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Human Health and Ecological Evaluation for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins (U)

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EXECUTIVE SUMMARY

Confirmation sample results from the 488-1D Ash Basin and the Inlet Basins were evaluated to demonstrate successful ash removal. The results are used as evidence that the residual concentrations/activities in the remaining soil are below human health and ecological risk-based threshold levels for constituents typically found in ash.

The confirmation sample dataset for the 488-1D Ash Basin evaluation includes sample results from 16 locations within the basin's western interior, three locations from the basin's southern and western berms, and two locations from an area east of the 488-4D Ash Landfill (outside of the 488-1D Ash Basin). The samples were collected in accordance with the *Field Sampling Plan for the 488-1D Ash Basin (U).* Each of these 21 samples (total) was analyzed for 24 metals and 6 radionuclides. The confirmation sample results were evaluated to demonstrate that the ash has been successfully removed from the areas of excavation. With the exception of hexavalent chromium, the residual concentrations of all analytes met the pre-established cleanup criteria documented in the *Confirmation Sampling and Analysis Plan for Coal and/or Ash Removal at the Savannah River Site (U)* for unrestricted land use. The concentration of hexavalent chromium does not exceed the threshold level for an industrial use scenario. Therefore, land use controls to prevent unrestricted use (i.e., residential) will be implemented at the capped portion and the excavated western portion of the 488-1D Ash Basin and the area east of the 488-4D Ash Landfill.

Confirmation samples from the Inlet Basins were collected in accordance with the *Field Sampling Plan for the D-Area Inlet Basins (U).* The Inlet Basins dataset is comprised of samples from four locations from within each of the two basins for a total of eight confirmation samples. The residual concentrations of all analytes met the pre-established cleanup criteria for unrestricted land use. The Inlet Basins will be graded, contoured and appropriately sloped to direct storm water to the D-Area Discharge Canal.

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LIST OF ABREVIATIONS AND ACRONYMS

<. ≤	less than, less than or equal to
>, ≥	greater than, greater than or equal to
BAL	Brooks Applied Laboratories
COC	constituent of concern
COPC	constituent of potential concern
DL	detection limit
ECO	ecological
FD	field duplicate
FSP	field sampling plan
GEL	General Engineering Laboratories
HH	human health
IC-ICP-MS	ion chromatography-inductively coupled plasma-mass spectrometry
LANL	Los Alamos National Laboratory
mg/kg	milligram per kilogram
ND	nondetect
pCi/g	picocuries per gram
PQL	practical quantization limit
PRG	preliminary remediation goal
QA	quality assurance
QC	quality control
RGO	remedial goal option
RSL	regional screening level
SAP	sampling and analysis plan
SRS	Savannah River Site
TL	threshold level
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
WSR	Wilcoxon Signed Rank
WSRC	Washington Savannah River Company LLC (October 2005-present)

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1.0 INTRODUCTION

The purpose of this document is to provide an evaluation of the confirmation sampling results from the 488-1D Ash Basin and Inlet Basins as a means of validation that the ash has been successfully removed. The confirmation sampling was conducted in accordance with the *Confirmation Sampling and Analysis Plan* (SAP) *for Coal and/or Ash Removal at the Savannah River Site* (SRS) *(U)* (SRNS 2014a), the *Field Sampling Plan* (FSP) *for the 488-1D Ash Basin (U)* (SRNS 2015), and the *Field Sampling Plan for the D-Area 488-1D Inlet Basins (U)* (SRNS 2014b).

Confirmation sample results provide evidence that the residual concentrations/activities in the remaining soil following ash excavation of selected hazardous/radioactive constituents commonly found in ash are below the human health (HH) risk-based threshold levels (TLs) identified in the Confirmation SAP document (SRNS 2014a). In addition, an ecological (ECO) assessment is presented in this evaluation. The analytical approach and acceptance criteria that are outlined in the Confirmation SAP document for the HH evaluation are also used for the ECO evaluation. This evaluation will be used to support the *Removal Action Report for the 488-1D Ash Basin and 489-D Coal Pile Runoff Basin* (SRNS 2019). A *Data Usability Report for Confirmation Sampling at the 488-1D Ash Basin and Inlet Basins* was generated upon completion of sampling activities and submitted in Appendix S of the Removal Action Report.

2.0 ANALYTICAL APPROACH

2.1 Human Health

The HH TLs established in the Confirmation SAP (SRNS 2014a) are presented in Table 1. For constituents of concern (COCs) that have a TL based on the residential United States Environmental Protection Agency (USEPA) Regional Screening Level (RSL) or Preliminary Remediation Goal (PRG), the excavation/removal activities are considered successful if the mean concentration/activity from the samples collected within the excavated zone is less than the HH TL concentration/activity. For constituents that have a HH TL based on the SRS background 95th percentile concentration/activity (i.e., arsenic, thallium, potassium-40, radium-226, radium-228,

thorium-228, and uranium-238), the excavation/removal activities are considered successful if the mean concentration/activity is less than the HH TL concentration/activity, *and* no individual sample result is greater than the maximum SRS background concentration/activity.

A review of the current set of RSL values (November 2018) and the HH TLs shown in Table 1, (which are based on the approved Confirmation SAP), shows that the more recent RSL values for arsenic, cadmium, hexavalent chromium and mercury are slightly higher (i.e., less conservative) than the values that were used in this evaluation. The minor differences in concentrations based on the most recent RSL updates are insignificant and do not change the conclusions of this document.

2.2 Ecological

The primary source for the ECO TLs used in this document is the Los Alamos National Laboratory (LANL) ECO Risk Database low-effects screening level for soil media (LANL 2015). A comparison of the risk-based screening values to the SRS background 95th percentile concentration is provided in Table 2. The ECO TL is identified as the screening value if it is greater than the SRS 95th percentile concentration. If the screening value is less than the SRS 95th percentile concentration, then the SRS background is identified as the ECO TL. The ECO TLs are presented in Table 2.

The same decision rule that was established for the HH evaluation is used for the ECO evaluation. For the constituents that have an ECO TL based on the risk-based screening value, the excavation/removal activities are considered successful if the mean concentration/activity from the samples collected within the excavated zone is less than the ECO TL concentration/activity. For the constituents that have an ECO TL based on the SRS background 95th percentile concentration (i.e., selenium, thallium, and vanadium), the excavation/removal activities are considered successful if the mean concentration is less than the ECO TL concentration, *and* no individual sample result is greater than the maximum SRS background concentration.

The LANL database identifies 68 mg/kg as the Low Effect Ecological Screening Level to be used in the data screening for arsenic. A more thorough review of the database identifies a value of

24 mg/kg that may be the more appropriate value to be used because it is a lower, more conservative threshold. However, the use of the 24 mg/kg as the ECO TL in place of the 68 mg/kg value (Table 2) would not change the ecological evaluation for arsenic since the maximum detected concentrations of arsenic in the 488-1D Ash Basin dataset and the Inlet Basins dataset are below this more conservative value.

2.3 Background

The *Background Soils Statistical Summary Report for the Savannah River Site (U)* (WSRC 2006) is a comprehensive soils data set based on information compiled from SRS Site-wide inorganic and radionuclide data. In 2005, both the USEPA and South Carolina Department of Health and Environmental Control agreed that it would be beneficial to develop an SRS Site-wide background data report consisting of data from approved environmental restoration projects. The sample location, sample collection, and laboratory analysis for the background data was previously approved under the Environmental Restoration Program. Consequently, there is a high level of confidence that the data are representative of SRS background soils and would be appropriate for initial screening of constituents of potential concern (COPCs), aid in the establishment of unit-related remedial goal options (RGOs), and in eliminating or reducing the need to collect waste unit-specific background data. The study presents summary statistics for the 0- to 1-ft and 0- to all-depth intervals of the vadose zone. Protocols have been developed to perform COPC screening and identify RGOs utilizing the approved soil background datasets as appropriate. The SRS background maximum and 95th percentile concentrations are shown in Table 3.

3.0 ACCEPTANCE CRITERIA

The USEPA software package *Statistical Software ProUCL 5.1 for Environmental Applications for Data Sets With and Without Nondetect Observations* (USEPA 2015) contains statistical methods that can be used to evaluate and address various environmental issues. Single sample hypothesis tests are useful when the environmental parameters such as the clean standard, TL, or compliance limits are known, and the objective is to compare site concentrations with these known threshold values. Specifically, a t-Test or a Wilcoxon Signed Rank (WSR) Test (for datasets with

nondetects) can be used to verify the attainment of cleanup levels within the area of contamination after removal activities.

The decision rule for this confirmation sampling is expressed as a statistical hypothesis test. To test the hypothesis that TLs are achieved following removal activities, the null hypothesis (H_0) of interest is established as follows: COC mean concentration/activity is less than or equal to the TL. The alternative hypothesis (H_A) would then be that the COC mean concentration/activity is greater than the TL. These are considered typical statements when the cleanup level has been pre-established. The statistical test for ash removal confirmation sampling is as follows:

Null hypothesis (H_0): COC mean concentration/activity $\leq$ threshold limit

Alternative hypothesis (H_A): COC mean concentration/activity > threshold limit

For H_A: COC mean concentration/activity > threshold limit, if

$t > t_{a(1),v}$, then reject H_0

where

a = 0.05 is the level of significance (i.e., 95% confidence level)

1 = one-tail t-Test

v = degrees of freedom = n-1, where n = number of sample results

With regard to the constituents that have a TL based on the SRS 95th percentile concentration/ activity, the SRS maximum background concentration/activity is established as the upper limit for any individual sample (i.e., no single sample result > SRS background maximum concentration/ activity).

Note: If the confirmation dataset has a large proportion of nondetects or the data distribution is indeterminate, then a nonparametric WSR test may be more appropriate than the t-Test to perform the hypothesis testing.

4.0 488-1D ASH BASIN DATA EVALUATION

This section summarizes the results of the evaluation for the 488-1D Ash Basin.

4.1 Data

The confirmation sampling data used in the 488-1D Ash Basin evaluation are provided in Appendix A. The requirement to collect a total of 19 samples (1 sample / acre, plus 3 berm samples) to demonstrate ash removal as outlined in the FSP (SRNS 2015). The samples were collected in a progressive fashion to allow construction activities to proceed. In addition, confirmation samples were collected on 12/15/16 at the east end of the 488-4D Ash Landfill at a rate of 1 sample / acre (total of 2 samples) per the FSP (SRNS 2015). These two samples were evaluated as part of the 488-1D Ash Basin confirmation sampling dataset; therefore, a total of 21 sample results were used in this evaluation.

Based on a screening evaluation of the preliminary sample results, areas with results that exceeded background-based TLs were re-excavated followed by collection of a new sample from that area. The area associated with sample grid 1DAB-14 that was collected on 11/30/17 required additional excavation and re-sampling due to an arsenic concentration (63.4 mg/kg) that was above the maximum SRS background concentration of 22.9 mg/kg. The arsenic concentration associated with the re-sampled result at 1DAB-14 (add) is 20.4 mg/kg (sample collected on 1/17/18). This evaluation considers only the final confirmation sample results from all stations, i.e., the results from the earlier sampling event associated with sample grid 1DAB-14 collected on 11/30/17 were not included in this assessment.

Figure 1 shows the final confirmation sampling locations within the 488-1D Ash Basin and Figure 2 shows the locations from outside the eastern end of the 488-4D Ash Landfill. The table below summarizes the confirmation sampling events presented in order of sample collection date.

Collection Date	FSP Grids (1DAB-xx)	Station Identification Number
12/15/16	FSP grids 1DAB-20, -21	DAC488-4D-9B-01, DAC488-4D-9B-02
9/7/17	FSP grids 1DAB-18, -19	488-1D-WE-CONF18, -19
11/8/17	FSP grids 1DAB -01, -02, -03, -04	488-1D-WE-CONF01, -02, -03, -04
11/16/17	FSP grids 1DAB -05, -06, -17	488-1D-WE-CONF05, -06, -17
11/30/17	FSP grids 1DAB -13, -14, -15, -16	488-1D-WE-CONF13, -14, -15, -16 (-14 not included in assessment; resampled on 1/17/18)

Collection Date	FSP Grids (1DAB-xx)	Station Identification Number
12/7/17	FSP grids 1DAB -08, -10, -11, -12	488-1D-WE-CONF08, -10, -11, -12
12/14/17	FSP grids 1DAB -07, -09	488-1D-WE-CONF07, -09
1/17/18	FSP grid 1DAB-14 (add)	488-1D-WE-CONF-20 is the resample of 488-1D-WE-CONF14

xx = sampling grid station number identified in FSP (SRNS 2015)

Quality Assurance/Quality Control (QA/QC) samples were also collected and analyzed in accordance with the Confirmation SAP (SRNS 2014a) and the FSP (SRNS 2015). These samples (e.g., field duplicates [FD], split samples, laboratory duplicates, etc.) are used to assess the precision, variability and comparability of the data. The *Data Usability Report for Confirmation Sampling at the 488-1D Ash Basin* will present the data verification, validation and usability assessment results for confirmation sampling for the project. Appendix A provides the FD results for samples taken at grids 1DAB-10 (488-1D-WE-CONF10) and 1DAB-21 (DAC488-4D-9B-02) for the 488-1D Ash Basin dataset.

4.2 Results

Table 4 is a comparison of the confirmation sampling maximum detected concentrations/ activities to the HH and ECO TLs for the 488-1D Ash Basin. If the maximum detected concentration/ activity is less than the TL, then formal statistical hypothesis testing is not necessary since the TL is based on mean concentration/activity (i.e., the mean will also be less than the TL). For the HH screening comparison, the maximum detected concentration/activity of the following constituents is greater than the TL (eight total): arsenic, hexavalent chromium, potassium-40, radium-226, radium-228, thorium-228, uranium-235 and uranium-238. For the ECO screening comparison, the maximum detected concentration of two constituents, mercury and vanadium, is greater than the TL.

4.2.1 Human Health

Formal statistical hypothesis testing using the Pro-upper confidence limit (UCL) software is required only for the constituents that the maximum detected concentration/activity exceeds the HH TL, i.e., arsenic, hexavalent chromium, potassium-40, radium-226, radium-228, thorium-228,

uranium-235 and uranium-238. Table 5 is a Summary of the Statistical Hypothesis Testing for HH for all constituents. The ProUCL input/output for this portion of the evaluation is provided in Appendix B. With the exception of hexavalent chromium, all constituents had the following output result indicating cleanup levels have been met (i.e., passing result):

Do not reject H_0; Conclude site mean $\leq$ TL

The statistical result for hexavalent chromium indicating that cleanup levels have not been met, *Reject H_0; Conclude site mean > TL*, is further addressed in Section 4.3.2 of this document.

For the constituents that have a TL based on the SRS 95th percentile concentration/activity, (i.e., arsenic, thallium, potassium-40, radium-226, radium-228, thorium-228, and uranium-238), a comparison of the maximum detected concentration/activity to the SRS maximum concentration/activity is presented in Table 6. The maximum detected concentration/activity of all seven of these constituents is less than the SRS maximum background value and therefore meet the acceptance criteria.

4.2.2 Ecological

The maximum detected concentrations of mercury and vanadium exceeds the ECO TL (Table 4). Table 7 is a Summary of the Statistical Hypothesis Testing for ECO for all constituents. The ProUCL output for this portion of the evaluation is provided in Appendix C. Both mercury and vanadium had the following output result, indicating cleanup levels have been met (i.e., passing result):

Do not reject H_0; Conclude site mean $\leq$ TL

For the constituents that have a TL based on the SRS 95th percentile concentration/activity, a comparison of the maximum detected concentration/activity to the SRS maximum concentration is presented in Table 6. The maximum detected concentration of selenium, thallium and vanadium are less than the SRS maximum background concentration and therefore meet the acceptance criteria.

4.3 Additional Evaluations

An additional evaluation is provided for uranium and hexavalent chromium.

4.3.1 Uranium

Uranium-233/234 (U-233/234) was not identified as a potential COC (with corresponding HH TLs) in the SAP (SRNS 2014a), but samples were analyzed for U-233/234 to perform isotopic comparisons to other analyzed uranium species (i.e., U-238). Uranium-238 (U-238), uranium-235 (U-235), and U-233/234 were used in reactor processes, but there is no history of use or disposal of reactor uranium in D Area. Uranium also occurs naturally and can be easily distinguished from reactor uranium by comparing activity ratios. In reactor fuel (enriched uranium), the U-233/234 to U-238 activity ratio will be very high, often exceeding 1,000. In reactor target (depleted uranium), that ratio will be <0.2. Natural uranium will have a U-233/234 to U-238 ratio very close to unity (i.e., one). Table 8 shows that for every sample, the U-233/234 to U-238 ratio is very close to one. The soil samples from the 488-1D Ash Basin soil dataset clearly show a natural signature. Uranium isotopic considerations conclusively demonstrate that U-233/234, U-235, and U-238 in the 488-1D Ash Basin confirmation soils samples are natural uranium. The U-233/234 to U-238 ratios of all samples are consistent with naturally-occurring radioactive material.

4.3.2 Hexavalent Chromium

The statistical hypothesis testing for hexavalent chromium using the standard USEPA Method 7196A (colorimetric) as described in the FSP indicates that cleanup levels have not been met:

Reject H_0; Conclude site mean > TL (0.29 mg/kg)

The *Human Health and Ecological Evaluation for Confirmation Sampling at the 488-2D Ash Basin (U)* (SRNS 2016) outlined several uncertainties with regard to the following: 1) toxicity values used in the evaluation; 2) known interferences associated with (and identified within) the USEPA Method 7196A that may result in false-positive results; 3) use of alternative analytical methodologies (USEPA Methods 7199 and 6800); and 4) history of use and/or presence in background. The statistical hypothesis testing results and residual risk levels varied, depending

on the analytical method used. Consideration of these uncertainties lead to the conclusion that the evaluation of confirmation sample results from the 488-2D Ash Basin was indeterminate with regard to meeting the acceptance criteria for unrestricted (residential) land use.

To further address potential issues associated with the colorimetric USEPA Method 7196A for the 488-1D Ash Basin dataset, confirmation samples that were collected per the FSP (SRNS 2015) were split in the field and an aliquot was also sent to Brooks Applied Laboratories (BAL) for an additional analysis using the USEPA Method 7199 ion chromatography-inductively coupled plasma-mass spectrometry (IC-ICP-MS). A comparison of results for both methods by sample location are reported in Table 9. Table 10 is a data summary comparison of both methods that include minimum, maximum and mean concentrations. Mean values reported in Table 10 for Method 7196A use a surrogate of one-half the sample-specific detection limit for non-detects. Statistical input/output using USEPA ProUCL software for Method 7196A are in Appendix B and the mean calculation is in Appendix D. Method 7199 did not yield non-detects and all results used as reported. Statistical input/output using EPA ProUCL software for Method 7199 are in Appendix D.

The two analytical methods yield similar results. Method 7196A (colorimetric) mean concentration is 0.55 mg/kg; Method 7199 (IC-ICP-MS) mean concentration is 0.88 mg/kg. The maximum concentrations of the two methods are similar (1.94 mg/kg and 1.63 mg/kg, respectively) although they did not come from the same sample.

The ProUCL statistical output for the Method 7199 (IC-ICP-MS) from BAL are also provided in Appendix D. The output result indicates that cleanup levels have not been met:

Reject H_0; Conclude site mean > TL (0.29 mg/kg)

The TL of 0.29 mg/kg is based on the residential RSL published by the USEPA in 2014; the industrial RSL is 6.3 mg/kg. The maximum detected concentration of hexavalent chromium (1.94 mg/kg) is less than the industrial use threshold level.

Hexavalent chromium occurs naturally in the environment from the erosion of natural chromium deposits found in rock and soil. Depending on conditions, hexavalent and trivalent forms of

chromium can convert back and forth in the environment and the human body. The occurrence of non-anthropogenic hexavalent chromium in soil and groundwater is a documented phenomenon recognized in scientific literature (SRNS 2016). The transformation of chromium in the environment involves complicated geochemical processes that are dependent on a variety of factors/conditions.

4.4 488-1D Ash Basin Conclusion

A total of 21 confirmation sample results were evaluated to demonstrate that the ash has been successfully removed from the 488-1D Ash Basin (and an area east of the 488-4D Ash Landfill) and that the remaining soils are below HH and ECO risk-based TLs. Twenty-four metals and six radionuclides were analyzed in each sample and evaluated. With the exception of hexavalent chromium, the residual concentrations of all analytes met the pre-established cleanup criteria documented in the *Confirmation Sampling and Analysis Plan for Coal and/or Ash Removal at the Savannah River Site (U)* for unrestricted land use (SRNS 2014a). The concentration of hexavalent chromium does not exceed the threshold level for an industrial use scenario. Therefore, land use controls to prevent unrestricted use (i.e., residential) will be implemented at the capped portion and the excavated western portion of the 488-1D Ash Basin and the area east of the 488-4D Ash Landfill.

5.0 INLET BASINS DATA EVALUATION

This section summarizes the results of the evaluation for the Inlet Basins.

