</td>
<td>6.80U</td>
<td>0</td>
<td>50-141</td>
<td>0.00</td>
</tr>
<tr>
<td>Aldrin</td>
<td>5.10U</td>
<td>15.0</td>
<td>16.2</td>
<td>108</td>
<td>15.0</td>
<td>35.1</td>
<td>235</td>
<td>45-136</td>
<td>73.50</td>
<td>(&lt; 20 )</td>
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<tr>
<td>alpha-BHC</td>
<td>5.10U</td>
<td>15.0</td>
<td>17.6</td>
<td>117</td>
<td>15.0</td>
<td>19.2</td>
<td>129</td>
<td>45-137</td>
<td>9.00</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>alpha-Chlordane</td>
<td>5.10U</td>
<td>15.0</td>
<td>15.5</td>
<td>103</td>
<td>15.0</td>
<td>15.5</td>
<td>104</td>
<td>54-133</td>
<td>0.38</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>beta-BHC</td>
<td>5.10U</td>
<td>15.0</td>
<td>15.7</td>
<td>104</td>
<td>15.0</td>
<td>15.4</td>
<td>103</td>
<td>50-136</td>
<td>2.00</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>delta-BHC</td>
<td>5.10U</td>
<td>15.0</td>
<td>16.6</td>
<td>111</td>
<td>15.0</td>
<td>15.7</td>
<td>105</td>
<td>47-139</td>
<td>6.10</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Dieldrin</td>
<td>6.80U</td>
<td>15.0</td>
<td>26.2</td>
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<td>15.0</td>
<td>71.8</td>
<td>481</td>
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<td>56-136</td>
</tr>
<tr>
<td>Endosulfan I</td>
<td>5.10U</td>
<td>15.0</td>
<td>16.5</td>
<td>110</td>
<td>15.0</td>
<td>14.3</td>
<td>95</td>
<td>53-132</td>
<td>14.80</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Endosulfan II</td>
<td>6.80U</td>
<td>15.0</td>
<td>23.6</td>
<td>157</td>
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<td>15.0</td>
<td>19.3</td>
<td>129</td>
<td>53-134</td>
<td>20.00</td>
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<tr>
<td>Endosulfan sulfate</td>
<td>6.80U</td>
<td>15.0</td>
<td>16.5</td>
<td>109</td>
<td>15.0</td>
<td>17.6</td>
<td>117</td>
<td>55-136</td>
<td>6.30</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Endrin</td>
<td>6.80U</td>
<td>15.0</td>
<td>13.9</td>
<td>93</td>
<td>15.0</td>
<td>11.1J</td>
<td>74</td>
<td>57-140</td>
<td>22.50</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Endrin aldehyde</td>
<td>6.80U</td>
<td>15.0</td>
<td>12.7J</td>
<td>84</td>
<td>15.0</td>
<td>12.8J</td>
<td>86</td>
<td>35-137</td>
<td>0.92</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Endrin ketone</td>
<td>17.0U</td>
<td>15.0</td>
<td>17.0U</td>
<td>82</td>
<td>15.0</td>
<td>17.0U</td>
<td>0</td>
<td>*</td>
<td>55-136</td>
<td>0.00</td>
</tr>
<tr>
<td>gamma-BHC (Lindane)</td>
<td>5.10U</td>
<td>15.0</td>
<td>12.3</td>
<td>82</td>
<td>15.0</td>
<td>10.5</td>
<td>71</td>
<td>49-135</td>
<td>15.00</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>gamma-Chlordane</td>
<td>5.10U</td>
<td>15.0</td>
<td>15.9</td>
<td>106</td>
<td>15.0</td>
<td>15.5</td>
<td>104</td>
<td>53-135</td>
<td>2.00</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Heptachlor</td>
<td>6.80U</td>
<td>15.0</td>
<td>9.86J</td>
<td>66</td>
<td>15.0</td>
<td>9.82J</td>
<td>66</td>
<td>47-136</td>
<td>0.46</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Heptachlor epoxide</td>
<td>6.80U</td>
<td>15.0</td>
<td>14.9</td>
<td>99</td>
<td>15.0</td>
<td>15.4</td>
<td>103</td>
<td>52-136</td>
<td>3.20</td>
<td>(&lt; 20 )</td>
</tr>
<tr>
<td>Methoxychlor</td>
<td>6.80U</td>
<td>15.0</td>
<td>6.80U</td>
<td>0</td>
<td>*</td>
<td>15.0</td>
<td>6.80U</td>
<td>0</td>
<td>52-143</td>
<td>0.00</td>
</tr>
</tbody>
</table>