5.1 Data

The confirmation sampling data used in the Inlet Basins evaluation are provided in Appendix E. The FSP identifies eight samples total, four from each of the two basins (SRNS 2014b). The samples from the southern Inlet Basin were collected on 9/6/17; the samples from the northern Inlet Basin were collected 7/26/18. The samples were collected in a progressive fashion to allow construction activities to proceed and allow for the North Inlet Basin to be utilized for management of stormwater in contact with ash. A map of the sample locations is provided in Figure 3. The confirmation sampling events for the Inlet Basins are summarized below:

Collection Date	FSP Grids (DINLET-xx)	Station Identification Number
9/6/17	FSP grids DINLET-05, -06, -07, -08	488-1D-STI-1CONF, 488-1D-STI-2CONF, 488-1D-STI-3CONF, 488-1D-STI-4CONF
7/26/18	FSP grids DINLET-01, -02, -03, -04	488-1D-STI-5CONF, 488-1D-STI-6CONF, 488-1D-STI-7CONF, 488-1D-STI-8CONF

xx = sampling grid station number identified in FSP (SRNS 2014b)

QA/QC samples were also collected and analyzed in accordance with the Confirmation SAP (SRNS 2014a) and the FSP (SRNS 2014b). These samples (e.g., FD, split samples, laboratory duplicates, etc.) are used to assess the precision, variability and comparability of the data. The *Data Usability Report for Confirmation Sampling at the Inlet Basins* presents the data verification, validation and usability assessment results for confirmation sampling for the project. Appendix E provides the FD results for samples taken at FSP grids DINLET-06 and DINLET-02 (4881D-STI-2CONF and 4881D-STI-6CONF) within the Inlet Basins.

5.2 Results

Table 11 is a comparison of the confirmation sampling maximum detected concentrations/ activities to the HH and ECO TLs for the Inlet Basins. If the maximum detected concentration/activity is less than the TL, then formal statistical hypothesis testing is not necessary since the TL is based on mean concentration/activity (i.e., the mean will also be less than the TL). For the HH screening comparison, the maximum detected concentration/activity of the two constituents (potassium-40 and radium-226) is greater than the TL. For the ECO screening comparison, the maximum detected concentration of boron and mercury is greater than the TL.

5.2.1 Human Health

Formal statistical hypothesis testing using the ProUCL software is required only for the constituents that the maximum detected concentration/activity exceeds the HH TL; potassium-40 and radium-226. Table 12 is a Summary of the Statistical Hypothesis Testing for HH for all constituents. The ProUCL output for this portion of the evaluation is provided in Appendix F. Potassium-40 and radium-226 had the following output result, indicating cleanup levels have been met (i.e., passing result):

Do not reject H_0; Conclude site mean $\leq$ TL

For the constituents that have a TL based on the SRS 95th percentile concentration/activity, (i.e., arsenic, thallium, potassium-40, radium-226, radium-228, thorium-228, and uranium-238), a comparison of the maximum detected concentration/activity to the SRS maximum concentration/activity is presented in Table 13. The maximum detected concentration/activity of all seven of these constituents is less than the SRS maximum background value and therefore meet the acceptance criteria.

5.2.2 Ecological

The maximum detected concentration of boron and mercury exceeds the ECO TL. Table 14 is a Summary of the Statistical Hypothesis Testing for ECO for all constituents. The ProUCL output for this portion of the evaluation is provided in Appendix G. Boron and mercury had the following output result, indicating cleanup levels have been met (i.e., passing result):

Do not reject H_0; Conclude site mean $\leq$ TL

For the constituents that have a TL based on the SRS 95th percentile concentration/activity, a comparison of the maximum detected concentration/activity to the SRS maximum concentration is presented in Table 13. The maximum detected concentration of selenium, thallium and vanadium are less than the SRS maximum background concentration and therefore meet the acceptance criteria.

5.3 Additional Evaluations

An additional evaluation is provided for uranium and hexavalent chromium.

5.3.1 Uranium

U-233/234 was not identified as a potential COC (with corresponding HH TLs) in the SAP (SRNS 2014a), but samples were analyzed for it to perform isotopic comparisons to other analyzed uranium species (i.e., U-238). U-238, U-235, and U-233/234 were used in reactor processes, but there is no history of use or disposal of reactor uranium in D Area. Uranium also occurs naturally and can be easily distinguished from reactor uranium by comparing activity ratios. In reactor fuel

(enriched uranium), the U-233/234 to U-238 activity ratio will be very high, often exceeding 1,000. In reactor target (depleted uranium), that ratio will be <0.2. Natural uranium will have a U-233/234 to U-238 ratio very close to unity (i.e., one). Table 15 shows that for every sample, the U-233/234 to U-238 ratio is very close to one. The soil samples from the Inlet Basin soil clearly show a natural signature. Uranium isotopic considerations conclusively demonstrate that U-233/234, U-235, and U-238 in the Inlet Basin confirmation soils samples are natural uranium. The U-233/234 to U-238 ratios of all samples are consistent with naturally-occurring radioactive material.

5.3.2 Hexavalent Chromium

The statistical hypothesis testing for hexavalent chromium using the standard USEPA Method 7196A (colorimetric) was not required since all the sample results are less that the HH threshold level of 0.29 mg/kg, indicating that cleanup levels have been met.

A FD sample was collected at Station Identification 488-1D-STI-CONF6. Both the regular sample and the duplicate sample were diluted by the laboratory due to matrix interference (matrix spike/post spike recovery outside of the established acceptance limits). The samples were diluted (5X), which correspondingly raised the sample specific method detection limits by 5X:

- The regular sample was reported as nondetect (ND) (detection limit [DL] = 0.885 mg/kg, Practical Quantization Limit [PQL] = 2.21 mg/kg).
- The FD sample result was 1.5 mg/kg and was J qualified (estimated) (DL = 0.949 mg/kg, PQL = 2.37 mg/kg).

A statistical WSR test was performed for the hexavalent chromium since the FD result of 1.5 mg/kg is above the HH TL of 0.29 mg/kg. The FD result replaced the regular sample result from Station Identification 488-1D-STI-CONF6 and was included in the sample dataset for statistical analysis. The following ProUCL output result was obtained, indicating that cleanup levels have been met (see Appendix H):

Do not reject H_0; Conclude site mean $\leq$ TL

To further address potential issues associated with the colorimetric USEPA Method 7196A, confirmation samples that were collected per the FSP were split in the field and an aliquot was also sent to BAL for an additional analysis using the USEPA Method 7199 IC-ICP-MS. A comparison of results for both methods by sample location are reported in Table 16. Table 17 is a data summary comparison of both methods that include minimum, maximum and mean concentrations. Mean values reported in Table 17 for Method 7196A use a surrogate of one-half the sample-specific detection limit for non-detects. Statistical input/output using USEPA ProUCL software for both methods and the mean calculation for Method 7196A is in Appendix H. Method 7199 did not yield non-detects and all results used as reported.

The two analytical methods yielded similar results. Method 7196A (colorimetric) mean concentration was 0.16 mg/kg; Method 7199 (IC-ICP-MS) mean concentration was 0.328 mg/kg. The maximum concentrations of the two methods (0.192 mg/kg and 1.09 mg/kg, respectively) did not come from the same sample. The maximum detect of 1.09 mg/kg for this method came from Station Identification 488-1D-STI-CONF6, the same location that had a matrix spike/post spike recovery outside of the established acceptance limits issue using the colorimetric method described in the previous paragraph.

The ProUCL statistical output for the Method 7199 (IC-ICP-MS) from BAL is also provided in Appendix H. The output result indicates that cleanup levels have been met:

$$Do\ not\ reject\ H_{0;}\ Conclude\ site\ mean \leq TL$$

The results agree with the Method 7196A (colorimetric) results.

Hexavalent chromium occurs naturally in the environment from the erosion of natural chromium deposits found in rock and soil. Depending on conditions, hexavalent and trivalent forms of chromium can convert back and forth in the environment and the human body. The occurrence of non-anthropogenic hexavalent chromium in soil and groundwater is a documented phenomenon recognized in scientific literature (SRNS 2016). The transformation of chromium in the environment involves complicated geochemical processes that are dependent on a variety of factors/conditions.

5.4 Inlet Basins Conclusion

A total of eight confirmation sample results were evaluated to demonstrate that the ash has been successfully removed from the Inlet Basins and the remaining soils are below HH and ECO risk-based TLs. Twenty-four metals and six radionuclides were analyzed in each sample and evaluated. The residual concentrations of these analytes met the pre-established cleanup criteria documented in the *Confirmation Sampling and Analysis Plan for Coal and/or Ash Removal at the Savannah River Site (U)* for unrestricted land use (SRNS 2014a). The Inlet Basins will be graded, contoured and appropriately sloped to direct storm water to the D-Area Discharge Canal.

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6.0 REFERENCES

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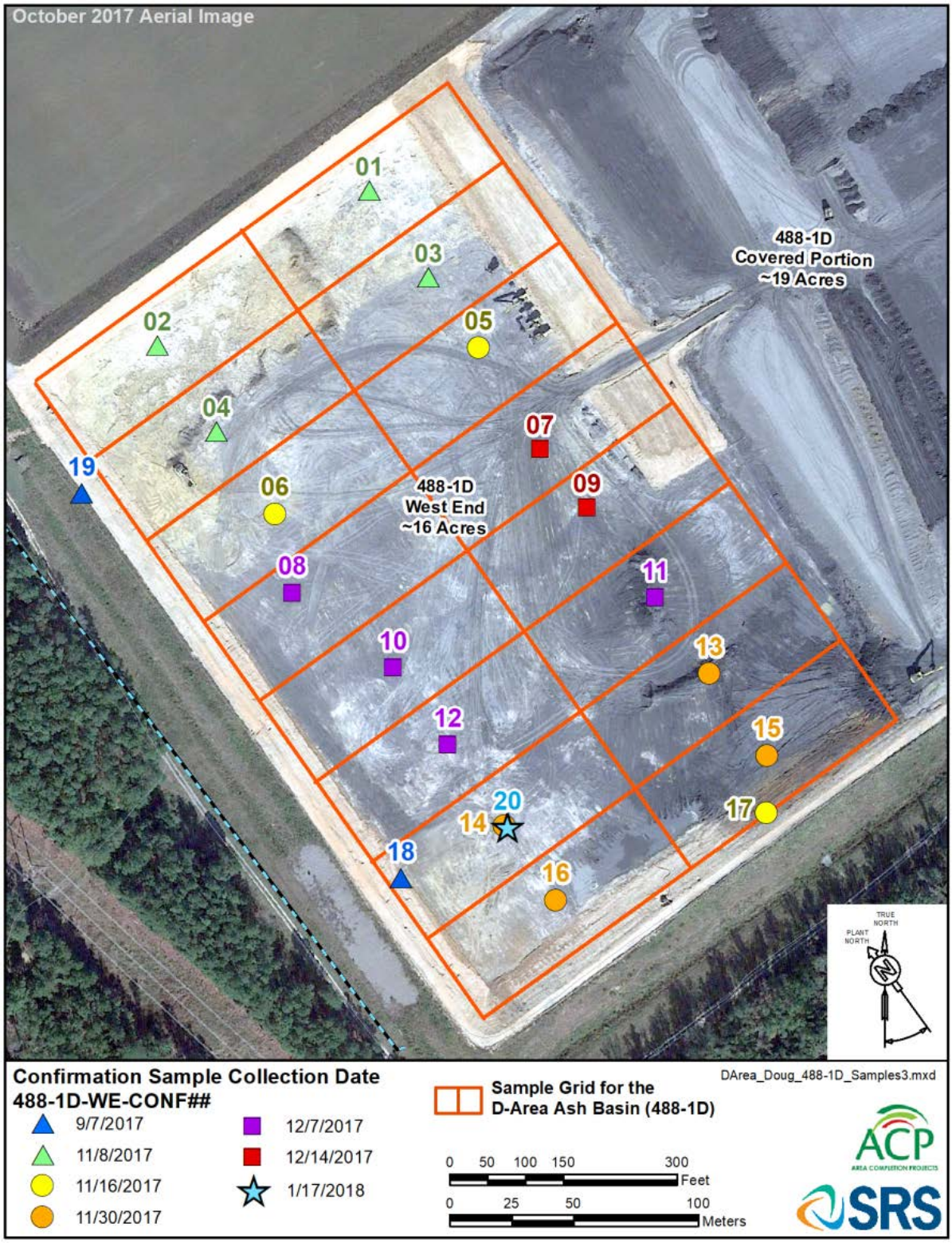

Figure 1. 488-1D Ash Basin Confirmation Sampling Locations

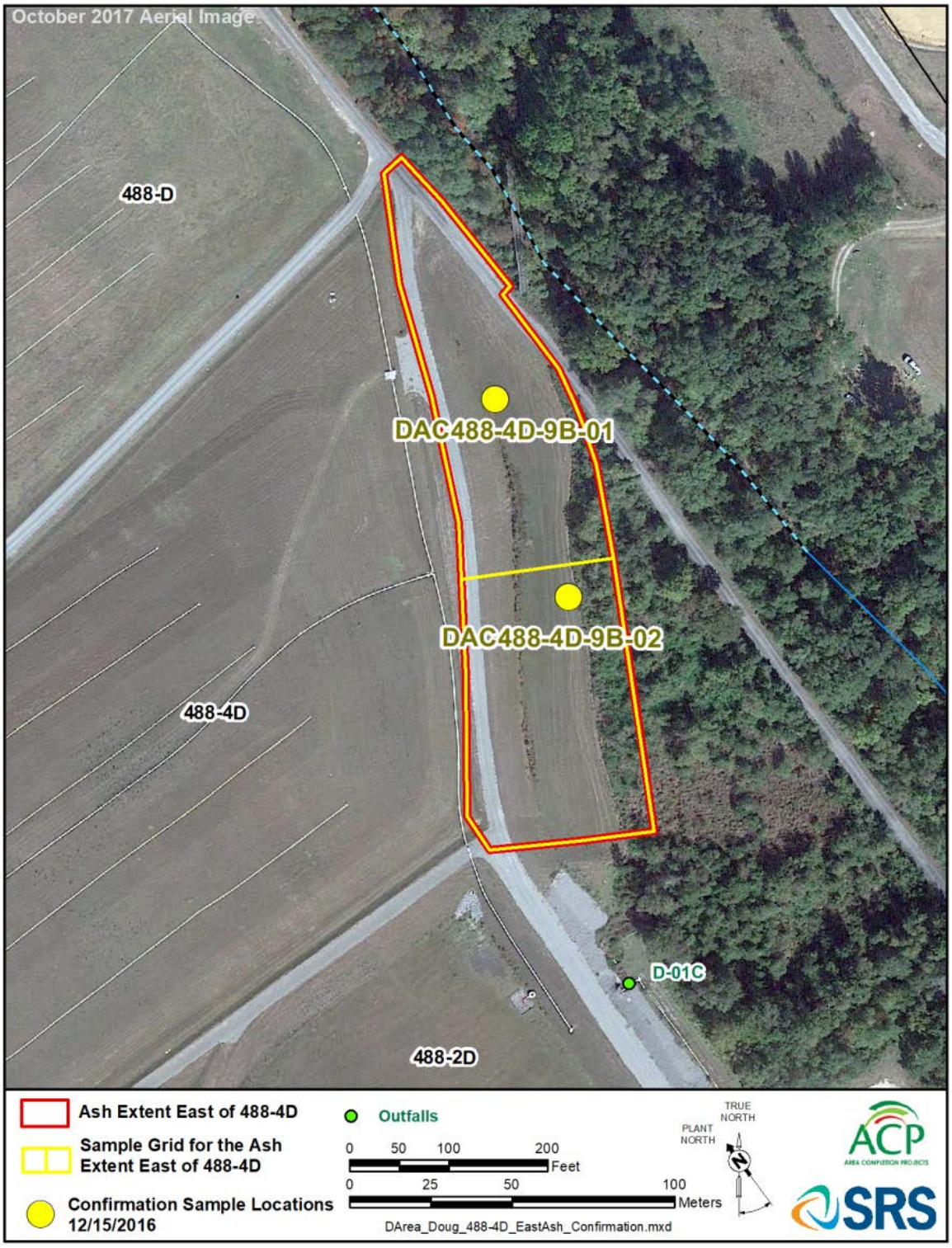

Figure 2. Confirmation Sampling Locations from Outside the Eastern End of the 488-4D Ash Landfill

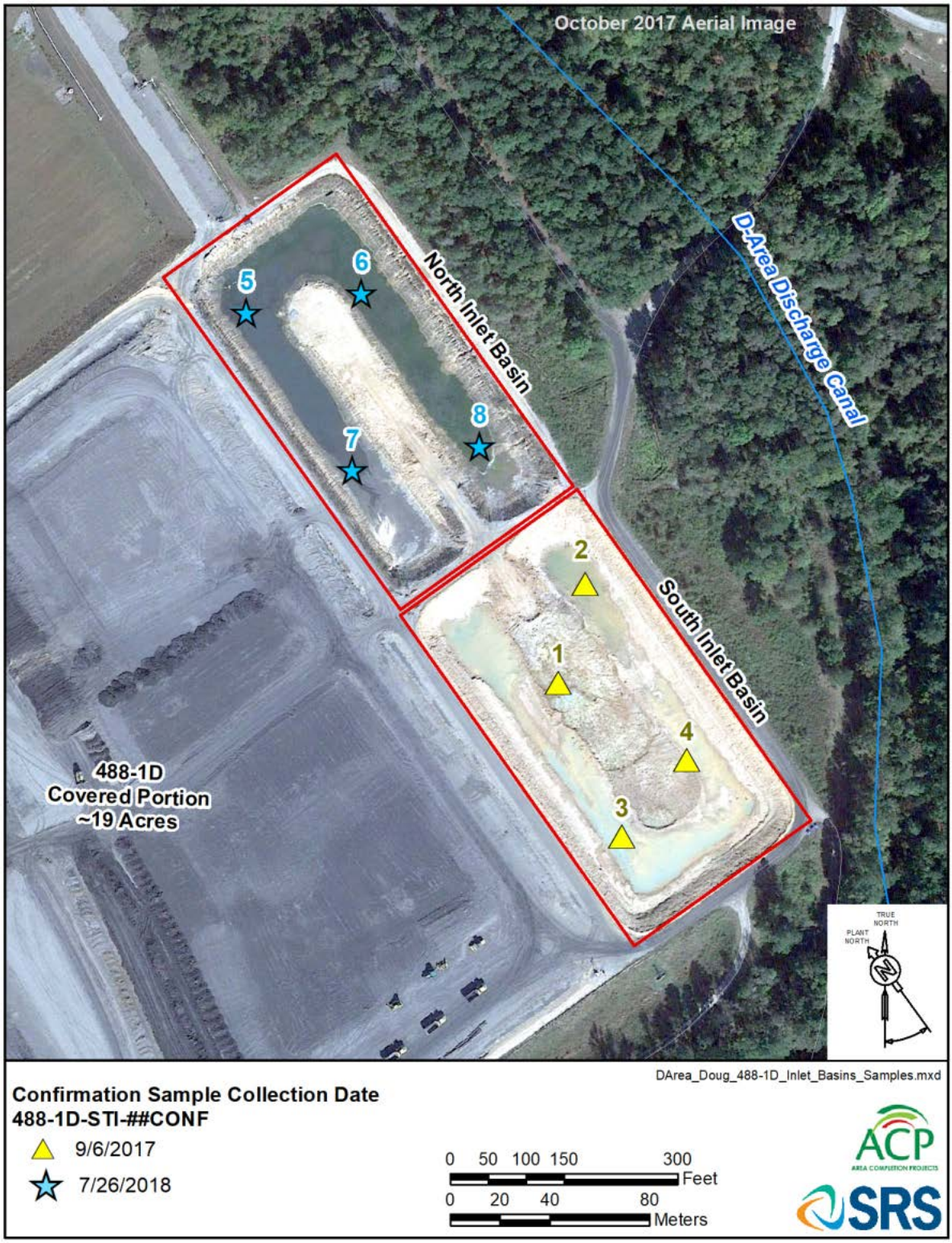

Figure 3. 488-1D Inlet Basins Confirmation Sampling Locations

Table 1. Human Health Threshold Levels

Analyte	Units	Residential RSL/PRG	SRS 95th %-tile Background	HH TL[1]
Al	mg/kg	*77,000*	15,700	77,000
Sb	mg/kg	*31*	3.3	31
As	mg/kg	0.61	*8.2*	8.2
Ba	mg/kg	*15,000*	49.9	15,000
Be	mg/kg	*160*	0.4	160
B	mg/kg	*16,000*	NA	16,000
Cd	mg/kg	*70*	1.4	70
Cr	mg/kg	*120,000*	29.9	120,000
Cr^{+6}	mg/kg	*0.29*	NA	0.29
Co	mg/kg	*23*	2.2	23
Cu	mg/kg	*3,100*	7.7	3,100
Fe	mg/kg	*55,000*	28,675	55,000
Pb	mg/kg	*400*	13.6	400
Mg	mg/kg	*NA*	334	None
Mn	mg/kg	*1,800*	134	1,800
Hg	mg/kg	*10*	0.10	10
Mo	mg/kg	*390*	NA	390
Ni	mg/kg	*1,500*	5.1	1,500
Se	mg/kg	*390*	7.8	390
Ag	mg/kg	*390*	1.4	390
Sr	mg/kg	*47,000*	NA	47,000
Tl	mg/kg	0.78	*6.3*	6.3
V	mg/kg	*390*	69.9	390
Zn	mg/kg	*23,000*	11.3	23,000
K-40	pCi/g	0.15	*3.3*	3.3
Ra-228 (+D)	pCi/g	0.0319	*2.22*	2.2
Th-228 (+D)	pCi/g	0.154	*2.25*	2.3
U-238 (+D)	pCi/g	0.725	*1.22*	1.2
Ra-226 (+D)	pCi/g	0.0127	*1.20*	1.2
U-235 (+D)	pCi/g	*0.194*	0.11	0.194

1 Threshold levels (TLs) per the *Confirmation SAP for Coal and/or Ash Removal at SRS* (SRNS 2014a). The HH TL is the residential RSL/PRG if it is greater than the background concentration. If the residential RSL/PRG is less than the SRS 95th %-tile background concentration, then the TL defaults to the background value. Sources of the TL are highlighted in italics in the table. There is no TL if a screening value is not available.

NA = not available

Table 2. Ecological Threshold Levels

Analyte	Units	Screening Value[1]	SRS 95th%-tile Background[2]	ECO TL [3]
Al	mg/kg	*NA*	15,700	None
Sb	mg/kg	*24*	3.3	24
As	mg/kg	*68*	8.2	68
Ba	mg/kg	*260*	49.9	260
Be	mg/kg	*25*	0.4	25
B	mg/kg	*10*	NA	10
Cd	mg/kg	*2.7*	1.4	2.7
Cr	mg/kg	*280*	29.9	280
Cr^{+6}	mg/kg	*3.4*	NA	3.4
Co	mg/kg	*130*	2.2	130
Cu	mg/kg	*46*	7.7	46
Fe	mg/kg	*NA*	28,675	None
Pb	mg/kg	*28*	13.6	28
Mg	mg/kg	*NA*	334	None
Mn	mg/kg	*1,100*	134	1,100
Hg	mg/kg	*0.13*	0.10	0.13
Mo	mg/kg	*170*	NA	170
Ni	mg/kg	*19*	5.1	19
Se	mg/kg	3.0	*7.8*	7.8
Ag	mg/kg	*26*	1.4	26
Sr	mg/kg	*960*	NA	960
Tl	mg/kg	0.50	*6.3*	6.3
V	mg/kg	13	*69.9*	69.9
Zn	mg/kg	*480*	11.3	480
K-40	pCi/g	*NA*	3.3	None
Ra-226 (+D)	pCi/g	*15*	1.20	15
Ra-228 (+D)	pCi/g	*12*	2.22	12
Th-228 (+D)	pCi/g	*430*	2.25	430
U-235 (+D)	pCi/g	*4,400*	0.11	4,400
U-238 (+D)	pCi/g	*4,000*	1.22	4,000

1 Screening Value = From the Los Alamos National Laboratory ECO Risk Database low-effects screening level for soil media (LANL 2015).

2 SRS 95th%-tile Background concentration from *the Background Soils Statistical Summary Report for the Savannah River Site* (WSRC 2006).

3 Ecological TL is the Screening Value if it is greater than the background concentration. If the Screening Value is less than the background concentration, then the TL defaults to the background value. Sources of the TL are highlighted in italics in the table. There is no TL if a screening value is not available.

NA = not available

Table 3. SRS Soil Background Concentrations

Analyte	Units	SRS 95th %-tile Background	SRS Maximum Background
Al	mg/kg	15,700	23,700
Sb	mg/kg	3.3	8.8
As	mg/kg	8.2	22.9
Ba	mg/kg	49.9	252
Be	mg/kg	0.4	1.2
B	mg/kg	NA	NA
Cd	mg/kg	1.4	2.0
Cr	mg/kg	29.9	54.3
Cr^{+6}	mg/kg	NA	NA
Co	mg/kg	2.2	5.0
Cu	mg/kg	7.7	74.2
Fe	mg/kg	28,675	44,300
Pb	mg/kg	13.6	26.6
Mg	mg/kg	334	1040
Mn	mg/kg	134	346
Hg	mg/kg	0.10	0.30
Mo	mg/kg	NA	NA
Ni	mg/kg	5.1	27.0
Se	mg/kg	7.8	12.2
Ag	mg/kg	1.4	2.0
Sr	mg/kg	NA	NA
Tl	mg/kg	6.3	8.1
V	mg/kg	69.9	104
Zn	mg/kg	11.3	20.7
K-40	pCi/g	3.3	8.53
Ra-226	pCi/g	1.20	1.74
Ra-228	pCi/g	2.22	6.75
Th-228	pCi/g	2.25	4.17
U-235	pCi/g	0.11	0.17
U-238	pCi/g	1.22	1.9

Note:
SRS soil background concentrations from concentrations from Appendix B-2 in the *Background Soils Statistical Summary Report for the Savannah River Site* (WSRC 2006).

NA = not available

Table 4. 488-1D Ash Basin: Maximum Detected Concentration Compared to Threshold Levels

Analyte	Units	Maximum Detect	HH TL[1]	Max Det > HH TL?	ECO TL[2]	Max Det > ECO TL?
Aluminum	mg/kg	34000	7.70E+04	No	None	No
Antimony	mg/kg	1.04	3.10E+01	No	2.40E+01	No
Arsenic	**mg/kg**	**20.4**	**8.20E+00**	**YES**	6.80E+01	No
Barium	mg/kg	118	1.50E+04	No	2.60E+02	No
Beryllium	mg/kg	0.772	1.60E+02	No	2.50E+01	No
Boron	mg/kg	8.59	1.60E+04	No	1.00E+01	No
Cadmium	mg/kg	ND	7.00E+01	No	2.70E+00	No
Chromium	mg/kg	30.3	1.20E+05	No	2.80E+02	No
Hexavalent Chromium	**mg/kg**	**1.94**	**2.90E-01**	**YES**	3.40E+00	No
Cobalt	mg/kg	4.94	2.30E+01	No	1.30E+02	No
Copper	mg/kg	9.89	3.10E+03	No	4.60E+01	No
Iron	mg/kg	37400	5.50E+04	No	None	No
Lead	mg/kg	15.8	4.00E+02	No	2.80E+01	No
Magnesium	mg/kg	595	None	No	None	No
Manganese	mg/kg	34.7	1.80E+03	No	1.10E+03	No
Mercury	**mg/kg**	**0.174**	1.00E+01	No	**1.30E-01**	**YES**
Molybdenum	mg/kg	0.347	3.90E+02	No	1.70E+02	No
Nickel	mg/kg	5.28	1.50E+03	No	1.90E+01	No
Selenium	mg/kg	1.49	3.90E+02	No	7.80E+00	No
Silver	mg/kg	0.193	3.90E+02	No	2.60E+01	No
Strontium	mg/kg	60.7	4.70E+04	No	9.60E+02	No
Thallium	mg/kg	0.49	6.30E+00	No	6.30E+00	No
Vanadium	**mg/kg**	**80.5**	3.90E+02	No	**6.99E+01**	**YES**
Zinc	mg/kg	11.9	2.30E+04	No	4.80E+02	No
Potassium-40	**pCi/g**	**4.91**	**3.30E+00**	**YES**	None	No
Radium-226 (+D)	**pCi/g**	**1.39**	**1.20E+00**	**YES**	1.50E+01	No
Pb-214						
Radium-228 (+D)	**pCi/g**	**2.37**	**2.20E+00**	**YES**	1.20E+01	No
Ac-228						
Thorium-228 (+D)	**pCi/g**	**2.33**	**2.30E+00**	**YES**	4.30E+02	No
Pb-212						
Uranium-235 (+D)	**pCi/g**	**0.29**	**1.94E-01**	**YES**	4.40E+03	No
Uranium-238 (+D)	**pCi/g**	**1.21**	**1.20E+00**	**YES**	4.00E+03	No

1. HH TL = Human Health Threshold Level from Table 1.
2. ECO TL = Ecological Threshold Level from Table 2.

ND = nondetect

Table 5. 488-1D Ash Basin: Summary of Statistical Hypothesis Testing for Human Health

Analyte	Units	HH TL	Hypothesis Test Result
Al	mg/kg	77,000	Statistical testing not required, site max < TL
Sb	mg/kg	31	Statistical testing not required, site max < TL
As	mg/kg	8.2	Do not reject H_0; Conclude site mean $\leq$ TL
Ba	mg/kg	15,000	Statistical testing not required, site max < TL
Be	mg/kg	160	Statistical testing not required, site max < TL
B	mg/kg	16,000	Statistical testing not required, site max < TL
Cd	mg/kg	70	Statistical testing not required, site max < TL
Cr	mg/kg	120,000	Statistical testing not required, site max < TL
Cr^{+6}	mg/kg	0.29	**Reject H_0; Conclude site mean > TL**
Co	mg/kg	23	Statistical testing not required, site max < TL
Cu	mg/kg	3,100	Statistical testing not required, site max < TL
Fe	mg/kg	55,000	Statistical testing not required, site max < TL
Pb	mg/kg	400	Statistical testing not required, site max < TL
Mg	mg/kg	None	NA
Mn	mg/kg	1,800	Statistical testing not required, site max < TL
Hg	mg/kg	10	Statistical testing not required, site max < TL
Mo	mg/kg	390	Statistical testing not required, site max < TL
Ni	mg/kg	1,500	Statistical testing not required, site max < TL
Se	mg/kg	390	Statistical testing not required, site max < TL
Ag	mg/kg	390	Statistical testing not required, site max < TL
Sr	mg/kg	47,000	Statistical testing not required, site max < TL
Tl	mg/kg	6.3	Statistical testing not required, site max < TL
V	mg/kg	390	Statistical testing not required, site max < TL
Zn	mg/kg	23,000	Statistical testing not required, site max < TL
K-40	pCi/g	3.3	Do not reject H_0; Conclude site mean $\leq$ TL
Ra-226 (+D)	pCi/g	1.2	Do not reject H_0; Conclude site mean $\leq$ TL
Ra-228 (+D)	pCi/g	2.2	Do not reject H_0; Conclude site mean $\leq$ TL
Th-228 (+D)	pCi/g	2.3	Do not reject H_0; Conclude site mean $\leq$ TL
U-235 (+D)	pCi/g	0.194	Do not reject H_0; Conclude site mean $\leq$ TL
U-238 (+D)	pCi/g	1.2	Do not reject H_0; Conclude site mean $\leq$ TL

NA = Not applicable

Table 6. 488-1D Ash Basin: Unit Maximum Detection Compared to SRS Background Maximum

Analyte	Units	Maximum Detect	SRS Background Maximum	Unit Max > SRS Max?
Human Health Constituents				
Arsenic	mg/kg	20.4	22.9	no
Thallium	mg/kg	0.49	8.13	no
Potassium-40	pCi/g	4.91	8.53	no
Radium-226	pCi/g	1.39	1.74	no
Radium-228	pCi/g	2.37	6.75	no
Thorium-228	pCi/g	2.33	4.17	no
Uranium-238	pCi/g	1.21	1.90	no
Ecological Constituents				
Selenium	mg/kg	1.49	12.2	no
Thallium	mg/kg	0.49	8.13	no
Vanadium	mg/kg	80.5	104	no

Table 7. 488-1D Ash Basin: Summary of Statistical Hypothesis Testing for Ecological Receptors

Analyte	Units	ECO TL	Hypothesis Test Result
Al	mg/kg	None	Statistical testing not required, site max < TL
Sb	mg/kg	24	Statistical testing not required, site max < TL
As	mg/kg	68	Statistical testing not required, site max < TL
Ba	mg/kg	260	Statistical testing not required, site max < TL
Be	mg/kg	25	Statistical testing not required, site max < TL
B	mg/kg	10	Statistical testing not required, site max < TL
Cd	mg/kg	2.7	Statistical testing not required, site max < TL
Cr	mg/kg	280	Statistical testing not required, site max < TL
Cr^{+6}	mg/kg	3.4	Statistical testing not required, site max < TL
Co	mg/kg	130	Statistical testing not required, site max < TL
Cu	mg/kg	46	Statistical testing not required, site max < TL
Fe	mg/kg	None	Statistical testing not required, site max < TL
Pb	mg/kg	28	Statistical testing not required, site max < TL
Mg	mg/kg	None	NA
Mn	mg/kg	1,100	Statistical testing not required, site max < TL
Hg	mg/kg	0.13	Do not reject H_0; Conclude site mean $\leq$ TL
Mo	mg/kg	170	Statistical testing not required, site max < TL
Ni	mg/kg	19	Statistical testing not required, site max < TL
Se	mg/kg	7.8	Statistical testing not required, site max < TL
Ag	mg/kg	26	Statistical testing not required, site max < TL
Sr	mg/kg	960	Statistical testing not required, site max < TL
Tl	mg/kg	6.3	Statistical testing not required, site max < TL
V	mg/kg	69.9	Do not reject H_0; Conclude site mean $\leq$ TL
Zn	mg/kg	480	Statistical testing not required, site max < TL
K-40	pCi/g	None	NA
Ra-226 (+D)	pCi/g	15	Statistical testing not required, site max < TL
Ra-228 (+D)	pCi/g	12	Statistical testing not required, site max < TL
Th-228 (+D)	pCi/g	430	Statistical testing not required, site max < TL
U-235 (+D)	pCi/g	4,400	Statistical testing not required, site max < TL
U-238 (+D)	pCi/g	4,000	Statistical testing not required, site max < TL

NA = Not applicable

Table 8. 488-1D Ash Basin: Uranium-233/234: Uranium-238 Activity Ratios

Station ID	Analyte	Result	Result Units	Review Qualifier
4881D-WE-CONF01	Uranium-233/234	0.866	pCi/g	
4881D-WE-CONF01	Uranium-238	0.963	pCi/g	
4881D-WE-CONF02	Uranium-233/234	0.901	pCi/g	
4881D-WE-CONF02	Uranium-238	0.872	pCi/g	
4881D-WE-CONF03	Uranium-233/234	1.05	pCi/g	
4881D-WE-CONF03	Uranium-238	0.99	pCi/g	
4881D-WE-CONF04	Uranium-233/234	1.03	pCi/g	
4881D-WE-CONF04	Uranium-238	0.902	pCi/g	
4881D-WE-CONF05	Uranium-233/234	1.2	pCi/g	
4881D-WE-CONF05	Uranium-238	0.995	pCi/g	
4881D-WE-CONF06	Uranium-233/234	1.23	pCi/g	
4881D-WE-CONF06	Uranium-238	1.04	pCi/g	J
4881D-WE-CONF07	Uranium-233/234	1.35	pCi/g	
4881D-WE-CONF07	Uranium-238	1.21	pCi/g	
4881D-WE-CONF08	Uranium-233/234	0.916	pCi/g	J
4881D-WE-CONF08	Uranium-238	0.882	pCi/g	
4881D-WE-CONF09	Uranium-233/234	1.2	pCi/g	
4881D-WE-CONF09	Uranium-238	1.09	pCi/g	
4881D-WE-CONF10	Uranium-233/234	0.855	pCi/g	
4881D-WE-CONF10	Uranium-238	0.767	pCi/g	
4881D-WE-CONF11	Uranium-233/234	1.08	pCi/g	
4881D-WE-CONF11	Uranium-238	1.11	pCi/g	
4881D-WE-CONF12	Uranium-233/234	0.909	pCi/g	J
4881D-WE-CONF12	Uranium-238	0.762	pCi/g	
4881D-WE-CONF13	Uranium-233/234	1.1	pCi/g	J
4881D-WE-CONF13	Uranium-238	0.813	pCi/g	J
4881D-WE-CONF15	Uranium-233/234	0.788	pCi/g	J
4881D-WE-CONF15	Uranium-238	0.716	pCi/g	J
4881D-WE-CONF16	Uranium-233/234	1.01	pCi/g	J
4881D-WE-CONF16	Uranium-238	0.711	pCi/g	J
4881D-WE-CONF17	Uranium-233/234	1.04	pCi/g	J
4881D-WE-CONF17	Uranium-238	1.02	pCi/g	
4881D-WE-CONF18	Uranium-233/234	0.869	pCi/g	J
4881D-WE-CONF18	Uranium-238	0.631	pCi/g	
4881D-WE-CONF19	Uranium-233/234	0.984	pCi/g	J
4881D-WE-CONF19	Uranium-238	0.868	pCi/g	
4881D-WE-CONF20	Uranium-233/234	0.72	pCi/g	
4881D-WE-CONF20	Uranium-238	0.584	pCi/g	
DAC488-4D-9B-01	Uranium-233/234	0.792	pCi/g	
DAC488-4D-9B-01	Uranium-238	0.648	pCi/g	
DAC488-4D-9B-02	Uranium-233/234	0.792	pCi/g	
DAC488-4D-9B-02	Uranium-238	0.74	pCi/g	

Table 9. 488-1D Ash Basin: Hexavalent Chromium Results Comparison

Station ID	GEL Cr+6 (Colorimetric)		BAL Cr+6 (IC-ICP-MS)	
	Result *(mg/kg)*	Review Qualifier	Result *(mg/kg)*	Review Qualifier
4881D-WE-CONF01	ND (0.172)	UJ	0.837	
4881D-WE-CONF02	0.637		1.24	
4881D-WE-CONF03	ND (0.184)	U	0.899	
4881D-WE-CONF04	0.397	J	1.1	
4881D-WE-CONF05	0.585		1.0	J
4881D-WE-CONF06	1.36		1.01	
4881D-WE-CONF07	0.592		1.63	J
4881D-WE-CONF08	0.582		0.695	J
4881D-WE-CONF09	1.94	J	1.37	J
4881D-WE-CONF10	0.337	J	0.997	J
4881D-WE-CONF11	1.06		1.54	J
4881D-WE-CONF12	0.217	J	0.63	J
4881D-WE-CONF13	1.15	J	1.24	J
4881D-WE-CONF15	0.199	J	0.651	J
4881D-WE-CONF16	0.574		1.6	J
4881D-WE-CONF17	ND (0.169)	U	0.223	
4881D-WE-CONF18	ND (0.138)	U	0.087	J
4881D-WE-CONF19	ND (0.163)	U	0.303	
4881D-WE-CONF20	0.409		0.489	
DAC488-4D-9B-01	0.627		0.141	
DAC488-4D-9B-02	0.214	J	0.725	

ND = nondetect (sample specific detection limit in parenthesis)

Table 10. 488-1D Ash Basin: Hexavalent Chromium Results Summary Comparison

Analytical Method-	Number of Samples	Number of Nondetects	Number J Qualified	Minimum	Maximum	Mean	Statistical Test HH TL = 0.29
				(mg/kg)			
GEL Sample Results EPA Methods 7196A (Colorimetric)	21	5	7	ND	1.94	0.55[1]	Fail
BAL Sample Results EPA Method 7199 Mod (IC-ICP-MS)	21	0	11	0.087	1.63	0.88	Fail

ND = nondetect
1- Mean calculated using surrogate value of the 1/2 sample specific detection limit for nondetects. Data provided in Appendix D.

Table 11. Inlet Basins: Maximum Detected Concentration Compared to Threshold Levels

Analyte	Units	Maximum Detect	HH TL[1]	Max Det > HH TL?	ECO TL[2]	Max Det > ECO TL?
Aluminum	mg/kg	33400	7.70E+04	No	None	No
Antimony	mg/kg	0.647	3.10E+01	No	2.40E+01	No
Arsenic	mg/kg	2.94	8.20E+00	No	6.80E+01	No
Barium	mg/kg	221	1.50E+04	No	2.60E+02	No
Beryllium	mg/kg	1.88	1.60E+02	No	2.50E+01	No
Boron	**mg/kg**	**10.9**	1.60E+04	No	**1.00E+01**	**YES**
Cadmium	mg/kg	0.0373	7.00E+01	No	2.70E+00	No
Chromium	mg/kg	16.1	1.20E+05	No	2.80E+02	No
Hexavalent Chromium	mg/kg	0.192	2.90E-01	No	3.40E+00	No
Cobalt	mg/kg	18.9	2.30E+01	No	1.30E+02	No
Copper	mg/kg	6.94	3.10E+03	No	4.60E+01	No
Iron	mg/kg	37300	5.50E+04	No	None	No
Lead	mg/kg	20.3	4.00E+02	No	2.80E+01	No
Magnesium	mg/kg	471	None	No	None	No
Manganese	mg/kg	20.7	1.80E+03	No	1.10E+03	No
Mercury	**mg/kg**	**0.148**	1.00E+01	No	**1.30E-01**	**YES**
Molybdenum	mg/kg	3.71	3.90E+02	No	1.70E+02	No
Nickel	mg/kg	6.92	1.50E+03	No	1.90E+01	No
Selenium	mg/kg	1.3	3.90E+02	No	7.80E+00	No
Silver	mg/kg	0.28	3.90E+02	No	2.60E+01	No
Strontium	mg/kg	39.1	4.70E+04	No	9.60E+02	No
Thallium	mg/kg	0.176	6.30E+00	No	6.30E+00	No
Vanadium	mg/kg	65.9	3.90E+02	No	6.99E+01	No
Zinc	mg/kg	15.1	2.30E+04	No	4.80E+02	No
Potassium-40	**pCi/g**	**7.5**	**3.30E+00**	**YES**	None	No
Radium-226 (+D)	**pCi/g**	**1.29**	**1.20E+00**	**YES**	1.50E+01	No
Pb-214						
Radium-228 (+D)	pCi/g	1.64	2.20E+00	No	1.20E+01	No
Ac-228						
Thorium-228 (+D)	pCi/g	1.63	2.30E+00	No	4.30E+02	No
Pb-212						
Uranium-235 (+D)	pCi/g	0.164	1.94E-01	No	4.40E+03	No
Uranium-238 (+D)	pCi/g	1.05	1.20E+00	No	4.00E+03	No

1 - HH TL = Human Health Threshold Level from Table 1.