#### Surrogates

- **2-Fluorobiphenyl (surr):**
  - Sample: 30.1
  - Spike: 25.6
  - Result: 85
  - 29.8
  - 25.3
  - 85
  - 46-115: 0.79

- **Terphenyl-d14 (surr):**
  - Sample: 30.1
  - Spike: 27.4
  - Result: 91
  - 29.8
  - 27.5
  - 92
  - 58-113: 0.69

### Batch Information

- **Analytical Batch:** XMS8803
- **Analytical Method:** 8270D SIMS (PEST)
- **Instrument:** HP 6890 Series II MS2 SVOA
- **Prep Batch:** XXX33602
- **Prep Method:** Sonication Extraction Soil Pesticides 82
- **Prep Date/Time:** 7/19/2015 1:59:25PM
- **Prep Initial Wt./Vol.:** 22.65g
- **Prep Extract Vol:** 1.00mL

Print Date: 07/31/2015 3:32:17PM

SGS North America Inc. 200 West Potter Drive Anchorage, AK 95518

Member of SGS Group
# ODY RECORD

## Analysis Parameters/Sample Container Description

(include preservative if used)

<table>
<thead>
<tr>
<th>Comp.</th>
<th>GRO</th>
<th>AER</th>
<th>NAP</th>
<th>VOCs</th>
<th>2,4,5T</th>
<th>2,3,7,8P</th>
<th>PCBs</th>
<th>Chlorinated</th>
<th>Metals</th>
<th>Sediment</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>X</strong></td>
<td><strong>X</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>X</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td><strong>X</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>3</strong></td>
</tr>
</tbody>
</table>

### Remarks/Matrix
- Sediment
- Trip Blank

## Project Information

<table>
<thead>
<tr>
<th>Project Number</th>
<th>Total Number of Containers</th>
</tr>
</thead>
<tbody>
<tr>
<td>32-1-02472</td>
<td></td>
</tr>
</tbody>
</table>

### Sample Receipt

- **Received By:** 1.  
  - Signature: 
  - Printed Name: Katie Nolan  
  - Date: 7/14/15  
  - Time: 10:45

- **Received By:** 2.  
  - Signature: 
  - Printed Name: Katie Nolan  
  - Date: 7/14/15  
  - Time: 10:45

- **Received By:** 3.  
  - Signature: 
  - Printed Name: Katie Nolan  
  - Date: 7/14/15  
  - Time: 10:45

### Instructions

- Requested Turnaround Time: Standard
- Special Instructions: Level II Deliverables

### Distribution

- White - wish shipment - returned to Shannon & Wilson w/ laboratory report
- Yellow - wish shipment - for consignee files
- Pink - Shannon & Wilson - Job File