2 - ECO TL = Ecological Threshold Level from Table 2.

Table 12. Inlet Basins: Summary of Statistical Hypothesis Testing for Human Health

Analyte	Units	HH TL	Hypothesis Test Result
Al	mg/kg	77,000	Statistical testing not required, site max < TL
Sb	mg/kg	31	Statistical testing not required, site max < TL
As	mg/kg	8.2	Statistical testing not required, site max < TL
Ba	mg/kg	15,000	Statistical testing not required, site max < TL
Be	mg/kg	160	Statistical testing not required, site max < TL
B	mg/kg	16,000	Statistical testing not required, site max < TL
Cd	mg/kg	70	Statistical testing not required, site max < TL
Cr	mg/kg	120,000	Statistical testing not required, site max < TL
Cr^{+6}	mg/kg	0.29	Statistical testing not required, site max < TL
Co	mg/kg	23	Statistical testing not required, site max < TL
Cu	mg/kg	3,100	Statistical testing not required, site max < TL
Fe	mg/kg	55,000	Statistical testing not required, site max < TL
Pb	mg/kg	400	Statistical testing not required, site max < TL
Mg	mg/kg	None	NA
Mn	mg/kg	1,800	Statistical testing not required, site max < TL
Hg	mg/kg	10	Statistical testing not required, site max < TL
Mo	mg/kg	390	Statistical testing not required, site max < TL
Ni	mg/kg	1,500	Statistical testing not required, site max < TL
Se	mg/kg	390	Statistical testing not required, site max < TL
Ag	mg/kg	390	Statistical testing not required, site max < TL
Sr	mg/kg	47,000	Statistical testing not required, site max < TL
Tl	mg/kg	6.3	Statistical testing not required, site max < TL
V	mg/kg	390	Statistical testing not required, site max < TL
Zn	mg/kg	23,000	Statistical testing not required, site max < TL
K-40	pCi/g	3.3	Do not reject H_0; Conclude site mean $\leq$ TL
Ra-226 (+D)	pCi/g	1.2	Do not reject H_0; Conclude site mean $\leq$ TL
Ra-228 (+D)	pCi/g	2.2	Statistical testing not required, site max < TL
Th-228 (+D)	pCi/g	2.3	Statistical testing not required, site max < TL
U-235 (+D)	pCi/g	0.194	Statistical testing not required, site max < TL
U-238 (+D)	pCi/g	1.2	Statistical testing not required, site max < TL

NA = Not applicable

Table 13. Inlet Basins: Unit Maximum Detection Compared to SRS Background Maximum

Analyte	Units	Maximum Detect	SRS Background Maximum	Unit Max > SRS Max?
Human Health Constituents				
Arsenic	mg/kg	2.94	22.9	no
Thallium	mg/kg	0.176	8.13	no
Potassium-40	pCi/g	7.5	8.53	no
Radium-226	pCi/g	1.29	1.74	no
Radium-228	pCi/g	1.64	6.75	no
Thorium-228	pCi/g	1.63	4.17	no
Uranium-238	pCi/g	1.05	1.90	no
Ecological Constituents				
Selenium	mg/kg	1.3	12.2	no
Thallium	mg/kg	0.176	8.13	no
Vanadium	mg/kg	65.9	104	no

Table 14. Inlet Basins: Summary of Statistical Hypothesis Testing for Ecological Receptors

Analyte	Units	ECO TL	Hypothesis Test Result
Al	mg/kg	None	Statistical testing not required, site max < TL
Sb	mg/kg	24	Statistical testing not required, site max < TL
As	mg/kg	68	Statistical testing not required, site max < TL
Ba	mg/kg	260	Statistical testing not required, site max < TL
Be	mg/kg	25	Statistical testing not required, site max < TL
B	mg/kg	10	Do not reject H_0; Conclude site mean $\leq$ TL
Cd	mg/kg	2.7	Statistical testing not required, site max < TL
Cr	mg/kg	280	Statistical testing not required, site max < TL
Cr^{+6}	mg/kg	3.4	Statistical testing not required, site max < TL
Co	mg/kg	130	Statistical testing not required, site max < TL
Cu	mg/kg	46	Statistical testing not required, site max < TL
Fe	mg/kg	None	Statistical testing not required, site max < TL
Pb	mg/kg	28	Statistical testing not required, site max < TL
Mg	mg/kg	None	NA
Mn	mg/kg	1,100	Statistical testing not required, site max < TL
Hg	mg/kg	0.13	Do not reject H_0; Conclude site mean $\leq$ TL
Mo	mg/kg	170	Statistical testing not required, site max < TL
Ni	mg/kg	19	Statistical testing not required, site max < TL
Se	mg/kg	7.8	Statistical testing not required, site max < TL
Ag	mg/kg	26	Statistical testing not required, site max < TL
Sr	mg/kg	960	Statistical testing not required, site max < TL
Tl	mg/kg	6.3	Statistical testing not required, site max < TL
V	mg/kg	69.9	Statistical testing not required, site max < TL
Zn	mg/kg	480	Statistical testing not required, site max < TL
K-40	pCi/g	None	NA
Ra-226 (+D)	pCi/g	15	Statistical testing not required, site max < TL
Ra-228 (+D)	pCi/g	12	Statistical testing not required, site max < TL
Th-228 (+D)	pCi/g	430	Statistical testing not required, site max < TL
U-235 (+D)	pCi/g	4,400	Statistical testing not required, site max < TL
U-238 (+D)	pCi/g	4,000	Statistical testing not required, site max < TL

NA = Not applicable

Table 15. Inlet Basins: Uranium-233/234: Uranium-238 Activity Ratios

Station ID	Analyte	Result	Result Units	Review Qualifier
4881D-STI-1CONF	Uranium-233/234	1.17	pCi/g	
4881D-STI-1CONF	Uranium-238	1.05	pCi/g	
4881D-STI-2CONF	Uranium-233/234	0.772	pCi/g	J
4881D-STI-2CONF	Uranium-238	0.736	pCi/g	
4881D-STI-3CONF	Uranium-233/234	0.787	pCi/g	J
4881D-STI-3CONF	Uranium-238	0.757	pCi/g	
4881D-STI-4CONF	Uranium-233/234	0.568	pCi/g	J
4881D-STI-4CONF	Uranium-238	0.483	pCi/g	
4881D-STI-5CONF	Uranium-233/234	0.849	pCi/g	
4881D-STI-5CONF	Uranium-238	0.63	pCi/g	
4881D-STI-6CONF	Uranium-233/234	1.31	pCi/g	
4881D-STI-6CONF	Uranium-238	1.01	pCi/g	
4881D-STI-7CONF	Uranium-233/234	0.479	pCi/g	
4881D-STI-7CONF	Uranium-238	0.417	pCi/g	
4881D-STI-8CONF	Uranium-233/234	1.1	pCi/g	
4881D-STI-8CONF	Uranium-238	1.01	pCi/g	

Table 16. Inlet Basins: Hexavalent Chromium Results Comparison

Station ID	GEL Cr+6 (Colorimetric)		BAL Cr+6 (IC-ICP-MS)	
	Result *(mg/kg)*	Review Qualifier	Result *(mg/kg)*	Review Qualifier
4881D-STI-1CONF	0.17	J	0.237	
4881D-STI-2CONF	ND (0.0963)	U	0.216	
4881D-STI-3CONF	ND (0.201)	U	0.090	
4881D-STI-4CONF	ND (0.157)	U	0.022	J
4881D-STI-5CONF	0.192	J	0.580	
4881D-STI-6CONF	ND (0.885)	U	1.09	
4881D-STI-7CONF	0.18	J	0.197	
4881D-STI-8CONF	ND (0.144)	U	0.188	J

ND = nondetect (sample specific detection limit in parenthesis)

Table 17. Inlet Basins: Hexavalent Chromium Results Summary Comparison

Analytical Method	Number of Samples	Number of Nondetects	Number J Qualified	Minimum	Maximum	Mean	Statistical Test HH TL = 0.29
				(mg/kg)			
GEL Sample Results EPA Methods 7196A (Colorimetric)	8	5	3	ND	0.192	0.16[1]	PASS
BAL Sample Results EPA Method 7199 Mod (IC-ICP-MS)	8	0	2	0.022	1.09	0.328	PASS

ND = nondetect
Mean calculated using surrogate value of the 1/2 sample specific detection limit for nondetects. Data provided in Appendix H.

APPENDIX A

488-1D Ash Basin Final Confirmation Sample Data

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488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF01	Aluminum	34,000	mg/kg		<77,000 (HH)
4881D-WE-CONF09	Aluminum	30,500	mg/kg		
4881D-WE-CONF07	Aluminum	29,100	mg/kg	J	
4881D-WE-CONF04	Aluminum	26,500	mg/kg		
4881D-WE-CONF03	Aluminum	25,800	mg/kg		
4881D-WE-CONF13	Aluminum	24,500	mg/kg		
4881D-WE-CONF06	Aluminum	22,700	mg/kg		
4881D-WE-CONF16	Aluminum	22,000	mg/kg		
DAC488-4D-9B-02	Aluminum	20,500	mg/kg		
4881D-WE-CONF05	Aluminum	19,800	mg/kg		
4881D-WE-CONF15	Aluminum	19,200	mg/kg		
DAC488-4D-9B-01	Aluminum	18,000	mg/kg		
4881D-WE-CONF20	Aluminum	17,500	mg/kg		
4881D-WE-CONF02	Aluminum	15,700	mg/kg		
4881D-WE-CONF11	Aluminum	14,600	mg/kg		
4881D-WE-CONF10	Aluminum	10,300	mg/kg		
4881D-WE-CONF12	Aluminum	10,300	mg/kg		
4881D-WE-CONF17	Aluminum	9,930	mg/kg		
4881D-WE-CONF08	Aluminum	9,840	mg/kg		
4881D-WE-CONF19	Aluminum	9,440	mg/kg		
4881D-WE-CONF18	Aluminum	6,930	mg/kg		
DAC488-4D-9B-02	Antimony	1.04	mg/kg	J	<24.0 (ECO)
4881D-WE-CONF09	Antimony	12.5	mg/kg	UJ	
4881D-WE-CONF07	Antimony	12.1	mg/kg	U	
4881D-WE-CONF06	Antimony	6.02	mg/kg	UJ	
4881D-WE-CONF16	Antimony	5.51	mg/kg	U	
4881D-WE-CONF05	Antimony	5.46	mg/kg	U	
4881D-WE-CONF03	Antimony	1.23	mg/kg	U	
4881D-WE-CONF11	Antimony	1.22	mg/kg	U	
4881D-WE-CONF15	Antimony	1.2	mg/kg	U	
4881D-WE-CONF04	Antimony	1.18	mg/kg	U	
4881D-WE-CONF13	Antimony	1.18	mg/kg	U	
4881D-WE-CONF01	Antimony	1.14	mg/kg	U	
4881D-WE-CONF08	Antimony	1.13	mg/kg	U	
4881D-WE-CONF12	Antimony	1.12	mg/kg	U	
4881D-WE-CONF10	Antimony	1.11	mg/kg	U	
4881D-WE-CONF20	Antimony	1.1	mg/kg	U	
DAC488-4D-9B-01	Antimony	1.1	mg/kg	U	
4881D-WE-CONF02	Antimony	1.08	mg/kg	U	
4881D-WE-CONF17	Antimony	1.08	mg/kg	U	
4881D-WE-CONF19	Antimony	1.06	mg/kg	U	

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF18	Antimony	1.04	mg/kg	U	
4881D-WE-CONF20	Arsenic	**20.4**	mg/kg	J	**8.2 (HH)**
4881D-WE-CONF01	Arsenic	**13.2**	mg/kg	J	
4881D-WE-CONF18	Arsenic	6.18	mg/kg		
4881D-WE-CONF16	Arsenic	5.57	mg/kg		
4881D-WE-CONF06	Arsenic	3.49	mg/kg	J	
4881D-WE-CONF12	Arsenic	3.39	mg/kg		
4881D-WE-CONF03	Arsenic	3.29	mg/kg		
4881D-WE-CONF04	Arsenic	2.8	mg/kg		
4881D-WE-CONF08	Arsenic	2.5	mg/kg		
4881D-WE-CONF19	Arsenic	2.47	mg/kg		
4881D-WE-CONF09	Arsenic	2.22	mg/kg	J	
4881D-WE-CONF07	Arsenic	1.63	mg/kg	J	
4881D-WE-CONF02	Arsenic	1.4	mg/kg		
4881D-WE-CONF05	Arsenic	1.23	mg/kg		
4881D-WE-CONF13	Arsenic	1.18	mg/kg	J	
4881D-WE-CONF10	Arsenic	1.15	mg/kg	J	
4881D-WE-CONF17	Arsenic	1.12	mg/kg		
DAC488-4D-9B-02	Arsenic	0.899	mg/kg	J	
DAC488-4D-9B-01	Arsenic	0.572	mg/kg	J	
4881D-WE-CONF15	Arsenic	0.527	mg/kg	J	
4881D-WE-CONF11	Arsenic	1.19	mg/kg	U	
DAC488-4D-9B-02	Barium	118	mg/kg		<260 (ECO)
4881D-WE-CONF11	Barium	104	mg/kg		
DAC488-4D-9B-01	Barium	80.4	mg/kg		
4881D-WE-CONF13	Barium	77.8	mg/kg		
4881D-WE-CONF01	Barium	56.3	mg/kg		
4881D-WE-CONF15	Barium	48.9	mg/kg		
4881D-WE-CONF03	Barium	44	mg/kg		
4881D-WE-CONF06	Barium	38.8	mg/kg		
4881D-WE-CONF05	Barium	36.3	mg/kg		
4881D-WE-CONF07	Barium	35.6	mg/kg	J	
4881D-WE-CONF16	Barium	34.5	mg/kg		
4881D-WE-CONF04	Barium	32.6	mg/kg		
4881D-WE-CONF02	Barium	27.8	mg/kg		
4881D-WE-CONF19	Barium	27.6	mg/kg		
4881D-WE-CONF09	Barium	26.3	mg/kg	J	
4881D-WE-CONF18	Barium	26.3	mg/kg		
4881D-WE-CONF08	Barium	25.7	mg/kg		
4881D-WE-CONF10	Barium	24.1	mg/kg		
4881D-WE-CONF20	Barium	23.1	mg/kg	J	

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF12	Barium	16.4	mg/kg		
4881D-WE-CONF17	Barium	12.6	mg/kg		
4881D-WE-CONF09	Beryllium	0.772	mg/kg		<25.0 (ECO)
4881D-WE-CONF13	Beryllium	0.561	mg/kg		
4881D-WE-CONF07	Beryllium	0.546	mg/kg	J	
DAC488-4D-9B-02	Beryllium	0.536	mg/kg		
4881D-WE-CONF05	Beryllium	0.423	mg/kg		
DAC488-4D-9B-01	Beryllium	0.402	mg/kg		
4881D-WE-CONF11	Beryllium	0.401	mg/kg		
4881D-WE-CONF15	Beryllium	0.371	mg/kg		
4881D-WE-CONF01	Beryllium	0.361	mg/kg		
4881D-WE-CONF03	Beryllium	0.311	mg/kg		
4881D-WE-CONF04	Beryllium	0.297	mg/kg		
4881D-WE-CONF16	Beryllium	0.293	mg/kg		
4881D-WE-CONF06	Beryllium	0.258	mg/kg		
4881D-WE-CONF02	Beryllium	0.172	mg/kg		
4881D-WE-CONF19	Beryllium	0.167	mg/kg		
4881D-WE-CONF18	Beryllium	0.139	mg/kg		
4881D-WE-CONF20	Beryllium	0.133	mg/kg		
4881D-WE-CONF17	Beryllium	0.131	mg/kg		
4881D-WE-CONF10	Beryllium	0.123	mg/kg	J	
4881D-WE-CONF08	Beryllium	0.113	mg/kg		
4881D-WE-CONF12	Beryllium	0.104	mg/kg	J	
4881D-WE-CONF09	Boron	8.59	mg/kg		< 10.0 (ECO)
4881D-WE-CONF07	Boron	8.44	mg/kg	J	
4881D-WE-CONF01	Boron	6.54	mg/kg	J	
4881D-WE-CONF20	Boron	5.55	mg/kg		
4881D-WE-CONF03	Boron	4.82	mg/kg		
4881D-WE-CONF04	Boron	3.48	mg/kg		
DAC488-4D-9B-01	Boron	3.27	mg/kg	J	
DAC488-4D-9B-02	Boron	3.11	mg/kg	J	
4881D-WE-CONF12	Boron	2.8	mg/kg	J	
4881D-WE-CONF02	Boron	2.73	mg/kg	J	
4881D-WE-CONF06	Boron	2.65	mg/kg	J	
4881D-WE-CONF05	Boron	2.36	mg/kg	J	
4881D-WE-CONF19	Boron	2.21	mg/kg	U	
4881D-WE-CONF11	Boron	2.08	mg/kg	J	
4881D-WE-CONF10	Boron	1.94	mg/kg	J	
4881D-WE-CONF15	Boron	1.82	mg/kg	J	
4881D-WE-CONF13	Boron	1.58	mg/kg	J	
4881D-WE-CONF08	Boron	1.49	mg/kg	J	