---

**F-19-91/UR**

---

**NOCustody**  
**Serv No:** 30352  
**WMM:** 7/14/15
<table>
<thead>
<tr>
<th>Sample Container ID</th>
<th>Matrix</th>
<th>%</th>
<th>Is sufficient volume/mass available?</th>
<th>Notes:</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Xylene miscible (Top layer * = matrix 3 **)</td>
<td>50%</td>
<td>Yes / No</td>
<td>If multiple jars were received, were they consistent? Yes / No / NA</td>
</tr>
<tr>
<td></td>
<td>Water miscible (Middle layer = matrix 6)</td>
<td>40%</td>
<td>Yes / No</td>
<td>If biphasic, was there only one layer with sufficient sample? Yes / No / NA</td>
</tr>
<tr>
<td></td>
<td>Solid (Bottom layer = matrix 7 or 2 if % solids required)</td>
<td>90%</td>
<td>Yes / No</td>
<td>Sample description/other observations: small water layer on top of soil layer.</td>
</tr>
<tr>
<td>S2</td>
<td>Xylene miscible (Top layer * = matrix 3 **)</td>
<td>50%</td>
<td>Yes / No</td>
<td>If multiple jars were received, were they consistent? Yes / No / NA</td>
</tr>
<tr>
<td></td>
<td>Water miscible (Middle layer = matrix 6)</td>
<td>40%</td>
<td>Yes / No</td>
<td>If biphasic, was there only one layer with sufficient sample? Yes / No / NA</td>
</tr>
<tr>
<td></td>
<td>Solid (Bottom layer = matrix 7 or 2 if % solids required)</td>
<td>100%</td>
<td>Yes / No</td>
<td>Sample description/other observations: soil w/ rocks</td>
</tr>
<tr>
<td>S3</td>
<td>Xylene miscible (Top layer * = matrix 3 **)</td>
<td>50%</td>
<td>Yes / No</td>
<td>If multiple jars were received, were they consistent? Yes / No / NA</td>
</tr>
<tr>
<td></td>
<td>Water miscible (Middle layer = matrix 6)</td>
<td>40%</td>
<td>Yes / No</td>
<td>If biphasic, was there only one layer with sufficient sample? Yes / No / NA</td>
</tr>
<tr>
<td></td>
<td>Solid (Bottom layer = matrix 7 or 2 if % solids required)</td>
<td>100%</td>
<td>Yes / No</td>
<td>Sample description/other observations: soil clay-like appearance</td>
</tr>
</tbody>
</table>

Remember: * = Chlorinated oils will be heavier than water and present as the bottom later. 
** = Oils must be filterable to be logged in as matrix 3. Nonfilterable oils must be logged in as matrix 7. 
*** = Refer to F078 'Characterization of TCLP Samples for LIMS' to determine if there's sufficient volume/mass.
## 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>Yes  ✔</td>
<td></td>
<td></td>
<td></td>
<td>Exemption permitted if sampler hand carries/delivers.</td>
</tr>
</tbody>
</table>

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

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

**Cooler ID:**
- 1 @ 5.3 w/ Therm.ID: 200
- 2 @ w/ Therm.ID:
- 3 @ w/ Therm.ID:
- 4 @ w/ Therm.ID:
- 5 @ w/ Therm.ID:

If samples are 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.”

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

- **Client (hand carried)**
- **USPS**
- **Lydden**
- **AK Air**
- **Alert Courier**
- **UPS**
- **FedEx**
- **RAVN**
- **C&D Delivery**
- **Carlile**
- **Pen Air**
- **Warp Speed**
- **Other:**

   - For WO# with airbills, was the WO# & airbill info recorded in the Front Counter eLog?

### Were samples received within hold time?

- Yes
- N/A
- No

### Do samples match COC* (i.e., sample IDs, dates/times collected)?

- Yes
- N/A
- No

### Were samples requested unambiguous?

- Yes
- N/A
- No

### Were samples in good condition (no leaks/cracks/breakage)?

- Yes
- N/A
- No

### Packing material used (specify all that apply):

- Bubble Wrap
- Separate plastic bags
- Vermiculite
- Other

### Were proper containers (type/mass/volume/preservative*) used?

- Yes
- N/A
- No

- **Trip Blanks** (i.e., VOAs, LL-Hg) in cooler with samples?

- Yes
- N/A
- No

- Were all VOAs free of headspace (i.e., bubbles ≤6 mm)?

- Yes
- N/A
- No

- Were all soil VOAs field extracted with MeOH+BFB?

- Yes
- N/A
- No

### For preserved waters (other than VOAs, LL-Mercury or microbiological analyses), was pH verified and compliant?

- Yes
- N/A
- No

- If pH was adjusted, were bottles flagged (i.e., stickers)?