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF17	Boron	3.33	mg/kg	U	
4881D-WE-CONF16	Boron	3.31	mg/kg	U	
4881D-WE-CONF18	Boron	1.49	mg/kg	U	
4881D-WE-CONF13	Cadmium	0.245	mg/kg	U	<2.7 (ECO)
4881D-WE-CONF03	Cadmium	0.244	mg/kg	U	
4881D-WE-CONF07	Cadmium	0.244	mg/kg	U	
4881D-WE-CONF09	Cadmium	0.243	mg/kg	U	
4881D-WE-CONF15	Cadmium	0.241	mg/kg	U	
DAC488-4D-9B-02	Cadmium	0.239	mg/kg	U	
4881D-WE-CONF01	Cadmium	0.239	mg/kg	U	
4881D-WE-CONF11	Cadmium	0.238	mg/kg	U	
4881D-WE-CONF10	Cadmium	0.232	mg/kg	U	
4881D-WE-CONF20	Cadmium	0.232	mg/kg	U	
4881D-WE-CONF04	Cadmium	0.23	mg/kg	U	
4881D-WE-CONF06	Cadmium	0.229	mg/kg	U	
4881D-WE-CONF08	Cadmium	0.226	mg/kg	U	
4881D-WE-CONF17	Cadmium	0.222	mg/kg	U	
DAC488-4D-9B-01	Cadmium	0.221	mg/kg	U	
4881D-WE-CONF16	Cadmium	0.221	mg/kg	U	
4881D-WE-CONF05	Cadmium	0.22	mg/kg	U	
4881D-WE-CONF12	Cadmium	0.22	mg/kg	U	
4881D-WE-CONF18	Cadmium	0.214	mg/kg	U	
4881D-WE-CONF02	Cadmium	0.213	mg/kg	U	
4881D-WE-CONF19	Cadmium	0.209	mg/kg	U	
4881D-WE-CONF09	Chromium	30.3	mg/kg		<280 (ECO)
4881D-WE-CONF07	Chromium	27	mg/kg	J	
4881D-WE-CONF01	Chromium	26.8	mg/kg		
4881D-WE-CONF06	Chromium	21.9	mg/kg	J	
4881D-WE-CONF04	Chromium	20.7	mg/kg		
4881D-WE-CONF03	Chromium	19.7	mg/kg		
4881D-WE-CONF16	Chromium	17.7	mg/kg		
4881D-WE-CONF13	Chromium	17.4	mg/kg	J	
4881D-WE-CONF12	Chromium	17.1	mg/kg		
4881D-WE-CONF05	Chromium	16.1	mg/kg		
4881D-WE-CONF02	Chromium	13.1	mg/kg		
4881D-WE-CONF15	Chromium	12.7	mg/kg		
4881D-WE-CONF20	Chromium	12.7	mg/kg	J	
4881D-WE-CONF11	Chromium	12.6	mg/kg		
DAC488-4D-9B-01	Chromium	12	mg/kg	J	
DAC488-4D-9B-02	Chromium	11.9	mg/kg		
4881D-WE-CONF08	Chromium	11.8	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF19	Chromium	10.9	mg/kg		
4881D-WE-CONF10	Chromium	9.22	mg/kg		
4881D-WE-CONF17	Chromium	8.69	mg/kg		
4881D-WE-CONF18	Chromium	5.43	mg/kg		
4881D-WE-CONF09	Chromium, Hexavalent	**1.94**	mg/kg	J	**0.29 (HH)**
4881D-WE-CONF06	Chromium, Hexavalent	**1.36**	mg/kg		
4881D-WE-CONF13	Chromium, Hexavalent	**1.15**	mg/kg	J	
4881D-WE-CONF11	Chromium, Hexavalent	**1.06**	mg/kg		
4881D-WE-CONF02	Chromium, Hexavalent	**0.637**	mg/kg		
DAC488-4D-9B-01	Chromium, Hexavalent	**0.627**	mg/kg		
4881D-WE-CONF07	Chromium, Hexavalent	**0.592**	mg/kg		
4881D-WE-CONF05	Chromium, Hexavalent	**0.585**	mg/kg		
4881D-WE-CONF08	Chromium, Hexavalent	**0.582**	mg/kg		
4881D-WE-CONF16	Chromium, Hexavalent	**0.574**	mg/kg		
4881D-WE-CONF20	Chromium, Hexavalent	**0.409**	mg/kg		
4881D-WE-CONF04	Chromium, Hexavalent	**0.397**	mg/kg	J	
4881D-WE-CONF10	Chromium, Hexavalent	**0.337**	mg/kg	J	
4881D-WE-CONF12	Chromium, Hexavalent	0.217	mg/kg	J	
DAC488-4D-9B-02	Chromium, Hexavalent	0.214	mg/kg	J	
4881D-WE-CONF15	Chromium, Hexavalent	0.199	mg/kg	J	
4881D-WE-CONF03	Chromium, Hexavalent	0.461	mg/kg	U	
4881D-WE-CONF01	Chromium, Hexavalent	0.429	mg/kg	UJ	
4881D-WE-CONF17	Chromium, Hexavalent	0.424	mg/kg	U	
4881D-WE-CONF19	Chromium, Hexavalent	0.407	mg/kg	U	
4881D-WE-CONF18	Chromium, Hexavalent	0.345	mg/kg	U	
4881D-WE-CONF09	Cobalt	4.94	mg/kg		<23.0 (HH)
4881D-WE-CONF07	Cobalt	3.02	mg/kg	J	
4881D-WE-CONF11	Cobalt	2.43	mg/kg		
4881D-WE-CONF16	Cobalt	2.21	mg/kg		
4881D-WE-CONF01	Cobalt	2.01	mg/kg		
4881D-WE-CONF13	Cobalt	1.91	mg/kg		
4881D-WE-CONF04	Cobalt	1.89	mg/kg		
4881D-WE-CONF05	Cobalt	1.81	mg/kg		
4881D-WE-CONF03	Cobalt	1.7	mg/kg		
4881D-WE-CONF15	Cobalt	1.4	mg/kg		
4881D-WE-CONF06	Cobalt	1.27	mg/kg		
DAC488-4D-9B-02	Cobalt	1.23	mg/kg		
DAC488-4D-9B-01	Cobalt	1.16	mg/kg		
4881D-WE-CONF02	Cobalt	1.14	mg/kg		
4881D-WE-CONF20	Cobalt	1.11	mg/kg		
4881D-WE-CONF18	Cobalt	0.938	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF10	Cobalt	0.87	mg/kg		
4881D-WE-CONF12	Cobalt	0.731	mg/kg		
4881D-WE-CONF19	Cobalt	0.552	mg/kg		
4881D-WE-CONF08	Cobalt	0.474	mg/kg		
4881D-WE-CONF17	Cobalt	0.43	mg/kg		
4881D-WE-CONF07	Copper	9.89	mg/kg	J	<46.0 (ECO)
4881D-WE-CONF09	Copper	9.12	mg/kg		
4881D-WE-CONF06	Copper	5.94	mg/kg		
4881D-WE-CONF04	Copper	5.85	mg/kg		
4881D-WE-CONF01	Copper	5.79	mg/kg		
4881D-WE-CONF03	Copper	5.72	mg/kg		
4881D-WE-CONF05	Copper	5.41	mg/kg		
4881D-WE-CONF16	Copper	3.25	mg/kg		
4881D-WE-CONF02	Copper	3.19	mg/kg		
DAC488-4D-9B-02	Copper	2.81	mg/kg		
4881D-WE-CONF19	Copper	2.37	mg/kg		
4881D-WE-CONF11	Copper	2.35	mg/kg		
4881D-WE-CONF10	Copper	2.26	mg/kg		
4881D-WE-CONF08	Copper	2.11	mg/kg		
4881D-WE-CONF20	Copper	2.09	mg/kg		
DAC488-4D-9B-01	Copper	2.05	mg/kg		
4881D-WE-CONF17	Copper	2.02	mg/kg		
4881D-WE-CONF12	Copper	1.96	mg/kg		
4881D-WE-CONF18	Copper	1.83	mg/kg		
4881D-WE-CONF13	Copper	1.81	mg/kg		
4881D-WE-CONF15	Copper	1.19	mg/kg		
4881D-WE-CONF09	Iron	37,400	mg/kg		<55,000 (HH)
4881D-WE-CONF16	Iron	31,500	mg/kg		
4881D-WE-CONF07	Iron	30,200	mg/kg	J	
4881D-WE-CONF13	Iron	28,300	mg/kg		
4881D-WE-CONF06	Iron	25,000	mg/kg		
4881D-WE-CONF01	Iron	22,300	mg/kg		
4881D-WE-CONF03	Iron	22,000	mg/kg		
4881D-WE-CONF05	Iron	20,700	mg/kg		
4881D-WE-CONF04	Iron	17,500	mg/kg		
4881D-WE-CONF15	Iron	14,000	mg/kg		
4881D-WE-CONF11	Iron	11,600	mg/kg		
4881D-WE-CONF02	Iron	10,100	mg/kg		
4881D-WE-CONF12	Iron	9,200	mg/kg		
DAC488-4D-9B-02	Iron	7,850	mg/kg		
4881D-WE-CONF17	Iron	7,730	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF19	Iron	7,580	mg/kg		
DAC488-4D-9B-01	Iron	7,000	mg/kg		
4881D-WE-CONF20	Iron	6,900	mg/kg		
4881D-WE-CONF10	Iron	5,770	mg/kg		
4881D-WE-CONF08	Iron	4,970	mg/kg		
4881D-WE-CONF18	Iron	3,960	mg/kg		
DAC488-4D-9B-02	Lead	15.8	mg/kg		<28.0 (ECO)
DAC488-4D-9B-01	Lead	13.7	mg/kg		
4881D-WE-CONF09	Lead	13.3	mg/kg	J	
4881D-WE-CONF01	Lead	12.6	mg/kg	J	
4881D-WE-CONF04	Lead	12	mg/kg		
4881D-WE-CONF06	Lead	10.8	mg/kg		
4881D-WE-CONF07	Lead	10.7	mg/kg	J	
4881D-WE-CONF15	Lead	10.3	mg/kg		
4881D-WE-CONF13	Lead	10.1	mg/kg	J	
4881D-WE-CONF03	Lead	9.75	mg/kg		
4881D-WE-CONF11	Lead	9.67	mg/kg		
4881D-WE-CONF16	Lead	8.81	mg/kg		
4881D-WE-CONF05	Lead	8.79	mg/kg		
4881D-WE-CONF08	Lead	8.6	mg/kg		
4881D-WE-CONF02	Lead	8.16	mg/kg		
4881D-WE-CONF20	Lead	7.32	mg/kg	J	
4881D-WE-CONF10	Lead	7.21	mg/kg		
4881D-WE-CONF19	Lead	7.11	mg/kg		
4881D-WE-CONF12	Lead	7.02	mg/kg		
4881D-WE-CONF17	Lead	5.93	mg/kg		
4881D-WE-CONF18	Lead	4.6	mg/kg		
4881D-WE-CONF01	Magnesium	595	mg/kg		None
4881D-WE-CONF07	Magnesium	495	mg/kg	J	
4881D-WE-CONF16	Magnesium	477	mg/kg		
DAC488-4D-9B-02	Magnesium	424	mg/kg		
4881D-WE-CONF09	Magnesium	423	mg/kg	J	
DAC488-4D-9B-01	Magnesium	373	mg/kg		
4881D-WE-CONF04	Magnesium	353	mg/kg		
4881D-WE-CONF03	Magnesium	352	mg/kg		
4881D-WE-CONF02	Magnesium	343	mg/kg		
4881D-WE-CONF20	Magnesium	326	mg/kg	J	
4881D-WE-CONF05	Magnesium	315	mg/kg		
4881D-WE-CONF06	Magnesium	313	mg/kg	J	
4881D-WE-CONF13	Magnesium	271	mg/kg		
4881D-WE-CONF15	Magnesium	268	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF19	Magnesium	232	mg/kg		
4881D-WE-CONF18	Magnesium	215	mg/kg		
4881D-WE-CONF12	Magnesium	209	mg/kg		
4881D-WE-CONF10	Magnesium	208	mg/kg		
4881D-WE-CONF11	Magnesium	162	mg/kg		
4881D-WE-CONF08	Magnesium	156	mg/kg		
4881D-WE-CONF17	Magnesium	131	mg/kg		
4881D-WE-CONF16	Manganese	34.7	mg/kg		<1,100 (ECO)
4881D-WE-CONF01	Manganese	31.9	mg/kg		
DAC488-4D-9B-01	Manganese	31.8	mg/kg		
4881D-WE-CONF19	Manganese	29.7	mg/kg		
4881D-WE-CONF18	Manganese	23	mg/kg		
4881D-WE-CONF20	Manganese	19.7	mg/kg	J	
DAC488-4D-9B-02	Manganese	17.3	mg/kg		
4881D-WE-CONF15	Manganese	16.9	mg/kg		
4881D-WE-CONF06	Manganese	15.9	mg/kg		
4881D-WE-CONF07	Manganese	15.8	mg/kg	J	
4881D-WE-CONF02	Manganese	13.4	mg/kg		
4881D-WE-CONF05	Manganese	13.4	mg/kg		
4881D-WE-CONF03	Manganese	12.8	mg/kg		
4881D-WE-CONF08	Manganese	11.9	mg/kg		
4881D-WE-CONF04	Manganese	11.7	mg/kg		
4881D-WE-CONF09	Manganese	11.3	mg/kg	J	
4881D-WE-CONF17	Manganese	10.8	mg/kg		
4881D-WE-CONF13	Manganese	10.7	mg/kg		
4881D-WE-CONF10	Manganese	9.93	mg/kg		
4881D-WE-CONF11	Manganese	9.52	mg/kg		
4881D-WE-CONF12	Manganese	9.15	mg/kg		
DAC488-4D-9B-02	Mercury	**0.174**	mg/kg	J	**0.13 (ECO)**
4881D-WE-CONF01	Mercury	**0.139**	mg/kg	J	
4881D-WE-CONF03	Mercury	**0.131**	mg/kg		
4881D-WE-CONF06	Mercury	0.0996	mg/kg	J	
4881D-WE-CONF13	Mercury	0.0562	mg/kg		
4881D-WE-CONF16	Mercury	0.0561	mg/kg		
4881D-WE-CONF12	Mercury	0.0549	mg/kg		
4881D-WE-CONF08	Mercury	0.0532	mg/kg		
4881D-WE-CONF02	Mercury	0.0506	mg/kg		
4881D-WE-CONF05	Mercury	0.0471	mg/kg		
4881D-WE-CONF04	Mercury	0.0455	mg/kg		
4881D-WE-CONF11	Mercury	0.0449	mg/kg	J	
4881D-WE-CONF07	Mercury	0.0441	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF15	Mercury	0.0426	mg/kg		
4881D-WE-CONF10	Mercury	0.0397	mg/kg	J	
4881D-WE-CONF18	Mercury	0.0297	mg/kg		
4881D-WE-CONF19	Mercury	0.027	mg/kg		
4881D-WE-CONF20	Mercury	0.0247	mg/kg		
DAC488-4D-9B-01	Mercury	0.0204	mg/kg		
4881D-WE-CONF17	Mercury	0.0113	mg/kg	J	
4881D-WE-CONF09	Mercury	0.00562	mg/kg	J	
4881D-WE-CONF06	Molybdenum	0.347	mg/kg	J	<170 (ECO)
4881D-WE-CONF01	Molybdenum	0.33	mg/kg	J	
4881D-WE-CONF18	Molybdenum	0.317	mg/kg		
4881D-WE-CONF03	Molybdenum	0.277	mg/kg		
4881D-WE-CONF20	Molybdenum	0.271	mg/kg	J	
4881D-WE-CONF02	Molybdenum	0.267	mg/kg		
4881D-WE-CONF04	Molybdenum	0.249	mg/kg		
4881D-WE-CONF19	Molybdenum	0.202	mg/kg	J	
4881D-WE-CONF07	Molybdenum	0.201	mg/kg	J	
4881D-WE-CONF09	Molybdenum	0.17	mg/kg	J	
4881D-WE-CONF05	Molybdenum	0.163	mg/kg	J	
4881D-WE-CONF16	Molybdenum	0.16	mg/kg	J	
4881D-WE-CONF17	Molybdenum	0.103	mg/kg	J	
DAC488-4D-9B-02	Molybdenum	0.0996	mg/kg	J	
4881D-WE-CONF13	Molybdenum	0.245	mg/kg	UJ	
4881D-WE-CONF15	Molybdenum	0.241	mg/kg	U	
4881D-WE-CONF11	Molybdenum	0.238	mg/kg	U	
4881D-WE-CONF10	Molybdenum	0.232	mg/kg	U	
4881D-WE-CONF08	Molybdenum	0.226	mg/kg	U	
DAC488-4D-9B-01	Molybdenum	0.221	mg/kg	UJ	
4881D-WE-CONF12	Molybdenum	0.22	mg/kg	U	
4881D-WE-CONF01	Nickel	5.28	mg/kg	J	<19.0 (ECO)
4881D-WE-CONF02	Nickel	4.83	mg/kg		
4881D-WE-CONF09	Nickel	4.17	mg/kg	J	
4881D-WE-CONF04	Nickel	4.14	mg/kg		
4881D-WE-CONF03	Nickel	3.99	mg/kg		
4881D-WE-CONF07	Nickel	3.77	mg/kg	J	
4881D-WE-CONF13	Nickel	3.03	mg/kg		
4881D-WE-CONF05	Nickel	3	mg/kg		
4881D-WE-CONF06	Nickel	2.91	mg/kg	J	
4881D-WE-CONF16	Nickel	2.76	mg/kg		
DAC488-4D-9B-02	Nickel	2.75	mg/kg		
DAC488-4D-9B-01	Nickel	2.54	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF18	Nickel	2.48	mg/kg		
4881D-WE-CONF11	Nickel	2.44	mg/kg		
4881D-WE-CONF15	Nickel	2.4	mg/kg		
4881D-WE-CONF19	Nickel	2.34	mg/kg		
4881D-WE-CONF20	Nickel	2.24	mg/kg		
4881D-WE-CONF12	Nickel	1.71	mg/kg		
4881D-WE-CONF17	Nickel	1.6	mg/kg		
4881D-WE-CONF10	Nickel	1.54	mg/kg		
4881D-WE-CONF08	Nickel	1.32	mg/kg		
4881D-WE-CONF01	Selenium	1.49	mg/kg	J	<7.8 (ECO)
4881D-WE-CONF06	Selenium	1.45	mg/kg	J	
4881D-WE-CONF13	Selenium	1.4	mg/kg	J	
4881D-WE-CONF16	Selenium	1.23	mg/kg		
4881D-WE-CONF02	Selenium	1.16	mg/kg		
4881D-WE-CONF05	Selenium	1.15	mg/kg		
4881D-WE-CONF03	Selenium	1.14	mg/kg	J	
4881D-WE-CONF15	Selenium	1.1	mg/kg	J	
4881D-WE-CONF09	Selenium	1.09	mg/kg	J	
4881D-WE-CONF04	Selenium	1.03	mg/kg	J	
4881D-WE-CONF20	Selenium	0.876	mg/kg	J	
4881D-WE-CONF12	Selenium	0.832	mg/kg	J	
DAC488-4D-9B-02	Selenium	0.821	mg/kg	J	
4881D-WE-CONF07	Selenium	0.775	mg/kg	J	
DAC488-4D-9B-01	Selenium	0.727	mg/kg	J	
4881D-WE-CONF08	Selenium	0.631	mg/kg	J	
4881D-WE-CONF11	Selenium	0.623	mg/kg	J	
4881D-WE-CONF17	Selenium	0.516	mg/kg	J	
4881D-WE-CONF10	Selenium	0.448	mg/kg	J	
4881D-WE-CONF18	Selenium	1.07	mg/kg	U	
4881D-WE-CONF19	Selenium	1.04	mg/kg	U	
DAC488-4D-9B-02	Silver	0.193	mg/kg	J	<26.0 (ECO)
DAC488-4D-9B-01	Silver	0.125	mg/kg	J	
4881D-WE-CONF07	Silver	6.07	mg/kg	U	
4881D-WE-CONF09	Silver	0.624	mg/kg	U	
4881D-WE-CONF03	Silver	0.616	mg/kg	U	
4881D-WE-CONF11	Silver	0.612	mg/kg	U	
4881D-WE-CONF06	Silver	0.602	mg/kg	U	
4881D-WE-CONF15	Silver	0.599	mg/kg	U	
4881D-WE-CONF13	Silver	0.59	mg/kg	U	
4881D-WE-CONF04	Silver	0.588	mg/kg	U	
4881D-WE-CONF01	Silver	0.568	mg/kg	U	

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF08	Silver	0.565	mg/kg	U	
4881D-WE-CONF12	Silver	0.561	mg/kg	U	
4881D-WE-CONF10	Silver	0.557	mg/kg	U	
4881D-WE-CONF16	Silver	0.551	mg/kg	U	
4881D-WE-CONF20	Silver	0.55	mg/kg	U	
4881D-WE-CONF05	Silver	0.546	mg/kg	U	
4881D-WE-CONF02	Silver	0.539	mg/kg	U	
4881D-WE-CONF17	Silver	0.539	mg/kg	U	
4881D-WE-CONF19	Silver	0.531	mg/kg	U	
4881D-WE-CONF18	Silver	0.521	mg/kg	U	
4881D-WE-CONF01	Strontium	60.7	mg/kg		<960 (ECO)
DAC488-4D-9B-02	Strontium	57.5	mg/kg		
4881D-WE-CONF20	Strontium	57.2	mg/kg		
4881D-WE-CONF16	Strontium	56.3	mg/kg		
DAC488-4D-9B-01	Strontium	33	mg/kg		
4881D-WE-CONF08	Strontium	22	mg/kg		
4881D-WE-CONF03	Strontium	20.5	mg/kg		
4881D-WE-CONF07	Strontium	20.3	mg/kg	J	
4881D-WE-CONF19	Strontium	17.1	mg/kg		
4881D-WE-CONF18	Strontium	14.7	mg/kg		
4881D-WE-CONF05	Strontium	12.9	mg/kg		
4881D-WE-CONF06	Strontium	10.3	mg/kg	J	
4881D-WE-CONF12	Strontium	8.1	mg/kg		
4881D-WE-CONF11	Strontium	7.92	mg/kg		
4881D-WE-CONF09	Strontium	7.55	mg/kg	J	
4881D-WE-CONF04	Strontium	7.25	mg/kg		
4881D-WE-CONF13	Strontium	6.38	mg/kg		
4881D-WE-CONF10	Strontium	6.3	mg/kg		
4881D-WE-CONF02	Strontium	6.06	mg/kg		
4881D-WE-CONF15	Strontium	5.58	mg/kg		
4881D-WE-CONF17	Strontium	3.16	mg/kg		
4881D-WE-CONF04	Thallium	0.49	mg/kg		<6.3 (HH and ECO)
4881D-WE-CONF07	Thallium	0.383	mg/kg	J	
4881D-WE-CONF09	Thallium	0.37	mg/kg	J	
4881D-WE-CONF01	Thallium	0.343	mg/kg	J	
4881D-WE-CONF06	Thallium	0.326	mg/kg	J	
4881D-WE-CONF03	Thallium	0.302	mg/kg	J	
4881D-WE-CONF05	Thallium	0.286	mg/kg	J	
DAC488-4D-9B-02	Thallium	0.241	mg/kg	J	
4881D-WE-CONF02	Thallium	0.239	mg/kg	J	
DAC488-4D-9B-01	Thallium	0.216	mg/kg	J	

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF13	Thallium	0.207	mg/kg	J	
4881D-WE-CONF10	Thallium	0.194	mg/kg	J	
4881D-WE-CONF16	Thallium	0.183	mg/kg	J	
4881D-WE-CONF11	Thallium	0.174	mg/kg	J	
4881D-WE-CONF15	Thallium	0.17	mg/kg	J	
4881D-WE-CONF20	Thallium	0.464	mg/kg	U	
4881D-WE-CONF08	Thallium	0.451	mg/kg	U	
4881D-WE-CONF17	Thallium	0.443	mg/kg	U	
4881D-WE-CONF12	Thallium	0.44	mg/kg	U	
4881D-WE-CONF18	Thallium	0.429	mg/kg	U	
4881D-WE-CONF19	Thallium	0.417	mg/kg	U	
4881D-WE-CONF09	Vanadium	**80.5**	mg/kg		69.9 (ECO)
4881D-WE-CONF07	Vanadium	**77.3**	mg/kg	J	
4881D-WE-CONF06	Vanadium	**70.1**	mg/kg		
4881D-WE-CONF04	Vanadium	69.1	mg/kg		
4881D-WE-CONF01	Vanadium	62.7	mg/kg		
4881D-WE-CONF05	Vanadium	54.7	mg/kg		
4881D-WE-CONF16	Vanadium	52.9	mg/kg		
4881D-WE-CONF08	Vanadium	39.7	mg/kg		
4881D-WE-CONF03	Vanadium	38.9	mg/kg		
4881D-WE-CONF13	Vanadium	35.8	mg/kg		
4881D-WE-CONF12	Vanadium	35.2	mg/kg		
DAC488-4D-9B-01	Vanadium	31.8	mg/kg		
4881D-WE-CONF11	Vanadium	28.9	mg/kg		
4881D-WE-CONF02	Vanadium	27.4	mg/kg		
4881D-WE-CONF10	Vanadium	25	mg/kg		
4881D-WE-CONF20	Vanadium	21.8	mg/kg	J	
DAC488-4D-9B-02	Vanadium	21.4	mg/kg		
4881D-WE-CONF15	Vanadium	20.5	mg/kg		
4881D-WE-CONF19	Vanadium	19.3	mg/kg		
4881D-WE-CONF17	Vanadium	17	mg/kg		
4881D-WE-CONF18	Vanadium	10.6	mg/kg		
4881D-WE-CONF09	Zinc	11.9	mg/kg	J	<480 (ECO)
4881D-WE-CONF01	Zinc	11.1	mg/kg	J	
4881D-WE-CONF13	Zinc	11.1	mg/kg	J	
4881D-WE-CONF07	Zinc	10.5	mg/kg	J	
4881D-WE-CONF16	Zinc	8.57	mg/kg		
4881D-WE-CONF04	Zinc	8.31	mg/kg		
4881D-WE-CONF05	Zinc	8.2	mg/kg		
4881D-WE-CONF03	Zinc	8	mg/kg		
4881D-WE-CONF02	Zinc	7.75	mg/kg		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF06	Zinc	6.96	mg/kg	J	
4881D-WE-CONF19	Zinc	6.54	mg/kg		
4881D-WE-CONF18	Zinc	6.32	mg/kg		
4881D-WE-CONF20	Zinc	5.57	mg/kg		
4881D-WE-CONF11	Zinc	5.37	mg/kg		
4881D-WE-CONF15	Zinc	5.37	mg/kg		
4881D-WE-CONF10	Zinc	5	mg/kg		
DAC488-4D-9B-02	Zinc	4.9	mg/kg		
4881D-WE-CONF08	Zinc	3.86	mg/kg		
4881D-WE-CONF17	Zinc	3.79	mg/kg		
DAC488-4D-9B-01	Zinc	3.48	mg/kg		
4881D-WE-CONF12	Zinc	3.48	mg/kg		
4881D-WE-CONF19	Actinium-228 (Radium-228+D)	**2.37**	pCi/g		**2.2 (HH)**
4881D-WE-CONF07	Actinium-228 (Radium-228+D)	2.08	pCi/g		
4881D-WE-CONF17	Actinium-228 (Radium-228+D)	1.76	pCi/g		
4881D-WE-CONF09	Actinium-228 (Radium-228+D)	1.73	pCi/g		
4881D-WE-CONF05	Actinium-228 (Radium-228+D)	1.69	pCi/g		
4881D-WE-CONF03	Actinium-228 (Radium-228+D)	1.55	pCi/g		
4881D-WE-CONF18	Actinium-228 (Radium-228+D)	1.43	pCi/g		
4881D-WE-CONF06	Actinium-228 (Radium-228+D)	1.36	pCi/g		
4881D-WE-CONF01	Actinium-228 (Radium-228+D)	1.35	pCi/g		
DAC488-4D-9B-02	Actinium-228 (Radium-228+D)	1.35	pCi/g		
4881D-WE-CONF04	Actinium-228 (Radium-228+D)	1.31	pCi/g		
4881D-WE-CONF16	Actinium-228 (Radium-228+D)	1.26	pCi/g		
4881D-WE-CONF15	Actinium-228 (Radium-228+D)	1.24	pCi/g		
4881D-WE-CONF13	Actinium-228 (Radium-228+D)	1.22	pCi/g		
DAC488-4D-9B-01	Actinium-228 (Radium-228+D)	1.2	pCi/g		
4881D-WE-CONF10	Actinium-228 (Radium-228+D)	1.19	pCi/g		
4881D-WE-CONF08	Actinium-228 (Radium-228+D)	1.18	pCi/g		
4881D-WE-CONF02	Actinium-228 (Radium-228+D)	1.1	pCi/g		
4881D-WE-CONF20	Actinium-228 (Radium-228+D)	1.08	pCi/g		
4881D-WE-CONF11	Actinium-228 (Radium-228+D)	1	pCi/g		
4881D-WE-CONF12	Actinium-228 (Radium-228+D)	0.986	pCi/g		
4881D-WE-CONF19	Lead-212 (Thorium-228+D)	**2.33**	pCi/g		**2.3 (HH)**
4881D-WE-CONF17	Lead-212 (Thorium-228+D)	1.88	pCi/g		
4881D-WE-CONF07	Lead-212 (Thorium-228+D)	1.67	pCi/g		
4881D-WE-CONF03	Lead-212 (Thorium-228+D)	1.52	pCi/g		
4881D-WE-CONF09	Lead-212 (Thorium-228+D)	1.46	pCi/g		
4881D-WE-CONF04	Lead-212 (Thorium-228+D)	1.45	pCi/g		
4881D-WE-CONF01	Lead-212 (Thorium-228+D)	1.44	pCi/g		
4881D-WE-CONF08	Lead-212 (Thorium-228+D)	1.41	pCi/g		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF18	Lead-212 (Thorium-228+D)	1.4	pCi/g		
4881D-WE-CONF06	Lead-212 (Thorium-228+D)	1.36	pCi/g		
4881D-WE-CONF05	Lead-212 (Thorium-228+D)	1.35	pCi/g		
4881D-WE-CONF10	Lead-212 (Thorium-228+D)	1.35	pCi/g		
4881D-WE-CONF02	Lead-212 (Thorium-228+D)	1.28	pCi/g		
4881D-WE-CONF12	Lead-212 (Thorium-228+D)	1.25	pCi/g		
4881D-WE-CONF16	Lead-212 (Thorium-228+D)	1.25	pCi/g		
DAC488-4D-9B-01	Lead-212 (Thorium-228+D)	1.24	pCi/g		
4881D-WE-CONF20	Lead-212 (Thorium-228+D)	1.23	pCi/g		
DAC488-4D-9B-02	Lead-212 (Thorium-228+D)	1.19	pCi/g	J	
4881D-WE-CONF11	Lead-212 (Thorium-228+D)	1.11	pCi/g		
4881D-WE-CONF15	Lead-212 (Thorium-228+D)	1.11	pCi/g		
4881D-WE-CONF13	Lead-212 (Thorium-228+D)	0.882	pCi/g		
DAC488-4D-9B-01	Lead-214 (Radium-226+D)	**1.39**	pCi/g		**1.2 (HH)**
4881D-WE-CONF05	Lead-214 (Radium-226+D)	**1.38**	pCi/g		
4881D-WE-CONF02	Lead-214 (Radium-226+D)	**1.36**	pCi/g		
4881D-WE-CONF03	Lead-214 (Radium-226+D)	**1.35**	pCi/g		
DAC488-4D-9B-02	Lead-214 (Radium-226+D)	**1.35**	pCi/g		
4881D-WE-CONF04	Lead-214 (Radium-226+D)	**1.34**	pCi/g		
4881D-WE-CONF01	Lead-214 (Radium-226+D)	**1.31**	pCi/g		
4881D-WE-CONF19	Lead-214 (Radium-226+D)	**1.27**	pCi/g		
4881D-WE-CONF06	Lead-214 (Radium-226+D)	1.17	pCi/g		
4881D-WE-CONF15	Lead-214 (Radium-226+D)	1.15	pCi/g		
4881D-WE-CONF08	Lead-214 (Radium-226+D)	1.14	pCi/g		
4881D-WE-CONF12	Lead-214 (Radium-226+D)	1.07	pCi/g		
4881D-WE-CONF07	Lead-214 (Radium-226+D)	1.05	pCi/g		
4881D-WE-CONF16	Lead-214 (Radium-226+D)	1.04	pCi/g		
4881D-WE-CONF09	Lead-214 (Radium-226+D)	0.971	pCi/g		
4881D-WE-CONF10	Lead-214 (Radium-226+D)	0.93	pCi/g		
4881D-WE-CONF11	Lead-214 (Radium-226+D)	0.915	pCi/g		
4881D-WE-CONF18	Lead-214 (Radium-226+D)	0.9	pCi/g		
4881D-WE-CONF13	Lead-214 (Radium-226+D)	0.894	pCi/g		
4881D-WE-CONF17	Lead-214 (Radium-226+D)	0.894	pCi/g		
4881D-WE-CONF20	Lead-214 (Radium-226+D)	0.809	pCi/g		
4881D-WE-CONF19	Potassium-40	**4.91**	pCi/g		**3.3 (HH)**
4881D-WE-CONF17	Potassium-40	**3.38**	pCi/g		
4881D-WE-CONF07	Potassium-40	3.11	pCi/g		
4881D-WE-CONF06	Potassium-40	2.57	pCi/g		
4881D-WE-CONF08	Potassium-40	2.52	pCi/g		
4881D-WE-CONF03	Potassium-40	2.5	pCi/g		
DAC488-4D-9B-02	Potassium-40	2.46	pCi/g	J	

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF18	Potassium-40	2.26	pCi/g	J	
4881D-WE-CONF09	Potassium-40	2.25	pCi/g		
4881D-WE-CONF16	Potassium-40	2.21	pCi/g		
4881D-WE-CONF12	Potassium-40	2.15	pCi/g		
DAC488-4D-9B-01	Potassium-40	2.15	pCi/g		
4881D-WE-CONF10	Potassium-40	2.06	pCi/g		
4881D-WE-CONF15	Potassium-40	1.95	pCi/g	J	
4881D-WE-CONF13	Potassium-40	1.93	pCi/g	J	
4881D-WE-CONF04	Potassium-40	1.86	pCi/g	J	
4881D-WE-CONF20	Potassium-40	1.84	pCi/g	J	
4881D-WE-CONF01	Potassium-40	1.79	pCi/g	J	
4881D-WE-CONF11	Potassium-40	1.78	pCi/g	J	
4881D-WE-CONF02	Potassium-40	1.36	pCi/g	J	
4881D-WE-CONF05	Potassium-40	1.14	pCi/g	J	
4881D-WE-CONF17	Uranium-235	**0.29**	pCi/g	J	**0.194 (HH)**
4881D-WE-CONF05	Uranium-235	**0.281**	pCi/g	J	
4881D-WE-CONF11	Uranium-235	**0.209**	pCi/g	J	
4881D-WE-CONF04	Uranium-235	0.146	pCi/g	J	
4881D-WE-CONF01	Uranium-235	0.128	pCi/g	J	
4881D-WE-CONF07	Uranium-235	0.128	pCi/g	J	
4881D-WE-CONF08	Uranium-235	0.128	pCi/g	J	
4881D-WE-CONF09	Uranium-235	0.104	pCi/g	J	
4881D-WE-CONF12	Uranium-235	0.0937	pCi/g	J	
4881D-WE-CONF10	Uranium-235	0.0854	pCi/g	J	
4881D-WE-CONF13	Uranium-235	0.151	pCi/g	U	
4881D-WE-CONF06	Uranium-235	0.144	pCi/g	U	
4881D-WE-CONF15	Uranium-235	0.131	pCi/g	U	
4881D-WE-CONF03	Uranium-235	0.0906	pCi/g	U	
4881D-WE-CONF18	Uranium-235	0.0899	pCi/g	U	
DAC488-4D-9B-02	Uranium-235	0.085	pCi/g	U	
4881D-WE-CONF20	Uranium-235	0.0815	pCi/g	U	
4881D-WE-CONF19	Uranium-235	0.0806	pCi/g	U	
4881D-WE-CONF16	Uranium-235	0.0602	pCi/g	U	
4881D-WE-CONF02	Uranium-235	0.0586	pCi/g	U	
DAC488-4D-9B-01	Uranium-235	0.0157	pCi/g	U	
4881D-WE-CONF07	Uranium-238	**1.21**	pCi/g		**1.20 (HH)**
4881D-WE-CONF11	Uranium-238	1.11	pCi/g		
4881D-WE-CONF09	Uranium-238	1.09	pCi/g		
4881D-WE-CONF06	Uranium-238	1.04	pCi/g	J	
4881D-WE-CONF17	Uranium-238	1.02	pCi/g		
4881D-WE-CONF05	Uranium-238	0.995	pCi/g		

488-1D ASH BASIN FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-WE-CONF03	Uranium-238	0.99	pCi/g		
4881D-WE-CONF01	Uranium-238	0.963	pCi/g		
4881D-WE-CONF04	Uranium-238	0.902	pCi/g		
4881D-WE-CONF08	Uranium-238	0.882	pCi/g		
4881D-WE-CONF02	Uranium-238	0.872	pCi/g		
4881D-WE-CONF19	Uranium-238	0.868	pCi/g		
4881D-WE-CONF13	Uranium-238	0.813	pCi/g	J	
4881D-WE-CONF10	Uranium-238	0.767	pCi/g		
4881D-WE-CONF12	Uranium-238	0.762	pCi/g		
DAC488-4D-9B-02	Uranium-238	0.74	pCi/g		
4881D-WE-CONF15	Uranium-238	0.716	pCi/g	J	
4881D-WE-CONF16	Uranium-238	0.711	pCi/g	J	
DAC488-4D-9B-01	Uranium-238	0.648	pCi/g		
4881D-WE-CONF18	Uranium-238	0.631	pCi/g		
4881D-WE-CONF20	Uranium-238	0.584	pCi/g		

Reported result for U-qualified data (nondetect) is the practical quantitation limit.
Bolded numbers indicate exceedance of threshold level
HH = human health
ECO = ecological

FIELD DUPLICATE SAMPLE RESULTS

Station ID	Analyte	Result	Result Units	Review Qualifier	Field QC Code
4881D-WE-CONF10	Aluminum	11,200	mg/kg		FD
4881D-WE-CONF10	Antimony	1.16	mg/kg	U	FD
4881D-WE-CONF10	Arsenic	1.43	mg/kg		FD
4881D-WE-CONF10	Barium	19.3	mg/kg	J	FD
4881D-WE-CONF10	Beryllium	0.112	mg/kg		FD
4881D-WE-CONF10	Boron	1.94	mg/kg	J	FD
4881D-WE-CONF10	Cadmium	0.225	mg/kg	U	FD
4881D-WE-CONF10	Chromium	9.8	mg/kg	J	FD
4881D-WE-CONF10	Chromium, Hexavalent	0.312	mg/kg	J	FD
4881D-WE-CONF10	Cobalt	0.818	mg/kg		FD
4881D-WE-CONF10	Copper	2.07	mg/kg		FD
4881D-WE-CONF10	Iron	6950	mg/kg		FD
4881D-WE-CONF10	Lead	7.03	mg/kg	J	FD
4881D-WE-CONF10	Magnesium	193	mg/kg	J	FD
4881D-WE-CONF10	Manganese	10.1	mg/kg	J	FD
4881D-WE-CONF10	Mercury	0.0388	mg/kg	J	FD
4881D-WE-CONF10	Molybdenum	0.225	mg/kg	UJ	FD
4881D-WE-CONF10	Nickel	2.11	mg/kg	J	FD
4881D-WE-CONF10	Selenium	0.463	mg/kg	J	FD
4881D-WE-CONF10	Silver	0.58	mg/kg	U	FD
4881D-WE-CONF10	Strontium	5.58	mg/kg	J	FD
4881D-WE-CONF10	Thallium	0.177	mg/kg	J	FD
4881D-WE-CONF10	Vanadium	22.6	mg/kg	J	FD
4881D-WE-CONF10	Zinc	3.69	mg/kg	J	FD
4881D-WE-CONF10	Actinium-228	1.47	pCi/g		FD
4881D-WE-CONF10	Actinium-228	1.09	pCi/g		FD
4881D-WE-CONF10	Lead-212	1.24	pCi/g		FD
4881D-WE-CONF10	Lead-212	1.3	pCi/g		FD
4881D-WE-CONF10	Lead-214	0.998	pCi/g		FD
4881D-WE-CONF10	Lead-214	1.11	pCi/g		FD
4881D-WE-CONF10	Potassium-40	1.79	pCi/g		FD
4881D-WE-CONF10	Potassium-40	1.49	pCi/g		FD
4881D-WE-CONF10	Uranium-233/234	0.945	pCi/g		FD
4881D-WE-CONF10	Uranium-233/234	1.06	pCi/g		FD
4881D-WE-CONF10	Uranium-235	0.041	pCi/g	U	FD
4881D-WE-CONF10	Uranium-235	0.105	pCi/g	J	FD
4881D-WE-CONF10	Uranium-238	0.82	pCi/g		FD
4881D-WE-CONF10	Uranium-238	0.821	pCi/g		FD
DAC488-4D-9B-02	Aluminum	24,200	mg/kg		FD
DAC488-4D-9B-02	Antimony	1.23	mg/kg	U	FD
DAC488-4D-9B-02	Arsenic	0.903	mg/kg	J	FD
DAC488-4D-9B-02	Barium	125	mg/kg		FD

FIELD DUPLICATE SAMPLE RESULTS

Station ID	Analyte	Result	Result Units	Review Qualifier	Field QC Code
DAC488-4D-9B-02	Beryllium	0.49	mg/kg		FD
DAC488-4D-9B-02	Boron	2.52	mg/kg	J	FD
DAC488-4D-9B-02	Cadmium	0.235	mg/kg	U	FD
DAC488-4D-9B-02	Chromium	14.5	mg/kg		FD
DAC488-4D-9B-02	Chromium, Hexavalent	0.503	mg/kg	U	FD
DAC488-4D-9B-02	Cobalt	1.23	mg/kg		FD
DAC488-4D-9B-02	Copper	2.38	mg/kg		FD
DAC488-4D-9B-02	Iron	7,090	mg/kg		FD
DAC488-4D-9B-02	Lead	16.7	mg/kg		FD
DAC488-4D-9B-02	Magnesium	477	mg/kg		FD
DAC488-4D-9B-02	Manganese	17.7	mg/kg		FD
DAC488-4D-9B-02	Mercury	0.045	mg/kg	J	FD
DAC488-4D-9B-02	Molybdenum	0.137	mg/kg	J	FD
DAC488-4D-9B-02	Nickel	3.04	mg/kg		FD
DAC488-4D-9B-02	Selenium	0.941	mg/kg	J	FD
DAC488-4D-9B-02	Silver	0.615	mg/kg	U	FD
DAC488-4D-9B-02	Strontium	60.1	mg/kg		FD
DAC488-4D-9B-02	Thallium	0.267	mg/kg	J	FD
DAC488-4D-9B-02	Vanadium	20.6	mg/kg		FD
DAC488-4D-9B-02	Zinc	5.34	mg/kg		FD
DAC488-4D-9B-02	Actinium-228	1.38	pCi/g		FD
DAC488-4D-9B-02	Lead-212	1.45	pCi/g		FD
DAC488-4D-9B-02	Lead-214	1.41	pCi/g		FD
DAC488-4D-9B-02	Potassium-40	2.48	pCi/g		FD
DAC488-4D-9B-02	Uranium-233/234	0.842	pCi/g		FD
DAC488-4D-9B-02	Uranium-235	0.0486	pCi/g	U	FD
DAC488-4D-9B-02	Uranium-238	0.675	pCi/g		FD

FD = field duplicate

Reported result for U qualified data (nondetect) is the practical quantitation limit

APPENDIX B

ProUCL Output/Input for Human Health Statistical Hypothesis Testing for the 488-1D Ash Basin

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One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects - Arsenic

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 2:56:06 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Action Level	**8.2**
Selected Null Hypothesis	Mean/Median <= Action Level (Form 1)
Alternative Hypothesis	Mean/Median > the Action Level

As

One Sample Wilcoxon Signed Rank Test

Raw Statistics	
Number of Valid Data	21
Number of Distinct Data	21
Number of Non-Detects	1
Number of Detects	20
Percent Non-Detects	4.76%
Minimum Non-detect	0.403
Maximum Non-detect	0.403
Minimum Detect	0.527
Maximum Detect	20.4
Mean of Detects	3.761
Median of Detects	2.345
SD of Detects	4.855
Median of Processed Data used in WSR	2.22
Number Above Action Level	2
Number Equal Action Level	0
Number Below Action Level	19
T-plus	27
T-minus	204

H0: Sample Median <= 8.2 (Form 1)

Large Sample z-Test Statistic	-3.059
Critical Value (0.05)	1.645
P-Value	0.999

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean/Median <= 8.2
P-Value > Alpha (0.05)

All NDs are replaced by their respective DL/2

One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects - Hexavalent Chromium (Method 7196A)

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 2:57:22 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Action Level	**0.29**
Selected Null Hypothesis	Mean/Median <= Action Level (Form 1)
Alternative Hypothesis	Mean/Median > the Action Level