- Yes
- N/A
- No

### 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)?

- Yes
- N/A
- No

### For RUSH/SHORT Hold Time, were COC/Bottles flagged accordingly? Was Rush/Short HT email sent, if applicable?

- Yes
- N/A
- No

### For SITE-SPECIFIC QC, e.g., BMS/BMSD/BDUP, were containers / paperwork flagged accordingly?

- Yes
- N/A
- No

### For any question answered “No,” has the PM been notified and the problem resolved (or paperwork put in their bin)?

- Yes
- N/A
- No

### SRF Completed by: KMW 7/14/15

### PM notified:

### Peer Reviewed by:

**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>
<th>Container Id</th>
<th>Preservative</th>
<th>Container Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1153644001-A</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1153644001-B</td>
<td>Methanol field pres. 4 C</td>
<td>OK</td>
</tr>
<tr>
<td>1153644002-A</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1153644002-B</td>
<td>Methanol field pres. 4 C</td>
<td>OK</td>
</tr>
<tr>
<td>1153644003-A</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1153644004-A</td>
<td>Methanol field pres. 4 C</td>
<td>OK</td>
</tr>
<tr>
<td>1153644005-A</td>
<td>No Preservative Required</td>
<td>OK</td>
<td>1153644006-A</td>
<td>No Preservative Required</td>
<td>OK</td>
</tr>
<tr>
<td>1153644007-A</td>
<td>No Preservative Required</td>
<td>OK</td>
<td></td>
<td></td>
<td></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.
- **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.
- **BU** - The container was received with headspace greater than 6mm.

*7/14/2015*
Important Information About Your Geotechnical/Environmental Report

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors, which were considered in the development of the report, have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.
A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

Page 2 of 2

3/2004
# Project: Eklutna River Lower Dam Removal
## Subject: Toxicity Table

### Background

**Computed by:** Reeves, Molly  **Date:** 8/26/2015  
**Checked by:** J. Miller  **Date:** 09/8/2015

**File:** c:\pwwork\sea\d1522492\Eklutna Sediment Toxicity Table.xlsx

## Toxicity Table

<table>
<thead>
<tr>
<th>Element</th>
<th>Cr (mg/kg)</th>
<th>Cr III (mg/kg)</th>
<th>As (mg/kg)</th>
<th>Ba (mg/kg)</th>
<th>Cd (mg/kg)</th>
<th>Pb (mg/kg)</th>
<th>Hg (mg/kg)</th>
<th>Se (mg/kg)</th>
<th>Ag (mg/kg)</th>
<th>GRO (mg/kg)</th>
<th>DRO (mg/kg)</th>
<th>RRO (mg/kg)</th>
<th>VOCs (mg/kg)</th>
<th>SVOCs (mg/kg)</th>
<th>Pesticides (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eklutna Dam Background Sediment Concentrations</td>
<td>34.9-78.9</td>
<td>4.58-5.7</td>
<td>27.7-44.2</td>
<td>ND-0.0783</td>
<td>3.99-4.82</td>
<td>0.0653-0.10</td>
<td>ND</td>
<td>ND</td>
<td>-</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
</tr>
<tr>
<td>Eklutna Dam Sediment Concentrations</td>
<td>44-66 nm</td>
<td>50-1000</td>
<td>3900</td>
<td>90-2000</td>
<td>2000</td>
<td>None</td>
<td>50-1000</td>
<td>3530</td>
<td>90-2000</td>
<td>35300</td>
<td>91300</td>
<td>486</td>
<td>500</td>
<td>596</td>
<td>3530</td>
</tr>
</tbody>
</table>

**Sources:**
- EPA Ecotox thresholds for Superfund Sites: [USEPA](http://www.epa.gov/osw/er/riskassessment/ecotox.htm)
- USACE Freshwater benthic toxicity screening levels: [Interim Final Northwest Regional Sediment Evaluation Framework (WA, OR)](http://www.nwp.usace.army.mil/Missions/Environment/DMM.aspx)
- EPA Hazardous Waste Regulated Level: [EPA](http://www.epa.gov/osw/hazard/tclp.htm)

**Notes:**
- **PEL** = Probable Effect Concentration (above which harmful effects are likely to be observed)
- **TEL** = Threshold Effects Level (below which harmful effects are unlikely to be observed)
- **ERL** = Effects Range Low Value
- **TEL** = Threshold Effects Level
- **PEL** = Probable Effects Level
- **SCO** = Sed Cleanup Objectives - State sediment goal for protection of benthic organisms
- **CSL** = Cleanup Screening Level - Exceedance triggers TCP coordination, may identify cleanup site for protection of benthic organisms

**Table:**

<table>
<thead>
<tr>
<th>TCP 7 results</th>
<th>Old Eklutna Dam Sediment Sampling Concentrations (mg/L)</th>
<th>EPA Hazardous Waste Regulated level (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>2</td>
<td>0.001</td>
<td>0.001</td>
</tr>
<tr>
<td>3</td>
<td>0.001</td>
<td>0.001</td>
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<tr>
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</table>