Cr6

One Sample Wilcoxon Signed Rank Test

Raw Statistics	
Number of Valid Data	21
Number of Distinct Data	21
Number of Non-Detects	5
Number of Detects	16
Percent Non-Detects	23.81%
Minimum Non-detect	0.138
Maximum Non-detect	0.184
Minimum Detect	0.199
Maximum Detect	1.94
Mean of Detects	0.68
Median of Detects	0.584
SD of Detects	0.476
Median of Processed Data used in WSR	0.409
Number Above Action Level	13
Number Equal Action Level	0
Number Below Action Level	8
T-plus	177
T-minus	54

H0: Sample Median <= 0.29 (Form 1)

Large Sample z-Test Statistic	2.155
Critical Value (0.05)	1.645
P-Value	0.0156

Conclusion with Alpha = 0.05
Reject H0, Conclude Mean/Median > 0.29
P-Value < Alpha (0.05)

Dataset contains multiple Non-Detect values!
All NDs are replaced by their respective DL/2

One Sample t-Test for Uncensored Full Data Sets without NDs - Potassium-40

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 2:59:19 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**3.3**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

K40

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	20
Minimum	1.14
Maximum	4.91
Mean	2.294
Median	2.15
SD	0.786
SE of Mean	0.172

H0: Sample Mean <= 3.3 (Form 1)

Test Value	-5.863
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	1

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean <= 3.3
P-Value > Alpha (0.05)

One Sample t-Test for Uncensored Full Data Sets without NDs - Radium-226

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 3:00:33 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**1.2**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

Ra226

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	19
Minimum	0.809
Maximum	1.39
Mean	1.128
Median	1.14
SD	0.197
SE of Mean	0.043

H0: Sample Mean <= 1.2 (Form 1)

Test Value	-1.682
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	0.946

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 1.2

P-Value > Alpha (0.05)

One Sample t-Test for Uncensored Full Data Sets without NDs - Radium-228

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 3:01:41 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**2.2**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

Ra228

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	20
Minimum	0.986
Maximum	2.37
Mean	1.402
Median	1.31
SD	0.353
SE of Mean	0.0771

H0: Sample Mean <= 2.2 (Form 1)

Test Value	-10.35
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 2.2

P-Value > Alpha (0.05)

One Sample t-Test for Uncensored Full Data Sets without NDs - Thorium-228

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 3:02:45 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**2.3**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

Th228

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	18
Minimum	0.882
Maximum	2.33
Mean	1.389
Median	1.35
SD	0.299
SE of Mean	0.0653

H0: Sample Mean <= 2.3 (Form 1)

Test Value	-13.96
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 2.3

P-Value > Alpha (0.05)

One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects - Uranium-235

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 3:10:36 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Action Level	**0.194**
Selected Null Hypothesis	Mean/Median <= Action Level (Form 1)
Alternative Hypothesis	Mean/Median > the Action Level

U235

One Sample Wilcoxon Signed Rank Test

Raw Statistics	
Number of Valid Data	21
Number of Distinct Data	18
Number of Non-Detects	11
Number of Detects	10
Percent Non-Detects	52.38%
Minimum Non-detect	0.0123
Maximum Non-detect	0.104
Minimum Detect	0.0854
Maximum Detect	0.29
Mean of Detects	0.159
Median of Detects	0.128
SD of Detects	0.0748
Median of Processed Data used in WSR	0.052
Number Above Action Level	3
Number Equal Action Level	0
Number Below Action Level	18
T-plus	15
T-minus	216

H0: Sample Median <= 0.194 (Form 1)

Large Sample z-Test Statistic	-3.477
Critical Value (0.05)	1.645
P-Value	1

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean/Median <= 0.194
P-Value > Alpha (0.05)

Dataset contains multiple Non-Detect values!
All NDs are replaced by their respective DL/2

One Sample t-Test for Uncensored Full Data Sets without NDs - Uranium-238

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 3:07:21 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**1.2**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

U238

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	21
Minimum	0.584
Maximum	1.21
Mean	0.872
Median	0.872
SD	0.172
SE of Mean	0.0376

H0: Sample Mean <= 1.2 (Form 1)

Test Value	-8.731
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 1.2

P-Value > Alpha (0.05)

ProUCL Inputs										
As	**d_As**	**Cr+6**	**d_Cr+6**	**Ra-226**	**Ra-228**	**Th-228**	**K-40**	**U-235**	**d_U2-35**	**U-238**
20.4	1	1.94	1	1.39	2.37	2.33	4.91	0.29	1	1.21
13.2	1	1.36	1	1.38	2.08	1.88	3.38	0.281	1	1.11
6.18	1	1.15	1	1.36	1.76	1.67	3.11	0.209	1	1.09
5.57	1	1.06	1	1.35	1.73	1.52	2.57	0.146	1	1.04
3.49	1	0.637	1	1.35	1.69	1.46	2.52	0.128	1	1.02
3.39	1	0.627	1	1.34	1.55	1.45	2.5	0.128	1	0.995
3.29	1	0.592	1	1.31	1.43	1.44	2.46	0.128	1	0.99
2.8	1	0.585	1	1.27	1.36	1.41	2.26	0.104	1	0.963
2.5	1	0.582	1	1.17	1.35	1.4	2.25	0.0937	1	0.902
2.47	1	0.574	1	1.15	1.35	1.36	2.21	0.0854	1	0.882
2.22	1	0.409	1	1.14	1.31	1.35	2.15	0.0324	0	0.872
1.63	1	0.397	1	1.07	1.26	1.35	2.15	0.0634	0	0.868
1.4	1	0.337	1	1.05	1.24	1.28	2.06	0.0615	0	0.813
1.23	1	0.217	1	1.04	1.22	1.25	1.95	0.0516	0	0.767
1.18	1	0.214	1	0.971	1.2	1.25	1.93	0.0123	0	0.762
1.15	1	0.199	1	0.93	1.19	1.24	1.86	0.0399	0	0.74
1.12	1	0.184	0	0.915	1.18	1.23	1.84	0.104	0	0.716
0.899	1	0.172	0	0.9	1.1	1.19	1.79	0.0451	0	0.711
0.572	1	0.169	0	0.894	1.08	1.11	1.78	0.0301	0	0.648
0.527	1	0.163	0	0.894	1	1.11	1.36	0.022	0	0.631
0.403	0	0.138	0	0.809	0.986	0.882	1.14	0.0557	0	0.584

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APPENDIX C

ProUCL Output/Input for Ecological Statistical Hypothesis Testing for the 488-1D Ash Basin

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One Sample t-Test for Uncensored Full Data Sets without NDs - Mercury

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 1:14:48 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**0.13**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

Hg

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	21
Minimum	0.00562
Maximum	0.174
Mean	0.057
Median	0.0455
SD	0.0433
SE of Mean	0.00946

H0: Sample Mean <= 0.13 (Form 1)

Test Value	-7.717
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	1

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean <= 0.13
P-Value > Alpha (0.05)

One Sample t-Test for Uncensored Full Data Sets without NDs - Vanadium

User Selected Options	
Date/Time of Computation	ProUCL 5.12/6/2018 1:17:00 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**69.9**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

V

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	21
Minimum	10.6
Maximum	80.5
Mean	40.03
Median	35.2
SD	21.42
SE of Mean	4.675

H0: Sample Mean <= 69.9 (Form 1)

Test Value	-6.39
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	1

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 69.9

P-Value > Alpha (0.05)

ProUCL Inputs	
Hg	**V**
(mg/kg)	
0.174	80.5
0.139	77.3
0.131	70.1
0.0996	69.1
0.0562	62.7
0.0561	54.7
0.0549	52.9
0.0532	39.7
0.0506	38.9
0.0471	35.8
0.0455	35.2
0.0449	31.8
0.0441	28.9
0.0426	27.4
0.0397	25
0.0297	21.8
0.027	21.4
0.0247	20.5
0.0204	19.3
0.0113	17
0.00562	10.6

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APPENDIX D

Additional Hexavalent Chromium Data for the 488-1D Ash Basin

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One Sample t-Test for Uncensored Full Data Sets without NDs - Hexavalent Chromium (BAL)

User Selected Options	
Date/Time of Computation	ProUCL 5.13/1/2018 9:58:45 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**0.29**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

BAL Cr+6 (Method 7199)

One Sample t-Test

Raw Statistics	
Number of Valid Observations	21
Number of Distinct Observations	20
Minimum	0.087
Maximum	1.63
Mean	0.877
Median	0.899
SD	0.468
SE of Mean	0.102

H0: Sample Mean <= 0.29 (Form 1)

Test Value	5.746
Degrees of Freedom	20
Critical Value (0.05)	1.725
P-Value	6.36E-06

Conclusion with Alpha = 0.05

Reject H0, Conclude Mean > 0.29

P-Value < Alpha (0.05)

ProUCL Inputs for Method 7199
Cr+6 *(mg/kg)*
0.837
1.24
0.899
1.1
1.0
1.01
1.63
0.695
1.37
0.997
1.54
0.63
1.24
0.651
1.6
0.223
0.087
0.303
0.489
0.141
0.725

Mean Calculation for EPA Method 7196A (Colorimetric)

Sample Grid	Station Identification	Result *(mg/kg)*	Review Qualifier	Mean Calculation	Comment
1DAB-01	4881D-WE-CONF01	ND (0.172)	UJ	0.086	1/2 DL used as surrogate
1DAB-02	4881D-WE-CONF02	0.637		0.637	
1DAB-03	4881D-WE-CONF03	ND (0.184)	U	0.092	1/2 DL used as surrogate
1DAB-04	4881D-WE-CONF04	0.397	J	0.397	
1DAB-05	4881D-WE-CONF05	0.585		0.585	
1DAB-06	4881D-WE-CONF06	1.36		1.36	
1DAB-07	4881D-WE-CONF07	0.592		0.592	
1DAB-08	4881D-WE-CONF08	0.582		0.582	
1DAB-09	4881D-WE-CONF09	1.94	J	1.94	
1DAB-10	4881D-WE-CONF10	0.337	J	0.337	
1DAB-11	4881D-WE-CONF11	1.06		1.06	
1DAB-12	4881D-WE-CONF12	0.217	J	0.217	
1DAB-13	4881D-WE-CONF13	1.15	J	1.15	
1DAB-14	4881D-WE-CONF20	0.409		0.409	
1DAB-15	4881D-WE-CONF15	0.199	J	0.199	
1DAB-16	4881D-WE-CONF16	0.574		0.574	
1DAB-17	4881D-WE-CONF17	ND (0.169)	U	0.0845	1/2 DL used as surrogate
1DAB-18	4881D-WE-CONF18	ND (0.138)	U	0.069	1/2 DL used as surrogate
1DAB-19	4881D-WE-CONF19	ND (0.163)	U	0.0815	1/2 DL used as surrogate
1DAB-20	DAC488-4D-9B-01	0.627		0.627	
1DAB-21	DAC488-4D-9B-02	0.214	J	0.214	
			mean =	**0.55395**	

ND = nondetect (sample specific detection limit [DL] in parenthesis)

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APPENDIX E

Inlet Basins Final Confirmation Sample Data

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INLET BASINS FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-STI-6CONF	Aluminum	33,400	mg/kg	J	<77,000 (HH)
4881D-STI-5CONF	Aluminum	25,200	mg/kg		
4881D-STI-3CONF	Aluminum	21,700	mg/kg		
4881D-STI-2CONF	Aluminum	18,400	mg/kg		
4881D-STI-8CONF	Aluminum	17,200	mg/kg	J	
4881D-STI-4CONF	Aluminum	14,000	mg/kg		
4881D-STI-1CONF	Aluminum	13,500	mg/kg		
4881D-STI-7CONF	Aluminum	3,100	mg/kg	J	
4881D-STI-6CONF	Antimony	0.647	mg/kg	J	<24.0 (ECO)
4881D-STI-3CONF	Antimony	12.4	mg/kg	U	
4881D-STI-8CONF	Antimony	1.19	mg/kg	U	
4881D-STI-5CONF	Antimony	1.18	mg/kg	U	
4881D-STI-2CONF	Antimony	1.11	mg/kg	U	
4881D-STI-4CONF	Antimony	1.09	mg/kg	U	
4881D-STI-7CONF	Antimony	1.05	mg/kg	U	
4881D-STI-1CONF	Antimony	1.03	mg/kg	U	
4881D-STI-6CONF	Arsenic	2.94	mg/kg	J	<8.2 (HH)
4881D-STI-3CONF	Arsenic	2.06	mg/kg		
4881D-STI-8CONF	Arsenic	1.72	mg/kg	J	
4881D-STI-2CONF	Arsenic	1.45	mg/kg		
4881D-STI-7CONF	Arsenic	1.44	mg/kg	J	
4881D-STI-1CONF	Arsenic	1.21	mg/kg		
4881D-STI-5CONF	Arsenic	0.907	mg/kg	J	
4881D-STI-4CONF	Arsenic	0.84	mg/kg	J	
4881D-STI-3CONF	Barium	221	mg/kg		<260 (ECO)
4881D-STI-6CONF	Barium	160	mg/kg	J	
4881D-STI-5CONF	Barium	87.9	mg/kg		
4881D-STI-8CONF	Barium	59.7	mg/kg	J	
4881D-STI-4CONF	Barium	49.8	mg/kg		
4881D-STI-2CONF	Barium	26.4	mg/kg		
4881D-STI-1CONF	Barium	18	mg/kg		
4881D-STI-7CONF	Barium	13.1	mg/kg	J	
4881D-STI-6CONF	Beryllium	1.88	mg/kg	J	<25.0 (ECO)
4881D-STI-3CONF	Beryllium	1.06	mg/kg		
4881D-STI-5CONF	Beryllium	0.982	mg/kg	J	
4881D-STI-8CONF	Beryllium	0.927	mg/kg	J	
4881D-STI-1CONF	Beryllium	0.276	mg/kg		
4881D-STI-4CONF	Beryllium	0.263	mg/kg		
4881D-STI-2CONF	Beryllium	0.227	mg/kg		
4881D-STI-7CONF	Beryllium	0.0708	mg/kg	J	
4881D-STI-2CONF	Boron	**10.9**	**mg/kg**		**10.0 (ECO)**
4881D-STI-6CONF	Boron	7.6	mg/kg	J	
4881D-STI-5CONF	Boron	6.12	mg/kg	J	
4881D-STI-4CONF	Boron	2.91	mg/kg	J	
4881D-STI-1CONF	Boron	2.56	mg/kg	J	
4881D-STI-8CONF	Boron	2.56	mg/kg	J	
4881D-STI-3CONF	Boron	1.73	mg/kg	J	
4881D-STI-7CONF	Boron	1.31	mg/kg	J	

INLET BASINS FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-STI-6CONF	Cadmium	0.0373	mg/kg	J	<2.7 (ECO)
4881D-STI-1CONF	Cadmium	0.0253	mg/kg	J	
4881D-STI-3CONF	Cadmium	0.25	mg/kg	U	
4881D-STI-8CONF	Cadmium	0.243	mg/kg	UJ	
4881D-STI-5CONF	Cadmium	0.237	mg/kg	UJ	
4881D-STI-2CONF	Cadmium	0.226	mg/kg	U	
4881D-STI-7CONF	Cadmium	0.218	mg/kg	UJ	
4881D-STI-4CONF	Cadmium	0.209	mg/kg	U	
4881D-STI-6CONF	Chromium	16.1	mg/kg	J	<280 (ECO)
4881D-STI-1CONF	Chromium	16	mg/kg		
4881D-STI-5CONF	Chromium	14.8	mg/kg	J	
4881D-STI-3CONF	Chromium	13.9	mg/kg		
4881D-STI-2CONF	Chromium	12.7	mg/kg		
4881D-STI-4CONF	Chromium	12.1	mg/kg	J	
4881D-STI-8CONF	Chromium	9.93	mg/kg	J	
4881D-STI-7CONF	Chromium	2	mg/kg	J	
4881D-STI-5CONF	Chromium, Hexavalent	0.192	mg/kg	J	<0.29 (HH)
4881D-STI-7CONF	Chromium, Hexavalent	0.18	mg/kg	J	
4881D-STI-1CONF	Chromium, Hexavalent	0.17	mg/kg	J	
4881D-STI-6CONF	Chromium, Hexavalent	2.21	mg/kg	U	
4881D-STI-3CONF	Chromium, Hexavalent	0.502	mg/kg	U	
4881D-STI-4CONF	Chromium, Hexavalent	0.393	mg/kg	U	
4881D-STI-8CONF	Chromium, Hexavalent	0.359	mg/kg	U	
4881D-STI-2CONF	Chromium, Hexavalent	0.241	mg/kg	U	
4881D-STI-3CONF	Cobalt	18.9	mg/kg		<23.0 (HH)
4881D-STI-4CONF	Cobalt	1.79	mg/kg		
4881D-STI-8CONF	Cobalt	0.964	mg/kg	J	
4881D-STI-6CONF	Cobalt	0.932	mg/kg	J	
4881D-STI-2CONF	Cobalt	0.772	mg/kg		
4881D-STI-5CONF	Cobalt	0.698	mg/kg		
4881D-STI-1CONF	Cobalt	0.627	mg/kg		
4881D-STI-7CONF	Cobalt	0.125	mg/kg	J	
4881D-STI-3CONF	Copper	6.94	mg/kg		<46.0 (ECO)
4881D-STI-6CONF	Copper	3.58	mg/kg	J	
4881D-STI-8CONF	Copper	3.46	mg/kg	J	
4881D-STI-2CONF	Copper	1.65	mg/kg		
4881D-STI-4CONF	Copper	1.6	mg/kg		
4881D-STI-5CONF	Copper	1.35	mg/kg	J	
4881D-STI-1CONF	Copper	0.731	mg/kg		
4881D-STI-7CONF	Copper	0.336	mg/kg	J	
4881D-STI-3CONF	Iron	37,300	mg/kg		<55,000 (HH)
4881D-STI-5CONF	Iron	21,500	mg/kg		
4881D-STI-1CONF	Iron	13,900	mg/kg		
4881D-STI-2CONF	Iron	13,900	mg/kg		
4881D-STI-4CONF	Iron	7,470	mg/kg		
4881D-STI-8CONF	Iron	3,510	mg/kg	J	
4881D-STI-6CONF	Iron	3,060	mg/kg	J	
4881D-STI-7CONF	Iron	539	mg/kg	J	

INLET BASINS FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-STI-6CONF	Lead	20.3	mg/kg	J	<28.0 (ECO)
4881D-STI-5CONF	Lead	13.7	mg/kg	J	
4881D-STI-1CONF	Lead	13.4	mg/kg		
4881D-STI-8CONF	Lead	12	mg/kg	J	
4881D-STI-3CONF	Lead	11.3	mg/kg		
4881D-STI-2CONF	Lead	11.1	mg/kg		
4881D-STI-4CONF	Lead	7.6	mg/kg		
4881D-STI-7CONF	Lead	3.42	mg/kg	J	
4881D-STI-6CONF	Magnesium	471	mg/kg	J	None
4881D-STI-3CONF	Magnesium	453	mg/kg		
4881D-STI-2CONF	Magnesium	317	mg/kg		
4881D-STI-5CONF	Magnesium	316	mg/kg	J	
4881D-STI-4CONF	Magnesium	223	mg/kg	J	
4881D-STI-8CONF	Magnesium	222	mg/kg	J	
4881D-STI-1CONF	Magnesium	175	mg/kg		
4881D-STI-7CONF	Magnesium	58.8	mg/kg	J	
4881D-STI-8CONF	Manganese	20.7	mg/kg	J	<1,100 (ECO)
4881D-STI-6CONF	Manganese	15.1	mg/kg	J	
4881D-STI-5CONF	Manganese	14.4	mg/kg	J	
4881D-STI-7CONF	Manganese	11.1	mg/kg	J	
4881D-STI-3CONF	Manganese	9.26	mg/kg		
4881D-STI-2CONF	Manganese	9.09	mg/kg		
4881D-STI-4CONF	Manganese	7.42	mg/kg		
4881D-STI-1CONF	Manganese	6.24	mg/kg		
4881D-STI-8CONF	Mercury	**0.148**	**mg/kg**		**0.13 (ECO)**
4881D-STI-6CONF	Mercury	0.125	mg/kg		
4881D-STI-5CONF	Mercury	0.0945	mg/kg		
4881D-STI-7CONF	Mercury	0.0422	mg/kg		
4881D-STI-2CONF	Mercury	0.0113	mg/kg	J	
4881D-STI-3CONF	Mercury	0.00985	mg/kg	J	
4881D-STI-4CONF	Mercury	0.00585	mg/kg	J	
4881D-STI-1CONF	Mercury	0.00503	mg/kg	J	
4881D-STI-2CONF	Molybdenum	3.71	mg/kg	J	<170 (ECO)
4881D-STI-7CONF	Molybdenum	1.85	mg/kg	J	
4881D-STI-6CONF	Molybdenum	1.63	mg/kg	J	
4881D-STI-8CONF	Molybdenum	0.536	mg/kg	J	
4881D-STI-4CONF	Molybdenum	0.181	mg/kg	J	
4881D-STI-1CONF	Molybdenum	0.142	mg/kg	J	
4881D-STI-3CONF	Molybdenum	0.25	mg/kg	U	
4881D-STI-5CONF	Molybdenum	0.237	mg/kg	UJ	
4881D-STI-3CONF	Nickel	6.92	mg/kg		<19.0 (ECO)
4881D-STI-6CONF	Nickel	4.39	mg/kg	J	
4881D-STI-8CONF	Nickel	3.11	mg/kg	J	
4881D-STI-5CONF	Nickel	2.86	mg/kg		
4881D-STI-2CONF	Nickel	2.31	mg/kg		
4881D-STI-1CONF	Nickel	2.05	mg/kg		
4881D-STI-4CONF	Nickel	1.64	mg/kg		
4881D-STI-7CONF	Nickel	0.477	mg/kg	J	

INLET BASINS FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-STI-3CONF	Selenium	1.3	mg/kg		<7.8 (ECO)
4881D-STI-5CONF	Selenium	1.24	mg/kg	J	
4881D-STI-6CONF	Selenium	1.09	mg/kg	J	
4881D-STI-8CONF	Selenium	1.07	mg/kg	J	
4881D-STI-2CONF	Selenium	0.558	mg/kg	J	
4881D-STI-1CONF	Selenium	0.54	mg/kg	J	
4881D-STI-7CONF	Selenium	1.09	mg/kg	UJ	
4881D-STI-4CONF	Selenium	1.05	mg/kg	UJ	
4881D-STI-5CONF	Silver	0.28	mg/kg	J	<26.0 (ECO)
4881D-STI-8CONF	Silver	0.122	mg/kg	J	
4881D-STI-6CONF	Silver	0.621	mg/kg	U	
4881D-STI-3CONF	Silver	0.62	mg/kg	U	
4881D-STI-2CONF	Silver	0.555	mg/kg	U	
4881D-STI-4CONF	Silver	0.545	mg/kg	U	
4881D-STI-7CONF	Silver	0.525	mg/kg	U	
4881D-STI-1CONF	Silver	0.516	mg/kg	U	
4881D-STI-6CONF	Strontium	39.1	mg/kg	J	<960 (ECO)
4881D-STI-3CONF	Strontium	24.4	mg/kg		
4881D-STI-5CONF	Strontium	19.1	mg/kg	J	
4881D-STI-4CONF	Strontium	17.9	mg/kg	J	
4881D-STI-8CONF	Strontium	14.1	mg/kg	J	
4881D-STI-2CONF	Strontium	13.7	mg/kg		
4881D-STI-7CONF	Strontium	9.5	mg/kg	J	
4881D-STI-1CONF	Strontium	5.91	mg/kg		
4881D-STI-6CONF	Thallium	0.176	mg/kg	J	<6.3 (HH and ECO)
4881D-STI-3CONF	Thallium	0.5	mg/kg	U	
4881D-STI-8CONF	Thallium	0.486	mg/kg	UJ	
4881D-STI-5CONF	Thallium	0.474	mg/kg	U	
4881D-STI-2CONF	Thallium	0.451	mg/kg	U	
4881D-STI-7CONF	Thallium	0.435	mg/kg	UJ	
4881D-STI-1CONF	Thallium	0.425	mg/kg	U	
4881D-STI-4CONF	Thallium	0.419	mg/kg	U	
4881D-STI-1CONF	Vanadium	65.9	mg/kg		<69.9 (ECO)
4881D-STI-2CONF	Vanadium	49	mg/kg		
4881D-STI-3CONF	Vanadium	40.6	mg/kg		
4881D-STI-4CONF	Vanadium	29.9	mg/kg		
4881D-STI-5CONF	Vanadium	16.7	mg/kg	J	
4881D-STI-6CONF	Vanadium	16.6	mg/kg	J	
4881D-STI-8CONF	Vanadium	11.4	mg/kg	J	
4881D-STI-7CONF	Vanadium	1.71	mg/kg	J	
4881D-STI-3CONF	Zinc	15.1	mg/kg		<480 (ECO)
4881D-STI-8CONF	Zinc	5.54	mg/kg	J	
4881D-STI-2CONF	Zinc	4.75	mg/kg		
4881D-STI-6CONF	Zinc	4.67	mg/kg	J	
4881D-STI-4CONF	Zinc	4.46	mg/kg	J	
4881D-STI-1CONF	Zinc	3.97	mg/kg		
4881D-STI-5CONF	Zinc	3.77	mg/kg	J	
4881D-STI-7CONF	Zinc	2.02	mg/kg	J	

INLET BASINS FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
4881D-STI-3CONF	Actinium-228 (Radium-228+D)	1.64	pCi/g		<2.2 (HH)
4881D-STI-6CONF	Actinium-228 (Radium-228+D)	1.39	pCi/g		
4881D-STI-1CONF	Actinium-228 (Radium-228+D)	1.24	pCi/g		
4881D-STI-5CONF	Actinium-228 (Radium-228+D)	1.23	pCi/g		
4881D-STI-8CONF	Actinium-228 (Radium-228+D)	1.21	pCi/g		
4881D-STI-2CONF	Actinium-228 (Radium-228+D)	1.16	pCi/g		
4881D-STI-7CONF	Actinium-228 (Radium-228+D)	1.15	pCi/g		
4881D-STI-4CONF	Actinium-228 (Radium-228+D)	1.03	pCi/g	R	
4881D-STI-1CONF	Lead-212 (Thorium-228+D)	1.63	pCi/g		<2.3 (HH)
4881D-STI-5CONF	Lead-212 (Thorium-228+D)	1.3	pCi/g		
4881D-STI-8CONF	Lead-212 (Thorium-228+D)	1.24	pCi/g		
4881D-STI-2CONF	Lead-212 (Thorium-228+D)	1.23	pCi/g		
4881D-STI-3CONF	Lead-212 (Thorium-228+D)	1.23	pCi/g		
4881D-STI-6CONF	Lead-212 (Thorium-228+D)	1.18	pCi/g		
4881D-STI-4CONF	Lead-212 (Thorium-228+D)	1.09	pCi/g		
4881D-STI-7CONF	Lead-212 (Thorium-228+D)	1.08	pCi/g		
4881D-STI-1CONF	Lead-214 (Radium-226+D)	**1.29**	**pCi/g**		**1.2 (HH)**
4881D-STI-5CONF	Lead-214 (Radium-226+D)	1.14	pCi/g		
4881D-STI-6CONF	Lead-214 (Radium-226+D)	1.12	pCi/g		
4881D-STI-3CONF	Lead-214 (Radium-226+D)	1.06	pCi/g		
4881D-STI-2CONF	Lead-214 (Radium-226+D)	1.01	pCi/g		
4881D-STI-7CONF	Lead-214 (Radium-226+D)	1.01	pCi/g		
4881D-STI-8CONF	Lead-214 (Radium-226+D)	0.992	pCi/g		
4881D-STI-4CONF	Lead-214 (Radium-226+D)	0.552	pCi/g		
4881D-STI-4CONF	Potassium-40	**7.5**	**pCi/g**		**3.3 (HH)**
4881D-STI-7CONF	Potassium-40	**5.03**	**pCi/g**		
4881D-STI-8CONF	Potassium-40	**3.58**	**pCi/g**		
4881D-STI-3CONF	Potassium-40	2.95	pCi/g		
4881D-STI-1CONF	Potassium-40	2.76	pCi/g	J	
4881D-STI-6CONF	Potassium-40	2.28	pCi/g	J	
4881D-STI-5CONF	Potassium-40	1.53	pCi/g		
4881D-STI-2CONF	Potassium-40	1.34	pCi/g	J	
4881D-STI-1CONF	Uranium-235	0.164	pCi/g	J	<0.194 (HH)
4881D-STI-4CONF	Uranium-235	0.11	pCi/g	J	
4881D-STI-3CONF	Uranium-235	0.0925	pCi/g	J	
4881D-STI-7CONF	Uranium-235	0.0678	pCi/g	J	
4881D-STI-2CONF	Uranium-235	0.0858	pCi/g	U	
4881D-STI-8CONF	Uranium-235	0.079	pCi/g	U	
4881D-STI-6CONF	Uranium-235	0.0744	pCi/g	U	
4881D-STI-5CONF	Uranium-235	0.0644	pCi/g	U	
4881D-STI-1CONF	Uranium-238	1.05	pCi/g		<1.20 (HH)
4881D-STI-6CONF	Uranium-238	1.01	pCi/g		
4881D-STI-8CONF	Uranium-238	1.01	pCi/g		
4881D-STI-3CONF	Uranium-238	0.757	pCi/g		
4881D-STI-2CONF	Uranium-238	0.736	pCi/g		
4881D-STI-5CONF	Uranium-238	0.63	pCi/g		
4881D-STI-4CONF	Uranium-238	0.483	pCi/g		
4881D-STI-7CONF	Uranium-238	0.417	pCi/g		

INLET BASINS FINAL CONFIRMATION SAMPLE DATA

Station ID	Analyte	Result	Result Units	Review Qualifier	Most Conservative Threshold Level
Reported result for U-qualified data (nondetect) is the practical quantitation limit Bolded numbers indicate exceedance of threshold level HH = human health ECO = ecological					

FIELD DUPLICATE SAMPLE RESULTS

Station ID	Analyte	Result	Result Units	Review Qualifier	Field QC Code
4881D-STI-2CONF	Aluminum	21,400	mg/kg		FD
4881D-STI-2CONF	Antimony	1.04	mg/kg	U	FD
4881D-STI-2CONF	Arsenic	1.51	mg/kg		FD
4881D-STI-2CONF	Barium	32.8	mg/kg		FD
4881D-STI-2CONF	Beryllium	0.221	mg/kg		FD
4881D-STI-2CONF	Boron	10.5	mg/kg		FD
4881D-STI-2CONF	Cadmium	0.211	mg/kg	U	FD
4881D-STI-2CONF	Chromium	14.9	mg/kg		FD
4881D-STI-2CONF	Chromium, Hexavalent	0.2	mg/kg	J	FD
4881D-STI-2CONF	Cobalt	0.814	mg/kg		FD
4881D-STI-2CONF	Copper	1.47	mg/kg		FD
4881D-STI-2CONF	Iron	12,400	mg/kg		FD
4881D-STI-2CONF	Lead	14	mg/kg		FD
4881D-STI-2CONF	Magnesium	329	mg/kg		FD
4881D-STI-2CONF	Manganese	8.11	mg/kg		FD
4881D-STI-2CONF	Mercury	0.00983	mg/kg	J	FD
4881D-STI-2CONF	Molybdenum	0.138	mg/kg	J	FD
4881D-STI-2CONF	Nickel	2.57	mg/kg		FD
4881D-STI-2CONF	Selenium	0.733	mg/kg	J	FD
4881D-STI-2CONF	Silver	0.518	mg/kg	U	FD
4881D-STI-2CONF	Strontium	11.3	mg/kg		FD
4881D-STI-2CONF	Thallium	0.16	mg/kg	J	FD
4881D-STI-2CONF	Vanadium	38.2	mg/kg		FD
4881D-STI-2CONF	Zinc	4.81	mg/kg		FD
4881D-STI-2CONF	Actinium-228	1.23	pCi/g		FD
4881D-STI-2CONF	Lead-212	1.46	pCi/g		FD
4881D-STI-2CONF	Lead-214	1.14	pCi/g		FD
4881D-STI-2CONF	Potassium-40	1.15	pCi/g	J	FD
4881D-STI-2CONF	Uranium-233/234	0.75	pCi/g	J	FD
4881D-STI-2CONF	Uranium-235	0.074	pCi/g	U	FD
4881D-STI-2CONF	Uranium-238	0.741	pCi/g		FD
4881D-STI-6CONF	Aluminum	28,900	mg/kg	J	FD
4881D-STI-6CONF	Antimony	1.16	mg/kg	U	FD
4881D-STI-6CONF	Arsenic	0.902	mg/kg	J	FD
4881D-STI-6CONF	Barium	122	mg/kg	J	FD
4881D-STI-6CONF	Beryllium	1.8	mg/kg	J	FD
4881D-STI-6CONF	Boron	6.59	mg/kg	J	FD
4881D-STI-6CONF	Cadmium	0.244	mg/kg	UJ	FD
4881D-STI-6CONF	Chromium	15.7	mg/kg	J	FD
4881D-STI-6CONF	Chromium, Hexavalent	1.5	mg/kg	J	FD

FIELD DUPLICATE SAMPLE RESULTS

Station ID	Analyte	Result	Result Units	Review Qualifier	Field QC Code
4881D-STI-6CONF	Cobalt	0.641	mg/kg	J	FD
4881D-STI-6CONF	Copper	2.74	mg/kg	J	FD
4881D-STI-6CONF	Iron	2,270	mg/kg	J	FD
4881D-STI-6CONF	Lead	18.3	mg/kg	J	FD
4881D-STI-6CONF	Magnesium	332	mg/kg	J	FD
4881D-STI-6CONF	Manganese	10.5	mg/kg	J	FD
4881D-STI-6CONF	Mercury	0.143	mg/kg		FD
4881D-STI-6CONF	Molybdenum	0.314	mg/kg	J	FD
4881D-STI-6CONF	Nickel	3.51	mg/kg	J	FD
4881D-STI-6CONF	Selenium	1.09	mg/kg	J	FD
4881D-STI-6CONF	Silver	0.578	mg/kg	U	FD
4881D-STI-6CONF	Strontium	23.6	mg/kg	J	FD
4881D-STI-6CONF	Thallium	0.488	mg/kg	UJ	FD
4881D-STI-6CONF	Vanadium	14.6	mg/kg	J	FD
4881D-STI-6CONF	Zinc	3.57	mg/kg	J	FD
4881D-STI-6CONF	Actinium-228	1.38	pCi/g		FD
4881D-STI-6CONF	Lead-212	1.36	pCi/g		FD
4881D-STI-6CONF	Lead-214	1.36	pCi/g		FD
4881D-STI-6CONF	Potassium-40	2.41	pCi/g		FD
4881D-STI-6CONF	Uranium-233/234	1.06	pCi/g		FD
4881D-STI-6CONF	Uranium-235	0.0902	pCi/g	J	FD
4881D-STI-6CONF	Uranium-238	1.18	pCi/g		FD

FD = field duplicate
Reported result for U qualified data (nondetect) is the practical quantitation limit

APPENDIX F

ProUCL Output/Input for Human Health Statistical Hypothesis Testing for the Inlet Basins

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One Sample t-Test for Uncensored Full Data Sets without NDs- Potassium-40

User Selected Options	
Date/Time of Computation	ProUCL 5.18/27/2018 1:14:44 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**3.3**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

K40

One Sample t-Test

Raw Statistics	
Number of Valid Observations	8
Number of Distinct Observations	8
Minimum	1.34
Maximum	7.5
Mean	3.371
Median	2.855
SD	2.039
SE of Mean	0.721

H0: Sample Mean <= 3.3 (Form 1)

Test Value	0.0988
Degrees of Freedom	7
Critical Value (0.05)	1.895
P-Value	0.462

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean <= 3.3
P-Value > Alpha (0.05)

One Sample t-Test for Uncensored Full Data Sets without NDs- Radium-226

User Selected Options	
Date/Time of Computation	ProUCL 5.18/27/2018 1:17:29 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**1.2**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

Ra226

One Sample t-Test

Raw Statistics	
Number of Valid Observations	8
Number of Distinct Observations	7
Minimum	0.552
Maximum	1.29
Mean	1.022
Median	1.035
SD	0.213
SE of Mean	0.0755

H0: Sample Mean <= 1.2 (Form 1)

Test Value	-2.362
Degrees of Freedom	7
Critical Value (0.05)	1.895
P-Value	0.975

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 1.2

P-Value > Alpha (0.05)

ProUCL Inputs	
K-40	**Ra-226**
7.50	1.29
5.03	1.14
3.58	1.12
2.95	1.06
2.76	1.01
2.28	1.01
1.53	0.992
1.34	0.552

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APPENDIX G

ProUCL Output/Input for Ecological Statistical Hypothesis Testing for the Inlet Basins

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One Sample t-Test for Uncensored Full Data Sets without NDs - Boron

User Selected Options	
Date/Time of Computation	ProUCL 5.18/27/2018 1:31:47 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**10**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

B

One Sample t-Test

Raw Statistics	
Number of Valid Observations	8
Number of Distinct Observations	7
Minimum	1.31
Maximum	10.9
Mean	4.461
Median	2.735
SD	3.404
SE of Mean	1.203

H0: Sample Mean <= 10 (Form 1)

Test Value	-4.603
Degrees of Freedom	7
Critical Value (0.05)	1.895
P-Value	0.999

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 10

P-Value > Alpha (0.05)

One Sample t-Test for Uncensored Full Data Sets without NDs - Mercury

User Selected Options	
Date/Time of Computation	ProUCL 5.18/27/2018 1:34:23 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**0.13**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

Hg

One Sample t-Test

Raw Statistics	
Number of Valid Observations	8
Number of Distinct Observations	8
Minimum	0.00503
Maximum	0.148
Mean	0.0552
Median	0.0268
SD	0.0587
SE of Mean	0.0208

H0: Sample Mean <= 0.13 (Form 1)

Test Value	-3.602
Degrees of Freedom	7
Critical Value (0.05)	1.895
P-Value	0.996

Conclusion with Alpha = 0.05

Do Not Reject H0, Conclude Mean <= 0.13

P-Value > Alpha (0.05)

ProUCL Inputs	
B	**Hg**
10.9	0.148
7.6	0.125
6.12	0.0945
2.91	0.0422
2.56	0.0113
2.56	0.00985
1.73	0.00585
1.31	0.00503

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APPENDIX H

Additional Hexavalent Chromium Data for the Inlet Basins

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One Sample Wilcoxon Signed Rank Test for Data Sets with Non-Detects
- Cr6 GEL Field Duplicate Rerun

User Selected Options	
Date/Time of Computation	ProUCL 5.19/11/2018 9:42:27 AM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Action Level	**0.29**
Selected Null Hypothesis	Mean/Median <= Action Level (Form 1)
Alternative Hypothesis	Mean/Median > the Action Level

Cr6 Rerun GEL

One Sample Wilcoxon Signed Rank Test

Raw Statistics	
Number of Valid Data	8
Number of Distinct Data	8
Number of Non-Detects	4
Number of Detects	4
Percent Non-Detects	50.00%
Minimum Non-detect	0.0963
Maximum Non-detect	0.201
Minimum Detect	0.17
Maximum Detect	1.5
Mean of Detects	0.511
Median of Detects	0.186
SD of Detects	0.66
Median of Processed Data used in WSR	0.135
Number Above Action Level	1
Number Equal Action Level	0
Number Below Action Level	7
T-plus	8
T-minus	28

H0: Sample Median <= 0.29 (Form 1)

Exact Test Statistic	8
Critical Value (0.05)	31
P-Value	0.902

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean/Median <= 0.29
P-Value > Alpha (0.05)

Dataset contains multiple Non-Detect values!
All NDs are replaced by their respective DL/2

One Sample t-Test for Uncensored Full Data Sets without NDs — Cr6
BAL Method 7199

User Selected Options	
Date/Time of Computation	ProUCL 5.19/4/2018 2:44:42 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Substantial Difference	0
Action Level	**0.29**
Selected Null Hypothesis	Mean <= Action Level (Form 1)
Alternative Hypothesis	Mean > the Action Level

BAL Method 7199

One Sample t-Test

Raw Statistics	
Number of Valid Observations	8
Number of Distinct Observations	8
Minimum	0.022
Maximum	1.09
Mean	0.328
Median	0.207
SD	0.349
SE of Mean	0.123

H0: Sample Mean <= 0.29 (Form 1)

Test Value	0.304
Degrees of Freedom	7
Critical Value (0.05)	1.895
P-Value	0.385

Conclusion with Alpha = 0.05
Do Not Reject H0, Conclude Mean <= 0.29
P-Value > Alpha (0.05)

ProUCL Inputs — Method 7196A Rerun Using Field Duplicate	
Cr-6 Rerun GEL	**d_Cr-6 Rerun GEL**
0.17	1
0.0963	0
0.201	0
0.157	0
0.192	1
1.5*	1
0.18	1
0.144	0

*FD from 488-1D-STI-6CONF

ProUCL Input BAL for Method 7199
Cr *(mg/kg)*
0.237
0.216
0.09
0.022
0.58
1.09
0.197
0.188

Mean Calculation for EPA Method 7196A (Colorimetric)

Station ID	Result *(mg/kg)*	Review Qualifier	Mean Calculation	Comment
4881D-STI-1CONF	0.17	J	0.17	
4881D-STI-2CONF	ND (0.0963)	U	0.04815	1/2 DL used as surrogate
4881D-STI-3CONF	ND (0.201)	U	0.1005	1/2 DL used as surrogate
4881D-STI-4CONF	ND (0.157)	U	0.0785	1/2 DL used as surrogate
4881D-STI-5CONF	0.192	J	0.192	
4881D-STI-6CONF	ND (0.885)	U	0.4425	1/2 DL used as surrogate
4881D-STI-7CONF	0.18	J	0.18	
4881D-STI-8CONF	ND (0.144)	U	0.072	1/2 DL used as surrogate
		mean =	**0.160**	

ND = nondetect (sample specific detection limit [DL] in parenthesis)

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